Japan International Cooperation Agency (JICA)

Data Collection Survey on efforts for Natural Disaster Prevention in Central America

Final Report

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Kokusai Kogyo Co., Ltd.

Abbreviations[1]

Abbreviation	Spanish	English
Guatemala		
CEDESYD	Centro de Estudios de Desarrollo Seguro y Desastres	Center for the Study of Safe Development and Disasters
CESEM	Centro de Estudios Superiores en Energía y Minas	Center for Advanced Studies in Energy and Mines
CIG	Colegio Ingenieros de Guatemala	Guatemala Professional Engineers Association
CNEE	Comisión Nacional de Energía Eléctrica	National Commission for Electric Energy (Power)
COLRED	Local de Coordinación Institucional para la Reducción de Desastres	Institutional Coordination for Disaster Reduction
CONAP	Consejo Nacional de Areas Protegidas	National Council for Protected Areas
CONRED	Coordinadora Nacional para la Reducción de Desastres	National Coordinator for Disaster Reduction
CORRED	Regional de Coordinación Institucional para la Reducción de Desastres	Regional Institutional Coordination for Disaster Reduction
COMRED	Municipal de Coordinación Institucional para la Reducción de Desastres	Municipal Institutional Coordination for Disaster Reduction
COVIAL	Unidad de Ejecutora de Conservación Vial	Road Conservation Executive Unit
ECORED	Equipamiento de la Comunidad para Reducción de Desastres	Community Equipment for Disaster Reduction
IGSS	Instituto Guatemalteco de Seguridad Social	Guatemalan Social Security Institute
INAB	Instituto Nacional de Bosques	National Institute of Forests
INACIF	Instituto Nacional de Ciencias Forenses	National Institute for Forensic Sciences
INFOM	Instituto de Fomento Municipal	Municipal Development Institute
INSIVUMEH	Instituto Nacional de Sismología,Vulcanología, Meteorología e Hidrología	National Institute of Seismology, Volcanology, Meteorology and Hydrology
MAGA	Ministerio de Agricultura, Ganadería y Alimentación	Ministry of Agriculture, Livestock and Food (Feeding)
MEM	Ministerio de Energía y Minas	Ministry of Energy & Mines
MICIVI	Ministerio de Comunicaciónes, Infraestructura y Vivienda	Ministry of Communications, Infrastructure and Housing
MICUDE	Ministerio de Cultura y Deportes	Ministry of Culture & Sports
MINEDUC	Ministerio de Educación	Ministry of Education
MINGOB	Ministerio de Gobernación	Ministry of Interior
MP	Ministerio Público	Public Ministry (Office of the Attorney General)
MSPAS	Ministerio de Salud Pública y Asistencia Social	Ministry of Public Health & Social Welfare
SCEP	Secretaría de Coordinación Ejecutiva de la Presidencia	Secretariat of Executive Coordination of the Presidency (Office of the President)
SE-CONRED	Secretaría Ejecutiva-Coordinadora Nacional para la Reducción de Desastres	Executive Secretariat-National Coordinating Agency for Disaster Reduction
SEGEPLAN	Secretaría de Planificación y Programación	Economic Plannning Agency
SESAN	Secretaría de Seguridad Alimentaria y Nutricional	Secretariat of Food & Nutritional Security
SOSEP	Secretaría de Obras Sociales de la Esposa del Presidente	Secretariat for Social Works of the Wife of the President
UNIRIOS	Unidad de Manejo de Ríos y Canales, Dirección General de Caminos, Ministerio de Comunicaciones, Infraestructura y Vivienda	Unit of River and Road, Directorate Genaral Road , Ministry of Communications, Infrastructure and Housing
USAC	Universidad de San Carlos	University of San Carlos
El Salvador		
ACODES	Asociación de Consultores de El Salvador	Consultants Association of El Salvador
ASIA	Asociación Salvadoreña de Ingenieros y Arquitectos	Salvadoran Association of Engineers and Architects
CASALCO	Cámara Salvadoreña de la Industria de la Construcción	Salvadoran Chamber of Construction Industry
CEL	Comisión Ejecutiva Hidroeléctrica del Río Lempa	Hydroelectric Executive Committee of the Lempa River
COMITRAN	Consejo Sectorial de Ministros de Transporte	Sector Council of Transport Ministers
DACGER/MOP	Dirección de Adaptacion al Cambio Climático y Gestión Estratégica del Riesgo, Ministerio de Obras Públicas, Transporte Vivienda y Desarrollo Urbano	Directorate for Climate Change Adaptation and Strategic Risk Management, Ministry of Public Works, Transport, Housing and Urban Development
DGOA/MARN	Dirección General del Observatorio Ambiental / Ministerio de Medio Ambiente y Recursos Naturales	Ministry of Environment and Natural Resources / Environmental Monitoring Division
DGPC	Dirección General de Protección Civil	General Directorate for Civil Protection
FUNDASAL	Fundación Salvadoreña de Desarrollo y Vivienda Mínima	Salvadoran Foundation for Development and Minimum Housing
ISC	Instituto Salvadoreño de la Construcción	Salvadoran Institute of Building Construction
ISCYC	Instituto Salvadoreño del Cemento y del Concreto	National Institute of Cement and Concrete
ISDEM	Instituto Salvadoreño de Desarrollo Municipal	Salvadoran Institute for Municipal Development

[1] Study Team (2012)

MARN	Ministerio de Medio Ambiente y Recursos Naturales	Ministry of Environment and Natural Resources
MOP	Ministerio de Obras Públicas, Transporte Vivienda y Desarrollo Urbano	Ministry of Public Works, Transportation, Housing and Urban Development
SAV	Secretaría de Asuntos de la Vulnerabilidad	Secretariat of Vulnerability Affairs
UCA	Unversidad Centroamericana	Central American University
UES	Unversidad de El Salvador	University of El Salvador
VMVDU	Ministerio de Obras Públicas, Vice Ministerio de Vivienda y Desarrollo Urbano	Ministry of Public Works, Vice Ministry of Housing and Urban Development
Honduras		
AMHON	Asociación de Municipios de Honduras	Association of Municipalities of Honduras
CODEL	Comité de Emergencia Local	Local Emergency Committee
CODEM	Comité de Emergencia Municipal	Municipal Emergency Committee
COPECO	Comisión Permanente de Contingencias	Permanent Commission of Contingencies
FHIS	Fondo Hondureño de Inversión Social	Honduran Social Investment Fund
FONAPRE	Fondo Nacional de Preparación y Respuesta a Emergencias	National Fund for Emergency Preparation
IGH	Instituto de Geociencia de Honduras	Honduras Institute of Geoscience
SEPLAN	Secretaría Técnica de Planificación y Cooperación Externa	Ministry of Planning and International Cooperation
SERNA	Secretaría de Recursos Naturales y Ambiente	Ministry of Natural Resources and Environment
SINAGER	Sistema Nacional de Gestión de Riesgo	National System for Risk Management
SMN	Servicio Meteorológico Nacional de Honduras	National Weather Service of Honduras
SOPTRAVI	Secretaría de Obras Públicas, Transporte y Vivienda	Ministry of Public Works, Transportation and Housing
UNAG	Universidad Nacional de Agricultura	National University of Agriculture
UNAH / IHCIT	Universidad Nacional Autónoma de Honduras / Instituto Hondureño de Ciencia de la Tierra	National Autonomous University of Honduras / Honduran Institute of Earth Science
UPI	Universidad Politécnica de Ingenieria	Honduras University of Engineering
UPNFM	Universidad Pedagógica Nacional Francisco Morazan	National Education University of Francisco Morazan
Nicaragua		
COLOPRED	Comités Locales de Prevención y Desastres	Local Disaster Prevention Committee
COMUPRED	Comités Municipales de Prevención, Mitigación y Atención de Desastres	Municipal Disaster Prevention and Reduction Committee
CNC	Cámara Nicaragüense de la Construcción	Society of Construction Industry of Nicaragua
INETER	Instituto Nicaragüense de Estudios Territoriales	Nicaraguan Institute of Territorial Studies
MTI	Ministerio de Transporte e Infraestructura	Ministry of Transport and Infrastructure
SE-SINAPRED	Secretaría Ejecutiva - Sistema Nacional para la Prevención,Mitigación y Atención de Desastres en Nicaragua	Executive Secretariat - National System for Prevention, Mitigation and Attention of Disasters in Nicaragua
SINAPRED	Sistema Nacional para la Prevención, Mitigación y Atención de Desastres en Nicaragua	National System for Prevention, Mitigation and Attention of Disasters in Nicaragua
UNA	Universidad Nacional Agraria de Nicaragua	National Agriculture University of Nicaragua
UNAN	Universidad Nacional Autónoma de Nicaragua	National Autonomous University of Nicaragua
UNAM-CIGEO	Universidad Nacional Autónoma, Centro de Investigaciones Geocientíficas	National Autonomous University, Center for Geosciences Research
UNI	Universidad Nacional de Ingeniería	National University of Engineering
Costa Rica		
CCE	Comités Comunales de Emergencia	Public Emergency Committee
CFIA	Colegio Federado de Ingenieros y Arquitectos	Federated Association of Engineers and Architects
CLE	Comité Local de Emergencia	Local Emergency Committee
CNE	Comisión Nacional de (Prevención de Riesgos y Atención de) Emergencias	National Emergency Commission (Risk Prevention and Attention)
CONARE	Consejo Nacional de Rectores	National Chancellor Council
CRE	Comités Regionales de Emergencia	Regional Emergency Committee
DINADECO	Dirección Nacional de Desarrollo de Comunidades	National Directorate of Community Development
ICE	Instituto Costarricense de Electricidad	Institute of Electricity Costa Rica
IFAM	Instituto de Fomento y Asesoría Municipal	Institute of Municipal Development and Assistance
INVU	Instituto Nacional de Vivienda y Urbanismo	National Institute of Housing and Urban Planning
ITCR	Instituto Tecnologico de Costa Rica	Tecnology Institute of Costa Rica
MIDEPLAN	Ministerio de Planificación Nacional y Política Económica	Ministry of National Planning and Economic Policy
MIVAH	Ministerio de Vivienda y Asentamientos Humanos	Ministry of Housing and Human Settlements
MOPT	Ministerio de Obras Públicas y Transportes	Ministry of Public Work and Transportation
FNE	Fondo Nacional de Emergencia	National Emergency Fund
OVSICORI（UNA）	Observatorio Vulcanológico y Sismológico de Costa Rica (Universidad Nacional de Costa Rica)	Volcanological and Seismological Observatory of Costa Rica (National University of Costa Rica)
PREVENTEC	Programa de Información Científica y Tecnológica	Scientific and Technological Satellite Information Program at

	Satelital al Servicio de la Prevención y Mitigación de los Desastres, Universidad de Costa Rica	the Service of Disaster Prevention and Mitigation, University of Costa Rica
PRUGAM	Planificación Regional Urbana del Gran Área Metropolitana	Planification of Regional Urban of Metropolitan Area
SNGR	Sistema Nacional de Gestión de Riesgos	National Risk Management System
UCR	Universidad de Costa Rica	University of Costa Rica
UNA	Universidad Nacional de Costa Rica	National University of Costa Rica
UNED	Universidad Estatal a Distancia de Costa Rica	Estate Correspondence Education University of Costa Rica
UNGL	Unión Nacional de Gobiernos Locales	National Union of Local Governments
Panama		
ACP	Authoridad del Canal de Panamá	Panama Canal Authorities
CONAMA	Comisión Nacional del Medio Ambiente	National Enviromental Commission
ETESA	Empresa de Transmisión Eléctrica, S.A.	Electric Transmission Company, Inc.
SINAPROC	Sistema Nacional de Protección Civil	National Civil Protection System
SE-SINAPROC	Secretaría Ejecutiva - Sistema Nacional de Protección Civil	Executive Secretariat - National Civil Protection System
SENACYT	Secretaría Nacional de Ciencia, Tecnología e Innovación	National Secretariat of Science,Technology and Innovation
SPIA	Sindicato Panameño de Ingenieros y Arquitectos	Panamanian Union of Engineers and Architects
UDELAS	Universidad Especializada de las Américas	Specialize University of Americas
UMIP	Universidad Marítima Internacional de Panamá	International Marine University of Panama
UNACHI	Universidad Autónoma de Chiriquí	Chiriquí Autonomous University
UP	Universidad de Panamá	Panama University
UP/IGC	Universidad de Panamá, Instituto de Geociencias	Institute of Geosciences, University of Panama
UTP	Universidad Tecnológica de Panamá	University of Technology of Panama
Mexico		
CENAPRED	Centro Nacional de Prevención de Desastres	National Center for Disaster Prevention
SRE/DGCTC	Secretaría de Relaciones Exteriores, Dirección General de Cooperación Técnica y Científica	Ministry of Foreign Affairs, Directorate General of Technical and Scientific Cooperation
UNAM	Universidad Nacional Autónoma de México	National Autonomous University of Mexico
International Organization		
DIPECHO	Programa de Preparación antes los desastres de ECHO（El Departamento de Ayuda Humanitaria de la Comisión Europea）	Disaster Preparedness Program of the European Commission
EC	Comisión Europea	European Commission
ECHO	El Departamento de Ayuda Humanitaria de la Comisión Europea	European Commission's Humanitarian Aid Department
ECLAC (CEPAL)	Comisión Económica para América Latina y el Caribe	Economic Commission for Latin America and the Caribbean
EU	Unión Europea	European Union
FAO	Fondo de las Naciones Unidas para la Agricultura y la Alimentación	Food and Agriculture Organization
GFDRR	Facilidad Global para la Reducción y Recuperación de Desastres	Global Facility for Disaster Reduction and Recovery
IDB	Banco Interamericano de Desarrollo	Inter-American Development Bank
NOAA	Administración Nacional de Océano y Atmósfera	National Oceanic and Atmospheric Administration
OAS	Organización de Estados Americanos	Organization of American States
OCHA	Oficina de las Naciones Unidas para la Coordinación de Asuntos Humanitarios	United Nations Office for the Coordination of Humanitarian Affairs
PAHO	Organización Salud de PanAmerican	Pan American Health Organization
PASB	Buró Sanitario de PanAmerican	Pan American Sanitary Bureau
UNDP	Programa de las Naciones Unidas para el Desarrollo	United Nations Development Program
UNESCO	Organización de las Naciones Unidades para la Educación, Ciencias y Cultura	United Nations Educational, Scientific and Cultural Organization
UN-HABITAT	Programa de Naciones Unidas para los Asentamiento Humanos	United Nations Human Settlements Programme
UNICEF	Fondo de las Naciones Unidas para la Niñez y la Infancia	United Nations International Children/s Fund
UN-ISDR	Plataformas Nacionales Para la Reducción del Riesgo de Desastres	United Nations - International Strategy for Disaster Reduction
WB	Banco Mundial	World Bank
WHO	Organización Mundial de la Salud	World Health Organization
Central American and Caribbean Regional Institute/Organization		
BCIE	Banco Centroamericano de Integración Económica	Central American Bank for Economic Integration
CCAD	Comisión Centroamericana de Ambiente y Desarrollo	CentralAmerican Commission on the Environment and Development
CCJ	Corte Centroamericana de Justicia	CentralAmerican Court of Justice

CCP	Centro Centroamericano de Población	CentralAmerican Population Center
CENPROMYPE	Convenio Constitutivo del Centro para la Promoción de la Micro y Pequeña Empresa en Centroamérica	CentralAmerican Agreement for Micro and Small Enterprise
CFR-SICA	Consejo Fiscalizador Regional	Regional Prosecution Council
CRRH	Comité Regional de Recursos Hidrálicos	Central American Commission on Water Resources
CCHAC	Comité de Cooperación de Hidrocarburos de América Central	Committee for Cooperation on Hydrocarbon in Central America
CCVAH	Consejo Centroamericano de Vivienda y Asentamientos Urbanos	Central American Council of Housing and Urban Settlements
CDEMA	Agencia para el Manejo de Emergencias de Desastres en el Caribe	Caribbean Disaster Emergency Management Agency
CEAC	Consejo de Electrificación de América Central	CentralAmerican Council of Electrification
CECC	Coordinación Educativa y Cultural Centroamericana	Central American Education and Cultural Coordination
CENTROESTAD	Comisión Centroamericana de Estadística del SICA	CentralAmerican Statistical Commission of SICA
CEPREDENAC	Centro de Coordinación para la Prevención de los Desastres Naturales en América Central	Coordination Center for Natural Disaster Prevention in Central America
CISSCAD	Consejo de Institutos de Seguridad Social de Centroamérica y República Dominicana	Council of Social Security Institutions in Central America and Dominican Republic
COCATRAM	Comisión Centroamericana de Transporte Marítimo	Central American Commission of Marine Transport
COCESNA	Corporación Centroamericana de Servicios de Navegación Aérea	Central American Aerial Navigation Services Corporation
CODICADER	Consejo del Istmo Centroamericano de Deportes y Recreación	Central American Council of Sports and Recreations
CONCADECO	Consejo Centroamericano de Protección al Consumidor	Central American Council of Consumer Protection
COMISCA	Consejo de Ministros de Salud de Centroamerica	Council of Ministers of Health of Central America
COMTELCA	Comisión Técnica Regional de Telecomunicaciones de Centro América	Central American Regional Technical Commission of Telecomunication
COSEFIN	Consejo de Ministros de Hacienda o Finanzas de Centroamérica	Minister of Treasury and Finance Council of Central America
CRID	Centro Regional de Información sobre Desastres para América Latina y El Caribe	Regional Center for Disaster Information Latin America and the Caribbean
CRIE	Coordinadora Regional de Investigaciones Economicas y Sociales	Regional Coordinator of Economics and Socials Investigation
CRICAP	Consejo Registral Inmobiliario de Centroamérica, Panamá y República Dominicana	Property Registry Council of Central America, Panama and Dominican Republic
CSUCA	Consejo Superior Universitario Centroamericano	Central American University Superior Council
CTCAP	Comisión para el Desarrollo Científico y Tecnológico de Centro América y Panamá	Commission of Science and Tecnology Development of CentralAmerica and Panama
CTPT	Comisión Trinacional del Plan Trifinio	Trinational Commission of El Salvador, Guatemala and Honduras
EOR	Ente Operador Regional	Regional Operator Entity
FOCARD-APS	Fondo Centroamericano y República Dominicana de Agua Potable y Saneamiento	Central American and Dominican Republic Potable Water and Sanity Fund
ICAP	Instituto Centroamericano de Administración Pública	Central American Institute of Public Administration
INCAP	Instituto de Nutrición de Centro América y Panamá	Central American and Panama Institute of Nutrition
OCAM	Organización Centroamericana de Migración	Central American Organization for Migraction
OSPESCA	Organización del Sector Pesquero y Acuícola del Istmo Centroamericano	Fisheries and Aquatic Organization of Central America
PARLACEN	Parlamento Centroamericano	Central American Parliament
SE-CCAD	Comisión Centroamericana de Ambiente y Desarrollo	Executive Secretariat - Central American Commission of Enviroment and Development
SE-CEPREDENAC	Secretaría Ejecutiva del Centro de Coordinación para la Prevención de los Desastres Naturales en América Central	Executive Secretariat of the Coordination Center for the Prevention and Mitigation of Natural Disasters in Central America
SE-CMCA	Secretaría Ejecutiva del Consejo Monetario Centroamericano	Executive Secretariat of Central American Currency Council
SG-CECC	Secretaría General de la Coordinación Educativa y Cultural Centroamericana	General Secretariat of Central American Education and Culture
SG-SICA	Secretaría General del Sistema de la Integración Centroamericana	General Secretariat of the Central American Integration System
SICA	Sistema de la Integración Centroamericana	Central American Integration System
SIECA	Secretaría de Integración Económica Centroamericana	Secretariat of Central American Economic Integration
SISCA	Secretaría de la Integración Social Centroamericana	Secretariat of Social Integration of Central America
SITCA	Secretaría de Integración Turística Centroamericana	Secretariat of Tourist Intergration for Central America
Bilateral Donors		
AECID	Agencia Española de Cooperación Internacional para el	Spanish Agency for International Development

	Desarrollo	
AOS	Ayuda Obrera Suiza	Swiss Labour Assistance
COSUDE	Agencia Suiza para el Desarrollo y la Cooperación	Swiss Agency for Development and Cooperation
DANIDA	Asistencia Danesa de Cooperación al Desarrollo	Danish International Development Assistance
DFID	Departamento de Desarrollo Internacional del Reino Unido	The Department for International Development, UK
GIZ	Agencia Alemana de Cooperación Internacional	Die Deutsche Gesellschaft für Internationale Zusammenarbeit
JICA	Agencia de Cooperación Internación del Japón	Japan International Cooperation Agency
NORAD	Agencia Noruega para la Cooperación al Desarrollo	Norwegian Aid Agency
OFDA	Oficina de los Estados Unidos de Asistencia para Desastres en el Extranjero	Office of US Foreign Disaster Assistance
USAID	Agencia para el Desarrollo Internacional de los Estados Unidos	U.S. Agency for International Development
USGS	Servicio Geológico de los Estados Unidos	US Geological Survey
NGOs		
ASODEL	Asociación para la Sobrevivencia y el Desarrollo Local	Association for the Survival and Local Development
CARE	CARE Internacional	CARE International
CRS	Servicios Católicos de Ayuda	Catholic Relief Services
IFRC	Federación Internacional de Sociedades de la Cruz Roja y la Media Luna Roja	International Federation of Red Cross Societies
MSF	Médicos sin Fronteras	Medecins Sans Frontiers
OXFAM	Comité Oxford de Ayuda contra el Hambre	Oxford Committee for Fammine Relief
PLAN	Plan Internacional	Plan International
PREVDA	Programa Regional de Reduccion de la Vulnerabilidad y Degradacion Ambiental	Regional Programme for Reduction of Vulnerability and Environmental Degradation
UPADI	Unión Panamericana de Asociaciónes de Ingenieros	Pan American Union of Associations of Engineers
Others		
AVC	Análisis, Vulnerabilidad, y Capacidad	Analysis, Vulnerability, and Capacity
CAPRA	Valoración Probabilística del Riesgo en Centro América	Central American Probabilistic Risk Assessment
CAPRADE	Comité Andino para la Prevención y Atención de Desastres	Andean Committee for Disaster Prevention and Assistance
CAT DDO	Préstamo para Política de Desarrollo con la Opción de Ejecución en caso de Catástrofes	The Development Policy Loan with a Catastrophe Deferred Drawdown Option
CC	Cambio Climático	Climate Change
COE	Centro de Operaciones de Emergencia	Center for Emergency Operations
DART	Equipo Intervención de Asistencia Desastres	Disaster Assistance Response Team
DRM	Gestión de Riesgo de Desastres	Disaster Risk Management
EWS	Sistemas de Alerta Temprana	Early Warning Systems
FOPOMID	Fondo de Prevención y Mitigación de Desastres	Disaster Prevention and Reduction Fund
GEF	Facilidad Global del Ambiente	Global Environmental Facility
GIS	Sistema Información Geográfico	Geographic Information System
HFA	Marco de Acción de Hyogo 2005-2015	Hyogo Framework for Action 2005–2015
his	Indice de Seguridad de Hospitales	Hospital Safety Index
IH CANTABRIA	Instituto de Hidráulica Ambiental de Cantabria	Environmental Hydraulics Institute of Cantabria
IIC	Corporación de Inversión Interamericana	Inter-American Investment Corporation
JST	Agencia de Ciencia y Tecnología del Japón	Japan Science and Technology Agency
NGO	Organizaciones No Gubernamentales	Non-governmental Organization
ODA	Asistencia Oficial al Desarollo	Official Development Assistance
PARCA	Plan Ambiental de la Región Centroamericana	Central American Region Enviroment Plan
PCGIR	Política Centroamericana de Gestión Integral de Riesgo de Desastres	Central American Policy for Comprehensive Disaster Risk Management
PNPMD	Programa Nacional para la Prevención y Mitigación de Desastres	National Program for Disaster Prevention and Reduction
PROSADE	Promoción de la Seguridad Alimentaria y Desarrollo Económico en las Cuencas de los Ríos Choluteca y Negro	Alimentation Security and Economy Development Promotion for River Choluteca and Negro
PRRD	Plan Regional de Reducción de Desastres	Regional Disaster Reduction Plan
ROLAC	Officiná Regional de America Latina y Carribean	Regional Office for Latin America and the Caribbean
SAT	Sistemas de Alerta Temprana	Early Warning Systems
SNET	Sistema Nacional de Estudios Territoriales	National Territory Study System
UASD	Universidad Autónoma de Santo Domingo	Autonomous University of Santo Domingo

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1 Summary of the Survey

1.1 Background of the Survey

The Central American (CA) region is greatly impacted by natural disasters, not only in terms of human and material damage, but also in social and economic terms for all countries in the region. The region is a unique area in terms of plate tectonics[2] with continental and oceanic plates colliding in a complex fashion. It is also frequently hit directly with hurricanes and severe rains. Some of the more severe examples are Hurricane Mitch in 1998, Hurricane Stan in 2005, the El Salvador earthquakes in 2001 and Honduras earthquake in 2009. While there are slight differences between the six Central American countries (Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama), there are various dangers between floods, sediment disasters, earthquakes, tsunamis, volcanic eruptions and other disasters.

CA countries are in danger of various disasters such as floods, landslides, earthquakes, tsunamis, and volcanic eruptions in greater or lesser degrees. Frequency of floods and sediment disasters has been increasing. Because of the effects of climate change, damage has been increased further. The risk of large-scale/low frequency disaster (earthquakes, volcanic eruptions, tsunami etc.) is high due to the circumstances of the region's plate tectonics.

On the other hand, the vulnerability of housing and infrastructure has been pointed out. The risk of floods and sediment disasters, volcanic disasters and tsunami is high because the seismic resistance of buildings is low, urban planning/land-use policy does not include sufficient disaster mitigation/prevention and so on.[3] The direct causes of damage are natural phenomena, however inappropriate land use is one factor that exacerbate the severity of damage. The vulnerability of buildings, inappropriate land use and disaster prevention awareness are closely related to poverty.

Given this, natural disaster risk management is a priority issue for Central American governments. In addition to the agencies in place in each country for coordinating disaster response, there is also a regional disaster response framework. The Central American Integration System (SICA: Sistema de la Integración Centroamericana) has established the Coordination Center for Natural Disaster Prevention in Central America (CEPREDENAC: Centro de Coordinación para la Prevención de los Desastres Naturales en América Central) with national agencies as its members within its framework in 1987.

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[2] Plate tectonics is a scientific theory that describes the large-scale motions of Earth's lithosphere.

[3] As a common situation in the Central American region, the development of the legal system, such as building permits and land use control is insufficient. In addition, many poor people living in large cities are concentrated in dangerous areas such as along the slopes of hills and rivers. Such areas are prone to damage when large-scale disasters occur.

As such, in addition to disaster control and prevention with cooperation programs for each countries, the Japanese government and JICA are also involved in joint development issues for the entire Central American region. One such regional initiative is the Project on Capacity Development for Disaster Risk Management in Central America, or "BOSAI," [4]a project from 2007 to 2012 for six Central American countries. In this project, Japan helped to improve local government and community level disaster prevention abilities in each country based on its expertise and experience in community disaster prevention. But Japan has not stopped there; it is working to expand the synergistic effect by combining multiple forms of support in response to their diverse disaster-related needs. These include 1) emergency aid for post-disaster humanitarian support, 2) grant aid for landslide and flood measures as well as disaster recovery and reconstruction support, 3) technical collaborations for support in increasing disaster response abilities, 4) dispatch of scientific and technical researchers for surveys and research, and 5) dispatch of volunteers for activities to promote disaster education.

In the wake of the Great East Japan Earthquake, it is important and urgent that Japan develops a strategy for utilizing Japanese expertise, experience and resources in disaster prevention and response to implement effective cooperations in advancing foreign policy for reconstruction with ODA (Oficial Development Assistance) loans as promoted by the Japanese government.

1.2 Purpose of the Survey

The objectives of the Survey are 1) to comprehensively compile policy, organization, activity and other circumstances for disaster response and prevention initiatives by the Central American region and national governments, and 2) to gather information on trends for disaster prevention aid from JICA and other donors and analyze their projects. The results will be applied to expansions for medium-term regional cooperation projects in Central America. (In this report, the existing term of “donors” is used instead of “development partner”)

1.3 Survey Area, Relevant Organizations and Subject Disasters

1) Survey area

The six Central American countries of Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama; as well as Mexico (in Mexico City) and the U.S. (in Washington, D.C.).

2) Related Organizations

See attached the relevant organizations list.

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[4] BOSAI is an abbreviated designation for [Project on Capacity Development for Disaster Risk Management in Central America] (http://www.jica.go.jp/project/all_c_america/001/outline/index.html)

3) Subject Disasters

Floods, landslides, earthquakes, tsunami, volcanic eruptions, storms, ground subsidence, droughts[5]

1.4 Outline of survey process

< Preparatory Work in Japan >

Basic policies of the Survey, work flow, schedule, related organizations and method were examined through meeting with JICA headquarters and local office in CA region. Questionnaire sheets were sent to the organizations after the meeting.

< Work in Central American countries >

Table 1 shows the schedule of the Survey. The basic survey flow was following; first of all, hearing investigation and data collection survey are implemented to central authority of the each country (Executive Secretariat-National Coordinating Agency for Disaster Reduction of Guatemala, General Directorate for Civil Protection of El Salvador, Permanent Commission of Contingencies of Honduras, Executive Secretariat - National System for Prevention, Mitigation and Attention of Disasters in Nicaragua of Nicaragua, National Emergency Commission (Risk Prevention and Attention) of Costa Rica, Executive Secretariat - National Civil Protection System of Panama). Then, institutes, universities, donors and NGOs, private sector organizations (architecture association, engineering union, etc.) are investigated based on the survey result and introduction of the central authority. The survey team was divided into two groups because of limited schedule and efficiency with the exception of Guatemala.

< Review and arrangement work in Japan >

The data of needs, resource, situation of inter-organizational cooperation, issue of activities and restrictions are collected and compiled by the materials collected in the survey, result of the hearing investigation, questionnaire sheets, etc. Based on the information, the direction of cooperation on Disaster Risk Management (DRM) are examined and recommended.

[5] Most of the organization was focused basically floods, landslides, earthquakes, tsunamis, volcanic eruptions. Ground subsidences and droughts are considered by some organizatios, therefore those are added. The following will be the spanish translation for each disaster type with a slight difference meaning from Japanese. Flood (Inundación), Earthquake (Sismo), Landslide (Deslizamento, Derrumbe, Deslave), Hurricane (Huracán), Tropical Cyclone (Depresión tropical), Windstorm (Tormenta), Tsunami (Tsunami), Volcanic Eruption (Erupción volcánica), Stong Wind (Viento fuerte, Ventanón), Subsidence/Collapse (Hundimiento de la tierra), Drought (Sequía)

Table 1 Survey schedule[6]

Date	day	Visited Organization, Activities (Team 1)	Visited Organization, Activities (Team 2)
8-Apr	Sun	Moving (Japan -> Guatemala)	same as on the left
9-Apr	Mon	JICA Guatemala office, SE-CEPREDENAC, SE-CONRED	same as on the left
10-Apr	Tue	INSIVUMEH, UNIRIOS, SEGEPLAN	same as on the left
11-Apr	Wed	CSUCA	same as on the left
12-Apr	Thu	CEDESYD, CESEM, USAID/OFDA	same as on the left
13-Apr	Fri	SE-CONRED, SIECA, CIG, JICA Guatemala office	same as on the left
14-Apr	Sat	Organizing materials, survey	same as on the left
15-Apr	Sun	Moving (Guatemala -> Honduras)	Moving (Guatemala-> Nicaragua)
16-Apr	Mon	JICAHonduras office,UPI,COPECO	JICA Nicaragua office,INETER, SE-SINAPRED
17-Apr	Tue	SOPTRAVI, SEPLAN, BCIE, UPI	Organizing materials
18-Apr	Wed	CODEM, UNAH, Red Cross, COPECO	MTI
19-Apr	Thu	Marcovia city, Comisión Presidencial Golfo Fonseca, CARE International	UNAN-CIGEO, Defensa Civil, DIPECHO
20-Apr	Fri	SERNA, UNDP, JICA Honduras office	UNI, Nicaraguan Chamber of Construction, JICA Nicaragua office
21-Apr	Sat	Moving (Honduras-> El Salvador)	Moving(Nicaragua -> Costa Rica)
22-Apr	Sun	Organizing materials, survey	Organizing materials, survey
23-Apr	Mon	JICAEl Salvador office, UCA	JICACosta Rica office, CNE
24-Apr	Tue	MARN, MOP/DACGER, UNDP	PREVENTEC
25-Apr	Wed	Taiwan Embassy, AECID, ASIA, PLAN International	BID, UNGL, MIVAH, CFIA (Colegio Federado de Ingenieros y Arquitectos)
26-Apr	Thu	Foreign Ministry, SICA, DGPC, CARE, International UCA	USAID/OFDA, IFAM, MIDEPLAN
27-Apr	Fri	Red Cross, World Geologist, MOP/DACGER, UES, JICA El Salvador office	OVSICORI, DINADECO, JICA Costa Rica office
28-Apr	Sat	Moving(El Salvador->Mexico)	Moving(Costa Rica-> Panama)
29-Apr	Sun	Organizing materials, survey	Organizing materials, survey
30-Apr	Mon	CENAPRED, JICA Mexico office	JICA Panama office, SE-SINAPROC, PAHO
1-May	Tue	Organizing materials(Labour Day)	Organizing materials(Labour Day)
2-May	Wed	ECLAC	IGC, SE-SINAPROC-Prevention and Mitigation Department
3-May	Thu	Foreign Ministry, UNAM	Ministry of Education, Environmental Education Department, OCHA
4-May	Fri	UNAM, JICA Mexico office	UTP, UN-ISDR, JICA Panama office
5-May	Sat	Moving(Mexico -> Washington, D.C.)	Moving (Panama ->)
6-May	Sun	Organizing materials	Moving
7-May	Mon	JICA U.S.A office, PAHO, USAID	Arrival (Japan)
8-May	Tue	IDB, World Bank	
9-May	Wed	Moving (Washington, D.C. -> Japan)	
10-May	Thu	Arrival (Japan)	

[6] Study Team (2012)

2 Situation of natural disasters and disaster prevention system of the Central American region

2.1 Whole Central America Region

2.1.1 History of natural disasters

A great earthquake hit the capitals of Guatemala and Nicaragua in mid-1970s and the number of deaths reached into the tens of thousands. However in 1980s, when political instabilities prevented the region from disaster preparedness, fortunately, no major natural disasters occurred in the region. In late-1990s, Hurricane Mitch has brought serious damage in northwestern CA region in 1998. A great number of residents were killed in Honduras and Nicaragua by landslide or collapse of volcanic mountain incidental to the hurricane. The hurricane caused floods too in residential and agricultural lands in many river basins and widely influenced on the society and economy of the whole CA region.

From 2000 onward, the disaster such as landslides and floods caused by tropical cyclones continues in each countries, as well as earthquake in El Salvador.,

In terms of volcanic disaster, no severe eruption has been experienced since that of Mt. Santiaguito, Guatemala in 1929, with death toll of about 2,500, although minor eruptions often occur in every country.

Major natural disasters occurred in current 40 years in the CA region are tabulated below:

Table 2 Major disasters in the region of Central America over the last 30 years [7]

Year	Countries Affected	Disaster Type	Killed people (person)
1970	Panama	Flood	48
1972	Nicaragua	Earthquake	10,000
1973	Honduras	Landslide	2,800
1974	Honduras	Hurricane (Fifi)	8,000
1976	Guatemala	Earthquake	22,700
1982	Honduras、Nicaragua	Tropical Cyclone	200
1982	El Salvador、Guatemala	Tropical Cyclone	1,315
1986	El Salvador	Earthquake	1,100
1988	Nicaragua	Hurricane	111
1991	Costa Rica、Panama	Earthquake	75
1992	Nicaragua	Tsunami	137
1993	Honduras	Tropical Cyclone	374
1998	Honduras、Nicaragua、El Salvador、Guatemala	Hurricane (Mitch)	9,200
2001	El Salvador	Earthquake	844
2005	Guatemala	Tropical Cyclone (Stan)	1,513
2007	Nicaragua	Rainstorm	188
2008	Panama	Flood	16
2009	El Salvador	Rainstorm	275
2009	Costa Rica	Earthquake	31
2010	Guatemala、Honduras、El Salvador	Tropical Cyclone (Agatha)	194
2011	El Salvador	Tropical Cyclone (“12E”)	34

[7]The table is prepared by the Study Team based on the information provided by SE-CONRED, INSIVUMEH, IGH, MARN, etc in each country. There are therefore some differences from the lists of disasters prepared by disaster management authorities of each country, which are shown in the following sections, since this table shows the disasters recognized as the great ones by each organization.Source : Study Team (2012)

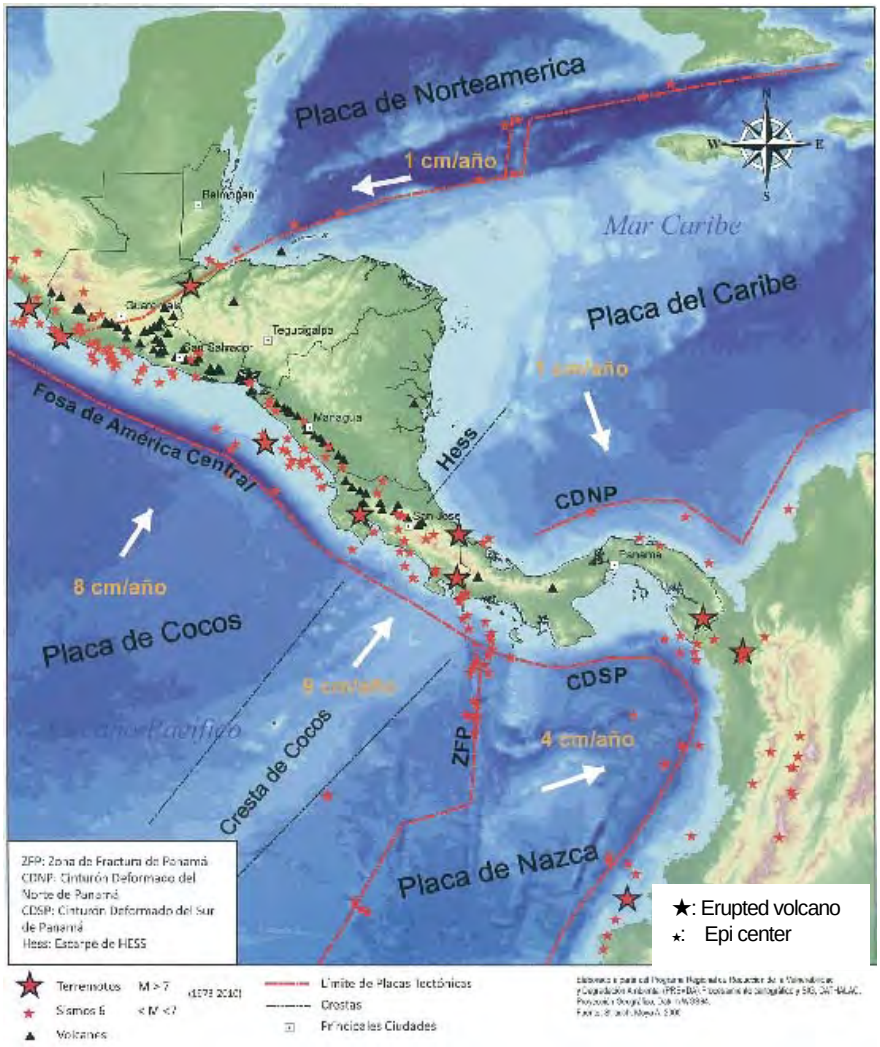

Figure 1 Distribution of tectonic plates, earthquake epicenters and volcanic eruptions in CA [8]

2.1.2 Occurrence status of natural disasters (Hazards)

The plates within CA Region such as North America, Cocos, Pacific, Caribbean, Nazca and South America are complicatedly joined. and from the view of plate tectonics, there are numerous active faults due to the diastrophism activity.

Many quakes which cause tsunami occur mainly in the Pacific Ocean side. The seismic belt along the Central American oceanic trench is active in the Pacific Ocean side and large quake occurs in the ocean causes tsunami with high possibility. Since 1500, the tsunami occurs on the coast along the Central American oceanic trench from Guatemala to Costa Rica. Minor tsunamis occasionally occur along earthquake spot in the Caribbean Sea.

The world's greatest volcanoes, which often make minor eruption, are situated in Guatemala, El Salvador, Nicaragua and Costa Rica on their Pacific Ocean sides. The stratum layer which is

[8] Moya A., Lindholm C. 2000., Microzonation of the metropolitan area of San Jose, CR. University of Costa Rica and Norsar

unstable and vulnerable volcanic products is widely distibuted around the volcano. [9]

Hurricanes and strong tropical cyclones (e.g. Hurricane Mitch in 1998 and Cyclone Stan in 2005) often attack the Region. The northern part of the Region from Costa Rica is affected by large hurricanes, which cause floods and sediment disasters, once every several years, although the damage by hurricanes and tropical cyclones is small in Costa Rica in south of the Region. Numerous hurricanes are spawned in southern part of the Caribbean Sea every year. They often hit the CA Region when they take westbound course[10].

The word "landslide" (deslizamiento, derrumbe, deslave in Spanish) in the CA Region covers wider range of sediment-related phenomena than that in Japan. It includes sluggish landslide, slope failures, collapse of volcanic mountain body and debris flood, and all of them are triggered by heavy rainfall or earthquake. Most of serious sediment-related disasters are triggered by heavy rainfall, although quake-triggered landslides (e.g. the earthquake and landslide in El Salvador in 2001) occur frequently.

Floods frequently occur at midstream/downstream of the river. There a sections of rivers in the city of Central America that are protected, although mostly are natural rivers without an embankment. Mudslide from the upstream which is located mostly at the mountain zone is carried and deposit at the bed of midstream/downstream. As a result, the river bed level rise and remarkably causing the flood.

2.1.3 Disaster situation due to social conditions (risk)

Damage can be aggravated by human-induced factors. They can be divided into 2 categories, i.e. discrete (individual) problem and aggregative problem. The former includes constructions of vulnerable and degraded facilities/buildings, lack of awareness and knowledge on disaster response on an individual level, and so on. Representative examples of the latter are improper land use, inadequate disaster response system, economic shortage, insufficient management in disaster policy, etc.

Political and social vulnerabilities such as national budget shortage, lack of disaster awareness,

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[9] About 6,000 people were killed by the eruption of Santa Maria volcano in 1902.
http://www.mlit.go.jp/river/sabo/link501list.htm

[10] Tropical Cylone is low pressure zones that occur between tropical and subtropical area.Hurricane, Cyclone and Typhoon are denomination given according to the location of sea area.

Denomination	Content
Hurricane Tropical Cyclone	Tropical Cyclone that occur in Northen Atlantic Ocean, Southern Atlantic Ocean, North-Central Pacific Ocean and has the maximum wind speed over 33m/s
Cyclone	Tropical Cyclone that occur in Northen Indian Ocean, Southern of Indian Ocean and Southern Pacific Ocean
Typhoon	Tropical Cyclone that occur in Northwest Pacific Ocean and South China Sea that has a maximum wind speed over 17m/s at the center area.

lack of land use vision including regulations, etc. are considerably related to the occurrence of disasters.

Among them, the poverty alleviation is the common vital problem to be tackled in the Region. Poor people who migrate into urban area for job opportunity are obliged to live in a low-priced and dangerous area such as steep mountainous area or low-lying area in the flood plain. The government cannot take effective actions to secure safety of such people due to lack of financial and political preparation. Damage risks are closely related with social issues such as vulnerability of infrastructures, inadequate land use, lack of awareness to disaster response, lack of information dissemination system, etc.

Flooding occurs in the middle and lower reaches of many rivers. Most rivers in the CA region are unliked natural rivers although some important stretches are protected by revetments. Large amount of sediment, which originate in the upstream mountainous area, accumulate in the middle and lower reaches and cause flood inundations.

Lack of awareness to disaster preparedness is one of the most urgent problems to be addressed. People's awareness to disaster preparedness promotes the effectiveness of structural measures and it can be enhanced by education and training programs in national, regional and community levels. The basic flow of awareness enhancement is expected to be established soon through the community based disaster management projects (including BOSAI) currently implemented. Mainstreaming this basic flow is the key for enhancement of disaster management capacity in this Region.

Economic aspect of the disaster management projects is a common issue worldwide. Improvement of seismicity of buildings and facilities in a region tends to be in proportion to the economic growth there. Building standard has been revised periodically in the CA Region and number of quakeproof buildings has gradually increased specially for those newly constructed in urban areas. Vulnerable buildings are however still constructed in local cities and rural areas because of unconsolidated inspection framework. Supports for effective function of laws, regulations and standards as well as those for formulation are necessary. Supports for enhancement of mutual support in community for disaster response are also essential.

2.1.4 Policies, strategies and plans for disaster prevention in Central America

Described below are two documents on policy and plan for disaster prevention in the Central American region, namely, Central America Policy for Comprehensive Disaster Risk (PCGIR: Política Centroamericana de Gestión Integral de Riesgo de Desastres 2010), and Regional Disaster Reduction Plan (PPRD: Plan Regional de Reducción de Desastres 2006-2015).Below described the plan details of PCGIR, PRRD (based on PCGIR record).

Table 3 Settlement details of PCGIR, PRRD[11]

1999	The Strategic Framework for Vulnerbilities and Disaster Reduction in Central America (Marco Estratégico para la Reducción de las Vulnerabulidades y Desastre en Centroamérica) has reached an agreement in 10th SICA Presidential Meeting.
2003	Evaluation and conformation for 5 years since Hurricane Mitch was held [Mitch+5] PRRD has been reexamined after the Hurricane Mitch due to it necessity
2009	PCGIR plan was included in Mitch+10 to promote disaster policy in Central America
2010	Settlement of PCGIR

PCGIR is the highest policy for disaster in Central America.and known to be the long-range plan. PRRD is a mid-range strategy to represent this policy. While the CEPREDENAC plans (Pluralanual Plan 2010-2013 and Activities Plan 2010) is a short-range multi/single years concrete plans based on PCGIR and PRRD[12]

Although there is another document: Declaration of Guatemala II (Declaración de Guatemala II) of October 1999, it did not contain references on the promotion of disaster prevention in the Central American region.

The contents of PCGIR and PRRD are indicated below

(1) Central American Policy for Comprehensive Disaster Risk Management 2010 (PCGIR 2010: Política Centroamericana de Gestión Integral de Riesgo de Desastres)

This policy takes into account the investment needs for sustainable economic development with a disaster reduction viewpoint. The purpose of the policy is to settle/examine the national disaster plan/survey of each country and improve the weakness in public funding of international roads (both hardware and software) that were observed in many countries. This is to be undertaken by Secretariat of Central American Economic Integration (SIECA: Secretaría de Integración Económica Centroamericana), with the support of Coordination Center for Natural Disaster Prevention in Central America (CEPREDENAC: Centro de Coordinación para la Prevención de los Desastres Naturales en América Central).

The detailed contents of this policy are indicated below.

① Securing financial sources (using funds from safe insurance system, plus subsidies and contributions)

② Information system maintenance (with the support of Planning Ministers Committee of member countries, Secretariat of Central American Economic Integration (SIECA: Secretaría de Integración Económica Centroamericana) is to collect quantitative and qualitative information on disasters, in order to organize and share such information, to be used in the formulation of investment projects)

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[11] Central America Policy for Comprehensive Disaster Risk (PCGIR 2010)

[12] Information based on CEPREDENAC plans (Pluralanual Plan 2010-2013 and Activities Plan 2010).Further more, this data are consisted of plan report before 2010 and multi year plan from2010 to 2013

③ Evaluation of public investments : the Finance Ministers Committee of member countries, with the support of SIECA, will establish the economic evaluation method of public investments and administration

④ Promotion of public investments : Finance Ministers Committee, with the support of SIECA and General Secretariat of the Central American Integration System (SG-SICA: Secretaría General del Sistema de la Integración Centroamericana) will establish the financing system

⑤ Priority will be given to the diffusion of disaster prevention education within the school education system, through cooperation between the Education and Culture Ministries of member countries and such regional institutions as Central American Education and Cultural Coordination (CECC : Coordinación Educativa y Cultural Centroamericana), Secretariat of Social Integration of Central America (SISCA : Secretaría de la Integración Social Centroamericano), Coordination Center for the Prevention and Mitigation of Natural Disasters in Central America (CEPREDENAC : Centro de Coordinación para la Prevención de los Desastres Naturales en América Central, and Central American University Superior Council (CSUCA : Consejo Superior Universitario Centroamericano).

⑥ CEPREDENAC, with the support of SISCA and Central American Council of Housing and Urban Settlements (CCVAH: Consejo Centroaméricano de Vivienda y Asentamiento Humanos), will coordinate the input and management of the information on the construction of safe housing. Also, CEPREDENAC will establish and promote response plans on affected buildings.

⑦ For investments in basic social infrastructure (water supply plan and implementation) SISCA, Council of Ministers of Health of Central America (COMISCA: Consejo de Ministros de Salud de Centroamerica), and CECC, with the technical cooperation of CEPREDENAC, will promote the financing of investments required for strengthening and for the conservation of basic social infrastructure.

⑧ Strengthening of the capacity to adapt to climate change (harmony between water and the environment to be included in plans, strengthening of adaptation capacity to climate change)

⑨ Strengthening of governance (strengthening the capacity of regional municipalities, strengthening the capacity of plan formulation for the management of urban disasters)

⑩ Disaster and recovery: incorporates the common thinking among the concerned countries into the regional disaster prevention plan and Manual on disaster response of the each embassy. Common management between countries: promotes construction of Geographic Information System (GIS) of monitoring and early warning system, vulnerability of economy / environment / social development. Standardize the damage evaluation while involving in the common experience between internal and external about restoration of infrastructure / asset /

service.

(2) Regional Plan for Disaster Reduction 2006-2015 (Plan Regional de Reducción de Desastres 2006-2015)

The Regional Plan 2006-2015 for Disaster Reduction was approved by SICA-CEPREDENAC in the 10th Meeting of the Central American Presidents, held in October 1999. It is a sustainable economic development plan that takes into account disaster risk management, by incorporating such concepts as the Hyogo Framework for Action (HFA) and the Millennium Development Goals of the United Nations.

The contents of the Plan are described below.

① Planning and diffusion of organized disaster legislation, and securing the required financial resources

② Accelerated strengthening of disaster reduction

③ Research and studies on disaster prevention (in accordance with the situation existing in each country, covering the stages from before the occurrence of disasters up to recovery and reconstruction)

The Plan implementing entities are divided into 2 groups, and suggestions are made on the organization for implementation, and relationships between implementing entities. The 1st group of implementing entities is composed of regional organizations (SICA, CEPREDENAC, Consultants Commission, Secretariat, and other SICA specialized institutions. The 2nd group of implementing entities refers to institutions in each country (Minister of Foreign Affairs, the President, Representative before CEPREDENAC, related Ministries, private sector organizations, citizens groups, technical committees).

2.1.5 Related organizations on disaster prevention in Central America

This Section presents the results of field works concerning the information on institutions and organizations that operate in a number of countries in the Central American region, their disaster prevention projects, coordination with other organizations, and related points.

Table 4 Interviewed organizations concerned with Disaster Prevention in Central America

Regional institutions of Central America	SG-SICA , SIECA , BCIE, SE-CEPREDENAC, PAHO, CSUCA
International organizations	IDB, Word Bank, ECLAC , DIPECHO, UN-ISDR, OCHA,PAHO
Bilateral donors	USAID/OFDA, AECID, Taiwan
NGOs	IFRC, CARE International, Plan International, UPADI

Source: Study Team (2012)

(1) General Secretariat of the Central American Integration System (SG-SICA: Secretaría General del Sistema de la Integración Centroamericana)

SICA was established in 1991 with the objective of achieving economic integration in the

Central American region. Member countries are 7, the 6 Central American States from the outset, plus Belize which joined later as a full member. The observer are EU, Taiwan. Spain, Japan, USA, Germany, Finland, Mexico, Korea, Italy,, Andalusia, India, Brazil, Swiss, Denmark, Norway, Australia. The secretariat is located in El Salvador and present builing was built by the support of Taiwan[13]

The basic objective is the pursuance of economic development in the whole Central American Region, while promoting peace, freedom and democracy through Central American integration.

Mentioned as regional strategies are 1) social harmonization, 2) economic integration, 3) maintenance of democracy, 4) preparedness and mitigation of natural disasters and climate change (Central American comprehensive policy on disaster risks, Central American fund for comprehensive risk management, regional policy on climate change, Central American regional plan on the environment), 5) institutional/organizational strengthening.[14]

Some of the measures considered in the pursuance of economic integration and harmonization in Central America include the following: stabilization of macroeconomy, completion of the Central American Free Market, common Customs duties applied to non-regional countries, Customs modernization and stabilization of fimances, unified market coordination before non-regional countries.

The organization of SICA is divided into 3 strata. The top stratum is concerned with deliberations, administration and control, and includes the Meeting of Presidents as the highest body, and sector Minister Commissions. General Secretariat of SICA (SG-SICA: Secretaría General del Sistema de la Integración Centroamericana) is the main body within Central American Integration System (SICA: Sistema de la Integración Centroamericana), and is responsible for the preparation and organization of the Meetings of Presidents and Minister Commissions, policy making and diverse coordination activities. The General Secretary is selected by turns every 4-year. As of April 2012, the post of Secretary General is held by Dr. Juan Daniel Alemán Gurdián from Nicaragua.[15]

[13] http://www.sica.int/miembros/miembros_en.aspx?Idm=2&IdmStyle=2
[14] Organization summary provided by SG-SICA
[15] http://www.sica.int/sgsica/sg_sica.aspx?IdEnt=1

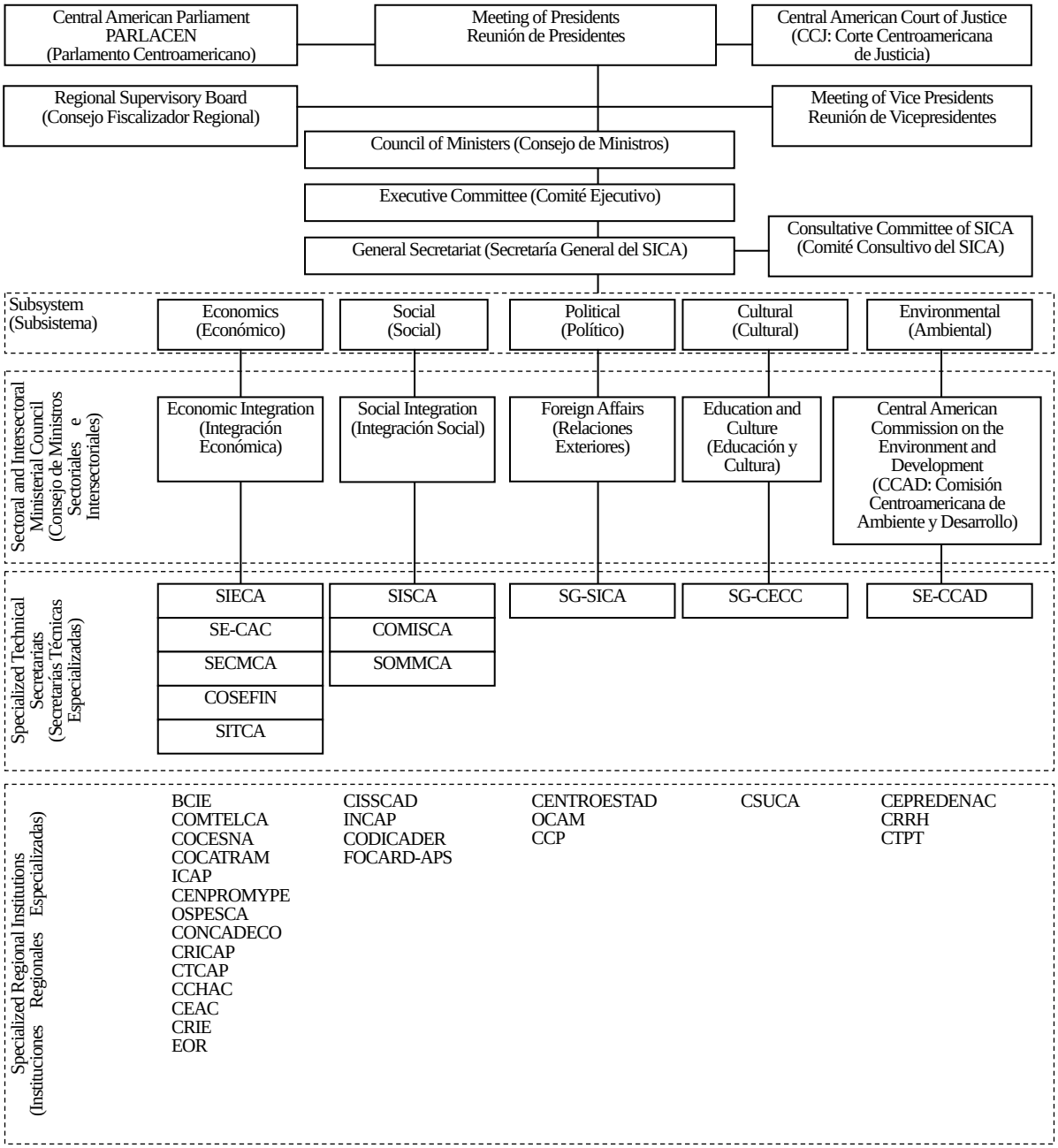

Figure 2 SICA's organization chart [16]

The middle stratum is concerned with the deliberation and organization of the specific themes in 5 different sectors, namely, 1) Economics, 2) Social, 3) Policy, 4) Culture, and 5) the Environment. SIECA is the central organization in the field of Economics, and was the subject of interview during this Study.

[16] Provided document from SG-SICA (presentation slide about organization summary) .Due to the sheet space, only the main organization relationed to disaster was recorded..Please refer the abbreviations for other organization's short term.

The low stratum is concerned with the implementation of topics concerning issues of interests within specific fields in the Central American Region. Executive Secretariat of thr Coordination Center for the Prevention and Mitigation of Natural Disaster in Central America (SE-CEPREDENAC: Secretaría Ejecutiva del Centro de Coordinación para la Prevención de los Desastres Naturales en América Central), Central America University Superior Council, (CSUCA: Consejo Superior Universitario Centroamericano), Central American Bank for Economic Integration (BCIE: Banco Centroamericano de Integración Económica) are specialized regional institutions in their respective fields, and were interviewed in the course of this Study.[17]

The current members of Central American Commission on the Enviroment and Development (CCAD: Comisión Centroamericana de Ambiente y Desarrollo) are the 7 countries of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, and Belize, while the Dominican Republic is an associate member.. The Commission members of CCAD are the Ministers and Secretaries of the Ministry of the Environment or the Secretariat of the Environment of each country, and this Commission of Ministers-Secretaries has the highest decision power. The main objective of CCAD is the contribution to the cooperative-integrated-sustainable development of the Central American environmental management. For this purpose, the Environmental Plan of the Central American Region (PARCA 2010-2014) has been established, with the following contents.[18]

- CCAD will support CEPREDENAC in the development and application of vulnerability index.
- CCAD will support the activities for strengthening research on climate change, through the regional research institutions, the office in charge of climate change in each country, and the coordination of activities between the countries and regional institutions with CEPREDENAC, Central American Commission on Water Resources (CRRH: Comité Regional de Recursos Hidrálicos).
- CCAD will support SG-SICA and CEPREDENAC in the promotion of disaster risk integrated management, on the basis of frameworks established in Central American Policy for Comprehensive Disaster Risk Management (PCGIR) and the Central American Strategy for the Reduction of Natural Disaster Vulnerabilities.

(2) Secretariat of Central American Economic Integration (SIECA : Secretaría de Integración Económica Cetroameriana)

SIECA is an organization aiming at expansion and growth of trade in the Central America

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[17] Unconfirrmed representative offices in countries （http://www.sica.int/sgsica/edificio.aspx?IdEnt=401&Idm=1&IdmStyle=1）
[18] CCAD Web site （http://www.sica.int/ccad/index.aspx?IdEnt=2&Idm=1&IdmStyle=1）

region. It develops laws, prepares training opportunities and materials and conducts economic analysis/research/study for economic integration.

Although SIECA makes little direct contribution to projects in the disaster risk reduction area, it provides assistance to infrastructure development projects which contribute to post-disaster reconstruction and disaster mitigation. While SIECA has been assisting the ministries of transport and economy in individual member countries in their efforts for the recovery from the disaster caused by Hurricane Mitch since 2000, it has been implementing a project to prepare manuals for disaster risk management of infrastructure with CEPREDENAC in recent years. The objective of the project is to understand the current state of infrastructure and facilitate its improvement. The following manuals are being prepared in the project as common management standards of the region:

1. Manual Centroamericano de Mantenimiento de Carreteras (2010)
2. Manual Centroamericano de Gestión del Reisgo en Puentes (2010)
3. Manual Centroamericano de Normas para el Diseño Geométrico de Carreteras (2011))

SIECA and CEPREDENAC concluded the agreement mentioned below on cooperation for the promotion of risk management of infrastructure,[19] whose contents are shown below.

[The Agreement between SIECA and CEPREDENAC on cooperation for the promotion of risk management of Infrastructure]
In July 2009, the Deputy Minister of Transport of the Government of Guatemala, the Secretary of SIECA and the Executive Secretary of CEPREDENAC put their signatures on an agreement on cooperation aiming at realization of the formulation of the Maintenance Manual for Roads in Central America (2004) and Bridge Construction Manual, which include disaster risk management. As practical measures, the agreement states that SICA shall provide CEPREDENAC with a fund of USD 100,000 obtained from AECID (the Spanish Agency for International Development Cooperation) and that SIECA and CEPREDENAC shall formulate PCGIR in cooperation.

The statute and operation rules of CEPREDENAC state that the board of directors (the supreme organ of CEPREDENAC) and the executive secretariat are to provide reports and information on disaster preparedness, mitigation and response to La Reunión de Presidentes de Centroamérica or Meeting of the Presidents of Central America, Committee of Foreign Ministers and Central American Commission on Safety, and the Executive Secretariat is to provide information on the report to each regional organizations in Central America through SG-SICA and to share it with them. [20]

(3) Central American Bank for Economic Integration (BCIE: Banco Centroamericano de Integración Económica)

BCIE is recognized as a special regional organization under SICA. However, its foundation predates that of SICA. It was founded in 1960 and celebrated its 50th anniversary in 2010.The head office is located in Tegucigalpa, Honduras. With the 50th anniversary to mark the start of a

[19] http://www.sica.int/busqueda/Noticias.aspx?IDItem=40711&IDCat=3&IdEnt=22&Idm=1&IdmStyle=1
[20] http://wqce.sica.int/busqueda/Centro%20de%20Documentación.aspx?IDItem=49012&IdCat=32&IdEnt=22&Idm=1&IdmStyle=1

new phase, a strategy (of strengthening competitiveness accompanied by regional integration and social development) has been established for the five-year period between 2010 and 2014. Under this strategy,a measures to overcome and recover from the international economic crisis has been implented..

Table 5 Organizational strategies of BCIE (2010 - 2014) [21]

Strategic axis	Strategy	Goal
Social Development	Countermeasure of poverty problem, education, gender, women, children's health, infectious diseases, environmental sustainable environment, for balanced economic and social development in CA	Opportunity to improve income. Contribution to the development of human resources Response to the residents needs and the public services provision
Strengthen competitiveness	Improving productivity is essential to the development of CA. Attractive environment for open trade and expansion of foreign investment. Development of logistics corridor and strengthening of financial system.	Strategic infrastructure development for economic activity. Induction of investment in production sector. Backup of capacity development and modernization in each country. Productivity development by Innovation of science and technology.
Regional integration	Roads, ports, airport development for the logistics and strengthen competitiveness and economic scale expansion. Financial intermediation for the improvement of agricultural and non-agricultural products	Support for the expansion of trade inside/outside CA. Support for the financial market development and deepening. Education for actual integration system Support for organizations of CA
Sustainable environment	Sustainable development of land and resources should be developed sustainably to ensure CA people's quality of life.	Sustainable nature environment in CA

Although the organizational strategy (2010 – 2014) of BCIE (which aims at improvement of the competitiveness and stable social development in Central America and promotes implementation of various policies and services) does not have a category of disaster risk reduction or management, BCIE supports development of infrastructure with the investment to the City of Tegucigalpa in Honduras. Such indirect disaster risk reduction activities are included in the goals of the core strategy for social development. BCIE is providing financial assistance to the improvement of the levels of education and health/sanitation and improvement of infrastructure (water supply, sewage, electricity, etc.) as a core of the social development strategy.

(4) Coordination Center for the Prevention and Mitigation of Natural Disasters in Central America (CEPREDENAC : Centro de Coordinación para la Prevención de los Desastres Naturales en América Central)

In the Central America region, countries share the same natural disaster risks and human and economic damage caused by these natural disasters is a large factor impeding the development of the region. Against this background, the six countries in Central America (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama) established CEPREDENAC under

[21] A document provided by BCIE (2010 Annual Report, Estrategia de Honduras)

SICA as an organization specialized in disaster risk reduction for the purpose of constructing a disaster-resistant society in cooperation. CEPREDENAC continues to work as an organization implementing measures to reduce disaster risks and to facilitate and coordinate strengthening of the system for the risk reduction through exchange of information with international organizations and donors.

After the foundation of CEPREDENAC, the Hurricane Mitch disaster occurred in 1998, which caused severe damage in the Central America region. Later, the presidents of the six Central American countries issued the "Guatemala Declaration" expressing their renewed resolution for the creation of a disaster-resistant society. Following the issuance of the declaration, the five-year Regional Disaster Reduction Plan (PRRD: Plan Regional de Reducción de Desastres) (2000 – 2004) was formulated under the leadership of CEPREDENAC. After the completion of PRRD (2000 – 2004), the ten-year PRRD (2006 – 2015) was formulated. The ten-year plan stipulates development and strengthening of the disaster risk reduction system at the level of the central government, the strengthening of disaster risk reduction capacity at the community level, the promotion of human resource development in the disaster risk reduction area and the strengthening of local disaster risk reduction capacity (that of municipalities) required for formulation of regional (municipality) development plan with disaster risk reduction taken into account as one of the priority issues.

CEPREDENAC consists of six countries, *i.e.* Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama, Dominican Republic as associated country, and three observer countries, Spain, Mexico and Taiwan, represented by representatives of intergovernmental organizations responsible for risk management, emergency response and disaster management of the respective governments.[22]

The table below shows the legislative decrees of the member countries, which stipulate their relationship with CEPREDENAC.

Table 6 Law of the relationship between CEPREDENAC in each country [23]

Guatemala	Decreto del Congreso de la República No. 74-2005 13 oct. 2005 y publicado 07 diciembre 2005.:
El Salvador	Decreto legislativo No. 217 del 4 de diciembre 2003, publicado en el Diario Oficial No. 11, Tomo No. 362 del 19 de enero del 2004.
Honduras	Decreto Legislativo No. 247, 1 sept. 2005 y 8 de diciembre 2005 y publicado en el Diario Oficial La Gaceta No. 30,838 del 1 nov. 2005.
Nicaragua	Decreto Legislativo No. 3924 del 15 de junio 2004, publicado en la Gaceta Oficial el 1 de julio del 2004. El Ejecutivo lo ratificó por Decreto No. 088-2004 del 13 de agosto 2004 y publicado en la Gaceta del Diario Oficial No. 169 del 30 de agosto 2004.
Costa Rica	Ley de la Asamblea Legislativa No. 8588 del 18 abril 2007 y publicado en la Gaceta No. 87 el 8 mayo 2007
Panama	La Asamblea Legislativa ha aprobado por Ley de la Asamblea Legislativa No. 39 el 7 de julio del 2004 y publicada en el diario oficial el 20 de julio 2004

[22] CEPREDENAC HP (http://www.sica.int/cepredenac/contexto_reg.aspx)
[23] CEPREDENAC, Regional Plan for Disaster Reduction 2006-2015

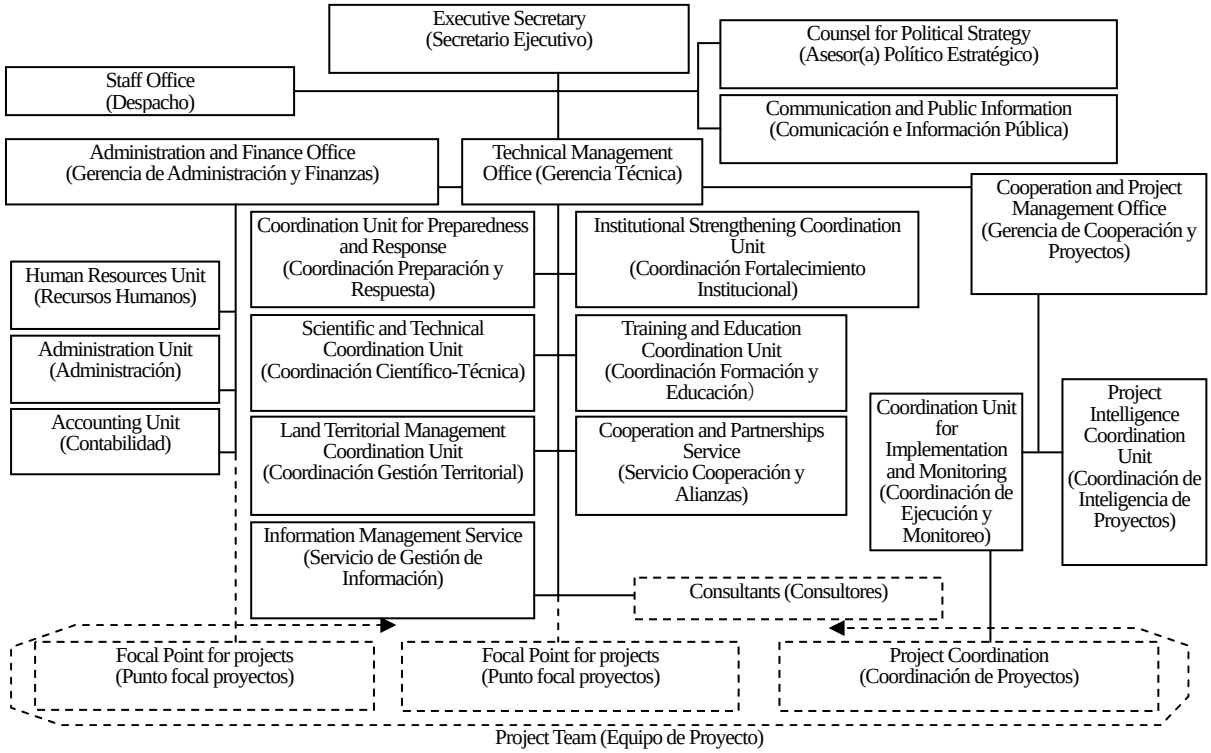


Figure 3 Organization chart of CEPREDENAC's executive body [24]

CEPREDENAC has five established areas of activities. The objectives and details of the activities in each area are as follows:

Table 7 Activity areas and contents of CEPREDENAC[25]

Area	Activity objective and Content
1) Strengthen the organization	1. Strengthening of the disaster risk reduction system of each country by reinforcement of organizational model 2. Improvement plan which aims to reinforce and realize DRM plan/policy in each country 3. Strengthening of regional capacity for information management and risk management 4. DRM promotion in sustainable planning process
2) Science and technology	Strengthening of the technical transfer process regarding to the disaster risk knowledge, equipment and method in science and technology institutions of CA 1. Construction of monitoring system for hazard, and database management/ standardization for disaster 2. Promotion of research and knowledge exchange in different areas for disaster risk reduction 3. Support of social science research process which includes social and cultural circumstances related to the prevention process (policy, economy, etc.)
3) Education	Promotion of education policy and strategy; Improvement of information management and organizational capability on the theme of disaster risk reduction for CA residents. 1. Promotion of education and information management which has the view point of preparedness of DRM 2. Promotion of public awareness and human resource development in public and private sector with the theme of disaster risk
4) Land Management	Capacity development of organization, which includes national development plan, legal system, environmental management plan at the national level.

[24] Information provided by CEPREDENAC and its web site (http://www.sica.int/cepredenac/estructura.aspx)

[25] Plan Plurianual 2010-2013 y Plan de Actividades 2010 (http://www.sica.int/busqueda/busqueda_archivo.aspx?Archivo=odoc_47117_3_10052010.pdf)

	1. Capacity development for national/regional planning considering gender and multiculturalism and, focusing on the vulnerability in national/regional development 2. Promotion of disaster evaluation mechanism which relates the public/private infrastructure, housing, social/natural heritage and production activity 3. Introduction of survey, assessment and management to the national development plan and sector plan considering gender and multiculturalism
5) Preparedness and Response for Disaster	Strengthen the capacity of regional mutual aid mechanism for disaster by institutional and political framework of the Hyogo Framework for Action 2005-2015 (HFA) and CEPREDENAC 1. Realization and strengthening of mutual aid mechanism for disaster 2. Training of personnel in the committee of the preparedness 3. Promotion the formulation or implementation of the plans (national development plan, organization/sector plan, legal framework etc.) 4. Strengthening of disaster response 5. Continuous development of communication and information dispatch at the regional level from the national 6. Strengthening of management capacity for shelter and storage 7. Technical proposal of supply management for disaster risk reduction at the regional level 8. DRM considering human rights and gender (Age, culture, religion, ideology, region, economic discrepancy) 9. Promotion of early recovery strategy

The table below shows the breakdown of the budget of CEPREDENAC for the year 2010. The source of revenue for the ordinary budget is the membership fees from the member countries (approximately USD 180,000 per year per country). The ordinary budget is used to pay the operating costs including the office expenditures and personnel costs of the workers. The funds from donors are classified as program costs. The amount of the program costs has been increasing since 2008.

Table 8 Budget 2010 of CEPREDENAC (unit:USD) [26]

Expense item / Funds	Office	Project Management	Technical Management	Program	Operation
Regular budget (from member countries)	-	-	-	-	262,550
SE-CONRED	-	-	-	-	122,278
AECID	13,500	-	10,000	402,519	67,830
WB	3,000	-	-	50,604	25,600
PNUD/BCPR	-	-	-	480,000	-
JICA Regional[27]	-	-	-	130,000	3,400
JICA National[28]	-	-	-	270,000	-

[26] Plan Plurianual 2010-2013 y Plan de Actividades 2010
(http://www.sica.int/busqueda/busqueda_archivo.aspx?Archivo=odoc_47117_3_10052010.pdf)

[27] Detailed contents of "JICA regional"

Contents	Budget (USD)
Activity to expand the knowledge and experience by volunteer of Japan and lecturer of disaster risk management	16,000
Information system development to share knowledge/succeed experience of local government.	7,000
Development with the local development to share knowledge/succeed experience of disaster risk management	12,000
Dissemination of good practice/technology of DRM by a trainee of JICA	5,000
Planning and implementation of DRM	30,000
Enhancement of equipment utilization for DRM	20,000
Publishing good practices in DRM	40,000
Implementation of Early warning system within BOSAI subjected area	12,000

[28] Detailed contents of "JICA National"

Contents	Budget (USD)
Support to BOSAI projects in each country	270,000

Comando Sur de los EE.UU	-	-	-	623,000	-
COSUDE	-	-	-	750,000	-
DIPECHO	-	-	-	6,000	-
OCHA	-	-	-	3,000	-
Brookings-Bern	-	-	-	27,000	-
European Commission	-	-	-	2,766,307	73,500
Norway	-	-	-	535,102	25,950
SF	-	-	-	3,200	-
Taiwan	-	36,000	-	239,000	59,800
UNICEF	-	-	-	14,500	-
TOTAL	16,500	36,000	10,000	6,300,232	640,908

JICA conducted the Project on Capacity Development for Disaster Risk Management in Central America "BOSAI" for five years (from May 2007 to May 2012). Counterparts of the project were SE-CEPREDENAC and the national disaster prevention/mitigation organization/agencies of the six Central American countries.[29] The project involved various types of capacity development such as risk evaluation, disaster prevention mapping, disaster drills, disaster education, enhancement of awareness and technology development for disaster prevention countermeasures (simplified rain gauges, simplified water level meters, embankment by used tires etc.) were implemented. The knowledge, experience, technology, method and educational material made by the project were distributed and shared in the Central American (CA) region through the SE-SEPREDENAC. These contributed to the disaster prevention capacity development of communities and local authorities in the CA region.

(5) Pan American Health Organization (PAHO: Organización Salud de PanAmerican)

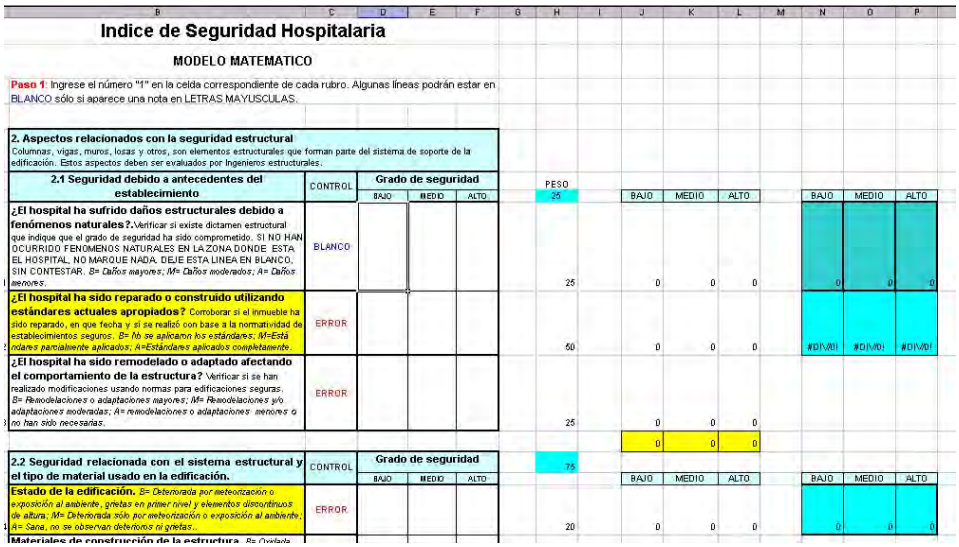
(6) PAHO has a long history. Its origin dates back to 1902 when 11 countries held a meeting and established The Pan American Sanitary Bureau (PASB: Buró Sanitario de PanAmerican) to fight against infectious diseases such as plague in the American Continents. Currently, it is served as the Regional Office for the World Health Organization (WHO: Organización Mundial de la Salud) in Americas and has 39 offices in Central, South America and the Caribbean. There are i) offices responsible for individual countries and ii) those responsible for two or more countries. Some populous countries have more than one office.

The services provided by PAHO include mental health care, gender-related services, health care for indigenous peoples and vaccination. While the operating costs of PAHO are financed by its member countries, specific projects receive financial assistance from the UK, the USA, the EU, etc. The Spanish Agency for International Development Cooperation (AECID: Agencia Española de Cooperación Internacional para el Desarrollo) provides the Disaster Fund, which is to be used for post-disaster activities as stipulated in the statute of AECID. PAHO was preparing a five-year plan as of April 2012. Implementation of the plan is expected to begin in October 2012 after a meeting of ministers concerned.

PAHO has two activities in the area of disaster risk management; i) those for the incorporation of measures for comprehensive preparedness in the health sector in national disaster risk reduction plans and ii) construction of disaster-resistant hospitals (Safe Hospital Activities).

[29] El Salvador, Guatemala, Nicaragua, Costa Rica, Panama, Honduras

Concerning activity ii), PAHO is implementing a hospital assessment project. In the project, each member country is conducting a HFA-based study on the DRM indices of hospitals and is evaluating hospitals on the basis of the "Hospital Safety Index (HSI)." Instead of employing consultants, PAHO is implementing the project by analyzing the data provided by the government of each member country upon request from PAHO. In the project, PAHO studies all hospitals, including public, private, university, military and police hospitals. There are 145 evaluation items which are classified into two major categories, items on structures and non-structural items. The score of each hospital can be automatically calculated on a Microsoft Excel worksheet (for index calculation) and the hospitals are classified into three categories, high, intermediate and low, in accordance with the vulnerability.



Indice de Seguridad Hospitalaria

MODELO MATEMATICO

Paso 1: Ingrese el número "1" en la celda correspondiente de cada rubro. Algunas líneas podrán estar en BLANCO sólo si aparece una nota en LETRAS MAYUSCULAS.

2. Aspectos relacionados con la seguridad estructural
Columnas, vigas, muros, losas y otros, son elementos estructurales que forman parte del sistema de soporte de la edificación. Estos aspectos deben ser evaluados por Ingenieros estructurales.

2.1 Seguridad debido a antecedentes del establecimiento	CONTROL	Grado de seguridad BAJO	MEDIO	ALTO	PESO 25	BAJO	MEDIO	ALTO	BAJO	MEDIO	ALTO
¿El hospital ha sufrido daños estructurales debido a fenómenos naturales?. Verificar si existe dictamen estructural que indique que el grado de seguridad ha sido comprometido. SI NO HAN OCURRIDO FENOMENOS NATURALES EN LA ZONA DONDE ESTA EL HOSPITAL, NO MARQUE NADA, DEJE ESTA LINEA EN BLANCO, SIN CONTESTAR. *B= Daños mayores; M= Daños moderados; A= Daños menores.*	BLANCO				25	0	0	0	0	0	0
¿El hospital ha sido reparado o construido utilizando estándares actuales apropiados? Corroborar si el inmueble ha sido reparado, en que fecha y si se realizó con base a la normatividad de establecimientos seguros. *B= No se aplicaron los estándares; M=Estándares parcialmente aplicados; A=Estándares aplicados completamente.*	ERROR				50	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
¿El hospital ha sido remodelado o adaptado afectando el comportamiento de la estructura? Verificar si se han realizado modificaciones usando normas para edificaciones seguras. *B= Remodelaciones o adaptaciones mayores; M= Remodelaciones y/o adaptaciones moderadas; A= remodelaciones o adaptaciones menores o no han sido necesarias.*	ERROR				25	0	0	0			
						0	0	0			
2.2 Seguridad relacionada con el sistema estructural y el tipo de material usado en la edificación.	CONTROL	Grado de seguridad BAJO	MEDIO	ALTO	75	BAJO	MEDIO	ALTO	BAJO	MEDIO	ALTO
Estado de la edificación. *B= Deteriorada por meteorización o exposición al ambiente, grietas en primer nivel y elementos discontinuos de altura; M= Deteriorada sólo por meteorización o exposición al ambiente; A= Sana, no se observan deterioros ni grietas..*	ERROR				20	0	0	0	0	0	0
Materiales de construcción de la estructura. *B= Quebrada*											

Figure 4 Example of Index Calculation of Disaster Prevention for Hospital[30]

HSI is an index which is used by PAHO as the basis for the investigation into how much training and financial assistance PAHO will have to provide to government offices involved in health administration and hospitals in each member country. PAHO is planning to expand the use of HSI to hospitals and health centers in rural areas.

PAHO cooperates with a variety of NGOs (including Médecins sans Frontières (MSF), the International Federation of the Red Cross and Red Crescent Societies, etc.). PAHO cooperated with as many as several hundred NGOs in Haiti after the large-scale earthquake disaster. However, PAHO restricts its cooperation with NGOs to post-disaster medical and health-care activities, instead of disaster preparedness. JICA has opportunities for cooperation with PAHO in training for capacity development, provision of basic life-saving equipment and information dissemination.

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[30] Information provided by PAHO

[Examples of activities in the Panama Office(PAHO)](Interview investigation in this study)
PAHO Panama has 55 staff members. It consists of Health/Sanitation, Hospital, Environment/Development and General Affairs Departments. The focus of the services of the office is on capacity development in health and sanitation at the national, provincial, municipal and community levels. It is engaged in activities before, during and after disasters. The following are practical examples of the activities for disaster risk reduction of PAHO Panama:

- Activity for the creation of safe hospitals: Development of capacity to operate hospitals at the time of disaster. PAHO Panama tries to promote this activity by establishing a law stipulating implementation of the activity. The targets of the capacity development are officials of the Ministry of Health, engineers, doctors and nurses. PAHO Panama provides the training on creation of safe hospitals using indices developed specifically for the activity. Forty to fifty people (mostly officials of the Ministry of Health) have received this training.
- Decentralization of disaster response: PAHO Panama has established Health/Sanitation Emergency Operation Centers (equipped with computers and equipment required for first aid and relief) in six or seven provinces. These operation centers provide training on information management and practical responses to be made in the eight-hour period after a disaster. The contents of the training have been developed on the basis of the experience in the areas (four or five) which have been hit by a number of disasters in the past five to six years.
- PAHO Panama implements activities such as provision of equipment required for emergency responses, mental health care, water and hygiene management and prevention of infectious diseases.
- Creation of awareness of disaster risk reduction in communities: PAHO Panama implements participatory community development activities for disaster risk reduction in which a group of community residents identify risks in their community, mark them on a map and identify emergency shelters and evacuation routes on the map. PAHO Panama implements this activity in collaboration with Executive Secretariat, National Civil Protection System (SE-SINAPROC) and the Ministry of Health and with assistance from Spain.

(7) Inter-American Development Bank (IDB: Banco Interamericano de Desarrollo)

IDB, which was founded in 1959, is the largest bank among those providing development funds in the Central and South America region. It provides countries in Central and South America and the Caribbean, which have various different developmental problems and needs, with loans, securities and technical assistance in the area of development including infrastructure development, social services, response to climate change, system construction and market integration using borrowing and its own capital as the source of revenue. IDB Group consists of Inter-American Development Bank (IDB), Inter-American Investment Corporation (IIC), and Multilateral Investment Fund (MIF). Also the group has 48 member countries (of which 26 are from Latin America and Caribbean areas).

For example, provision of a loan for emergency assistance after a disaster requires assessment of the disaster risk reduction plan of the country concerned by experts at the head office of IDB. A DRM specialist explained the obstacles to coordination with IDB and JICA for prompt post-disaster emergency Recovery assistance, firstly that the type of assistance is quite different, namely JICA provides technical assistance while IDB provides urgent financial assistance, and the fact that experts of IDB had to study and assess national strategy and legal framework for disaster risk management of a recipient country before providing a loan and that a long time is required for making a decision on loan provision. Therefore, a detailed study of departments involved in disaster risk reduction in IDB will be required to decide whether cooperation between JICA and IDB is feasible or not.

IDB is implementing a number of projects in disaster risk reduction and measures against climate change. The following are two of those projects in progress mentioned by a DRM expert of IDB.

◆ Honduras (HO-L1031 Disaster Risk Prevention and Mitigation Project)[31]

IDB has been implementing a project consisting of the following four components in 25 municipalities in Honduras with a loan of USD 19 million (since July 2010 with the Permanent Comission of Contigencies (COPECO) as the implementing organization): i) disaster prevention/mitigation at the level of municipality, ii) strengthening of disaster management and responses to disasters at the levels of community and municipality, iii) strengthening of institutions involved in DRM and iv) creation of awareness of disaster risks. The approaches used in the project are as follows:

- Development of a system of Disaster Risk Management (DRM) indices for monitoring the progress of the project and evaluating the effect of the use of a loan
- Estimation of maximum possible loss, economic impact and CAPRA (Central American Probabilistic Risk Assessment: for details, see the description under the World Bank below)
- Technical assistance to the Committee of Finance Ministers of Central America and the Caribbean in the investigation into appropriate procedures for disaster emergency financing by regional insurance organizations

In addition, IDB has begun operation of an institution for providing emergency loans at the time of natural disaster with a total fund of USD 600 million in Honduras.

◆ Nicaragua (NI-L1048 Environmental Program for Disaster Risk and Climate Change Management)[32]

This is a program consisting of afforestation and soil protection in the upper reaches of a small river basin on the Pacific coast with participation of small-scale farmers and construction of small-scale embankment in the lower reaches with local residents to mitigate impact of climate change. The project cost is USD 10 million. This program consists of the following three components:

- Assistance to adaptation to an environment regeneration system
- Construction of infrastructure which reduces loss derived from climate change
- Development of capacity and equipment, creation of a mechanism to provide financial support to environmental measures and climate change adaptation measures

The main goals of the program are improvement of DRM indices and the increase in agricultural production of the 3,600 beneficiaries in seven municipalities.

(8) World Bank

The World Bank proposes projects through the Ministry of Finance of each country and implements them in cooperation with implementing organizations such as organizations responsible for disaster risk reduction and the Ministry of Public Works. Like JICA, the World Bank recognizes the importance of the role of CEPREDENAC in promotion of activities in disaster risk reduction in the Central America region.

The World Bank has an information platform for hazard maps and risk maps and is creating earthquake, volcanic and flood hazard maps.

Central America Probabilistic Risk Assessment Initiative (CAPRA: Valoración Probabilística del Riesgo en Centro América) is a base development for open software which supports the risk analysis and decision making. This software is adapted with a probabilistic method to evaluate the risk factor and a loss. The CAPRA has been provided with a base for software development of Geographic Information System (GIS) and actual data of analysis. By adopting this software, the disaster risk can be viewed in table, graph and on the map, supporting the decision making for disaster information policy. Software in CAPRA includes tools for hazard mapping, risk assessment and cost-effectiveness analysis to support risk management as a preliminary measure. CAPRA is also used for study on risk financing strategy. The first phase of CAPRA began in January 2008 with CEPREDENAC, United Nations-International Strategy for Disaster Reduction, Panama Municipality (UN-ISDR: Plataformas Nacionales Para la Reducción del

[31] http://www.iadb.org/en/projects/project,1303.html?id=ho-l1031
[32] http://www.iadb.org/en/projects/project,1303.html?id=ni-l1048

Riesgo de Desastres), Inter-American Development Bank (IDB) and the World Bank (WB) as the partners. The second phase will begin in July 2012. It is a project which has three objectives and three target areas.

① Probabilistic seismic risk assessment and assessment of public infrastructure, health problems and structures (public buildings, schools, etc.) in the San Salvador Capital Area (El Salvador),(implementing organization: the Ministry of the Environment)

② Probabilistic seismic risk assessment and assessment of public infrastructure, health problems and structures in the City of David (Panama)

③ Understanding of and solution to the problems in the facilities of the (semi-public) water supply company and those with the water supply network in the event of an earthquake in Costa Rica

The World Bank has plans for implementing tsunami disaster estimation at two locations, measures against hurricanes in Honduras and Nicaragua and a project of measures against earthquakes in the city of Managua, Nicaragua. At the level of policy implementation, the World Bank has a plan for a project for the construction of frameworks (for the legal system, development of related plans and strategy, etc.) at the policy level in Panama, Honduras, Guatemala and Costa Rica. For details of the plans, see the reference web sites shown in the footnote.[33]

In addition, the World Bank established The Development Policy Loan with a Catastrophe Deferred Drawdown Option (CAT DDO) in 2008. CAT DDO is a system enabling the bank to provide a country which has declared a state of emergency because of the damage caused by natural disasters with a quick emergency loan up to USD 500 million per country. This survey confirmed provision of emergency loans at least to Costa Rica, Guatemala, El Salvador and Panama.[34]

(9) Economic Commission for Latin America and the Caribbean (ECLAC: Comisión Económica para América Latina y el Caribe)

ECLAC (or CEPAL in Spanish) is one of the five regional commissions of the United Nations. While ECLAC is headquartered in Chile, the Sub regional Headquarters for Central America and the Caribbean (in Mexico) is the center of disaster risk reduction-related activities. Department of disaster risk reduction has been implenting the evaluation related to the disaster reduction in Central American region regarding economy, society, agriculture and environment. As mentioned

[33] http://www.ecapra.org/
http://www.ecapra.org/software
http://www.ecapra.org/reducing-risks-prevent-disasters-project-highlights-issue-3-march-2012

[34] HP which explains the projects of the World Bank (http://www.worldbank.org/projects)

above, the Central America/Caribbean Sub regional Headquarters of ECLAC is playing a central role in the assessment and training of disaster risk reduction in the countries in Central America including Mexico and those in the Caribbean such as Cuba. Despite playing the central role, the Disaster Risk Reduction Capacity Assessment Department is a small department with only two staff members and an assistant and there is a limit to what those three can do. Therefore, the department is implementing projects in cooperation with other organizations and universities.

Since 2000, ECLAC has been taking measures to enhance awareness on appropriate disaster prevention and mitigation in cooperation with IDB. Five representative countries (Colombia, Chile, Jamaica, Mexico and Nicaragua) were selected from different regions with different characteristics and assessment was made on risk management and ease in obtaining relevant information in these countries.

ECLAC evaluates municipalities which have suffered from disasters with criteria such as humanitarian response, considerations to gender and children, treatment of the injured and the sick, supply of food and environmental considerations. In addition, ECLAC plans and holds seminars, workshops and training courses for organizational capacity development on the basis of the result of the survey on the capacity in disaster response. These projects are implemented with funds provided by the World Bank and IDB. Due to being located in Mexico, ECLAC is offering training courses jointly with National Disaster Prevention Center (CENAPRED: Centro Nacional de Prevención de Desastres).

Projects being planned by ECLAC include seminars for strengthening capacities of governmental organizations, analysis of the economic, social and environmental impact of disasters, preparation of publications and workshops on disaster prevention and risk management and publication of a book on disaster risk management in Central America. ECLAC expects financial assistance worth USD one million from the World Bank and IDB for the implementation of the above-mentioned activities.

(10) Disaster Preparedness, European Commission's Humanitarian Aid Department (DIPECHO: Programa de Preparación antes los desastres de ECHO (El Departamento de Ayuda Humanitaria de la Comisión Europea))

The European Commission's Humanitarian Aid department (ECHO: El Departamento de Ayuda Humanitaria de la Comisión Europea) is a department of the European Commission (EC: Comisión Europea) and responsible for humanitarian aid and civil protection. ECHO controls its activities in the countries in Central America from its office in Managua, Nicaragua, and Disaster Prepardness Program of the European Commission (DIPECHO) is the department responsible for disaster risk reduction in the office. ECHO has two offices, the Central America Office and the Latin America/the Caribbean Support Office, in Managua. The ECHO Central America

Office (with 24 staff members) was established in 1998 and has an annual budget of 420,000 Euros.

DIPECHO projects in Central America are called DIPECHO 5, 6, 7, etc. in accordance of the periods in which they are/were implemented. Under DIPECHO, similar projects have been continuously implemented in different project areas. The objectives of the projects are capacity development in communities, establishment of early warning systems, creation of awareness on tsunami and urban disasters, rehabilitation of emergency shelters and emergency stockpiles.

Table 9 Budget transition about disaster prevention/mitigation in DIPECHO [35]

Year	2005-2006	2007-2008	2009-2010	2010:- 2011	2012-2013
Budget (Euro)	600,000	750,000	10,000,000	10,000,000	10,000,000

The table below shows the training and capacity development activities implemented in DIPECHO during the period between February 2011 and January 2012. The figures in the table show that DIPECHO provided a significant number of opportunities for the activities.

Table 10 Activities by DIPECHO (February 2010 – January 2012) [36]

	El Salvador	Guatemala	Honduras	Nicaragua	Total
Target local government	90	55	44	61	250
Training (number of area)	5	12	5	7	29
Engineers who were trained	130	42	30	38	240
Related or involved in the activities	1,224	1,158	622	1,110	4,114

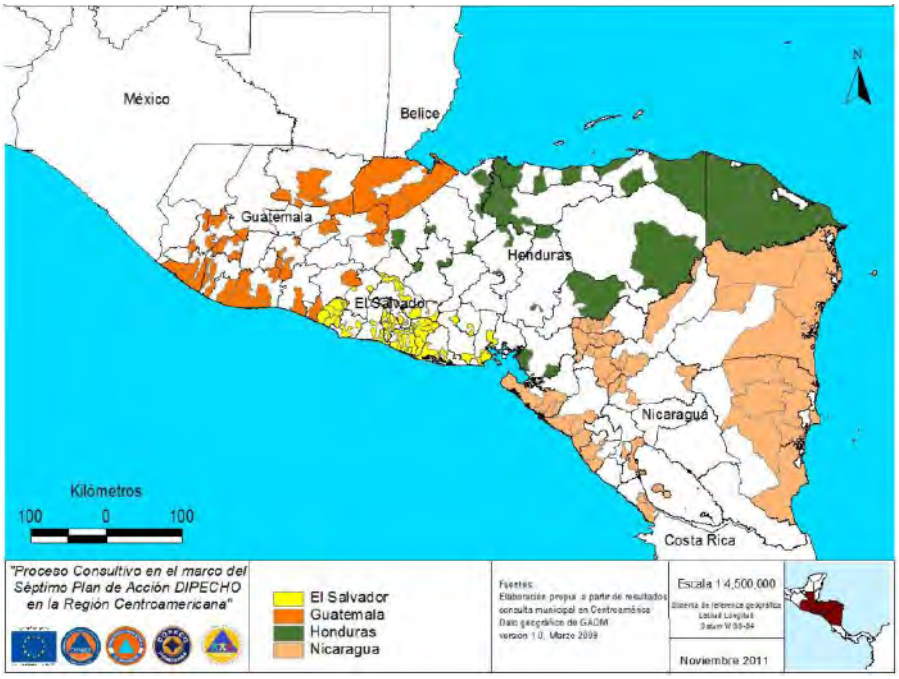

Figure 5 Activity area of DIPECHO (February 2010 – January 2012) [37]

Partners of DIPECHO are classified into three, i) European NGOs, ii) the Red Cross and iii) UN agencies (The United Nations Children's Fund (UNICEF: Fondo de las Naciones Unidas para

[35] Response in the questionnaire to DIPECHO
[36] Data provided by DIPECHO
[37] Data provided by DIPECHO

la Niñez y la Infancia), Pan American Health Organization (PAHO: Organización Salud de PanAmerican), Food and Agriculture Organization of the United Nations (FAO: Fondo de las Naciones Unidas para la Agricultura y la Alimentación) and United Nations Development Programme (UNDP: Programa de las Naciones Unidas para el Desarrollo)). Before the implementation of a project, ECHO concludes a contract with one of the above-mentioned partners and hands over funding for the project implementation to the partner. In this way, ECHO commissions its partner to implement a project. Almost all project activities are managed by staff of CARE International in the City of Choluteca in Honduras and the City of Usulután in El Salvador where the interview surveys were conducted.

In addition, organizations engaged in disaster risk management of each country, National Autonomous University of Mexico (UNAM: Universidad Nacional Autónoma de México), UNDP, UNICEF, PAHO, Die Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ: Agencia Alemana de Cooperación Internacional), Spanish Agency for International Development (AECID), Norwegian Agency for Development Cooperation (NORAD: Agencia Noruega para la Cooperación al Desarrollo) and Swiss Agency for Development and Cooperation (COSUDE: Agencia Suiza para el Desarrollo y la Cooperación) are the partners of DIPECHO. There is a process of consideration in DIPECHO about the cooperation with other organizations and donors before implenting a project and do have an intention of cooperation with JICA because of the similarity between BOSAI and the DIPECHO activities for the protection of residents at the community level.

In the other area of activities, ECHO published "Regional Situation Report on Disaster Prevention" in January 2012. ECHO also published "Documento País," a report on assistance provided by and disaster management implemented by other donors and institutions/organizations involved in disaster risk reduction in Central America described separately by country on its web site. Country-specific "Documentos País" for Guatemala, El Salvador, Honduras and Nicaragua in which ECHO implements projects along with those covering the entire Central America have been issued.[38]

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Web sites of plan, budget and project information	・ http://ec.europa.eu/echo/files/funding/decisions/2012/HIPs/DIPECHO_Central_America_annex.pdf ・ http://ec.europa.eu/echo/files/funding/decisions/2012/HIPs/DIPECHO_Central_America.pdf ・ http://www.desaprender.org/tool/risk-management/hazard-and-vulnerability?page=2
Reports regarding to DRM and support from donors in each country of CA	・ http://www.desaprender.org/tools/documento-regional-2012 ・ http://www.desaprender.org/tools/documento-pais-honduras-2012 ・ http://www.desaprender.org/tools/documento-país-guatemala-2012 ・ http://www.desaprender.org/tools/documento-pais-nicaragua-2012 ・ http://www.desaprender.org/tools/documento-pais-el-salvador-2012

(11) United Nations-International Strategy for Disaster Reduction (UN-ISDR: Plataformas Nacionales Para la Reducción del Riesgo de Desastres)

UN-ISDR refers to an organization of UN which is responsible for the basic strategy of disaster reduction. It was established in 2000 with it's headquarter located in Geneva. The base document is same as the Hyogo Framework for Action adopted in 2005.

UN-ISDR has only one regional office in Panama for Latin America and the Caribbean. The office has 10 staff members, of whom eight are experts (in disaster mitigation, climate change, information management, urban disaster risks, human risks, etc.) and two are administrative staff. There is no ISDR office in any other country in Latin America.

UN-ISDR is not an implementing organization. It makes proposals on and provides assistance to disaster risk reduction and is engaged in activities for the creation of awareness on disaster risk reduction at the level of the central government and municipality in cooperation with organizations responsible for disaster risk reduction in regional disaster prevention organization such as SE-CEPREDENAC and local orgainizations such as SE-CONRED, DGPC, COPECO, CNE and SE-SINAPROC.

Actual activities include promotion of HFA-related activities, assistance in preparation of progress reports on HFA by individual member countries and construction of a disaster risk reduction database (http://gar-isdr.desinventar.net/). A database on damage and losses caused by disasters since 1970 and state of activities related to disaster risk reduction in individual countries has been constructed and renewed. This database is used in the study on strategies of ISDR.

The following describe UN-ISDR's inter-organizational cooperation.

- UN-ISDR organizes regional meetings to discuss future strategies for disaster risk reduction with participation from not only international organizations, but also the academic community and the private sector. (The next meeting is scheduled on September 29 – 31, 2012 in Buenos Aires. Approximately 500 people are expected to participate in the meeting.)
- UN-ISDR is working with organizations for international cooperation, such as CEPREDENAC, Caribbean Disaster Emergency Management Agency (CDEMA: Agencia para el Manejo de Emergencias de Desastres en el Caribe) and Andean Committee for Disaster Prevention and Assistance (CAPRADE: Comité Andino para la Prevención y Atención de Desastres) and American organizations.
- UN-ISDR provides financial assistance to the activities of CEPREDENAC in comprehensive disaster risk reduction.
- UN-ISDR provides organizations responsible for disaster risk reduction in the central

governments of individual countries (*e.g.* SE-SINAPROC in Panama, CNE in Costa Rica and SE-SINAPRED in Nicaragua) with assistance to HFA-based activities and report preparation.

- UN-ISDR cooperates with international organizations such as the UN, multilateral donors, the World Bank, academic organizations, NGOs, etc. in regional meetings.
- UN-ISDR is the technical advisor in the Coordination Group of International Donor Organizations organized by AECID.

(12) UN Office for the Coordination of Humanitarian Affairs (OCHA: Oficina de las Naciones Unidas para la Coordinación de Asuntos Humanitarios)

OCHA is a section of the UN Secretariat responsible for practical coordination of emergency humanitarian assistance activities, mobilization of required resources, communication and information management required for smooth and effective implementation of assistance activities and awareness creation, promotion of understanding and policy formulation on international humanitarian problems. OCHA is headquartered in New York and Geneva.[39] Approximately 2,000 OCHA staff members are working in 35 field offices.

OCHA assigns approximately 35 officers responsible for disaster risk reduction to the Latin America region (13 countries). Half of them belong to Panama Office. The other half are assigned to various countries in the region and are engaged in coordination with international aid organizations. OCHA has the Regional Office for Latin America and the Caribbean (ROLAC: Officiná Regional de America Latina y Carribean) in Panama and country offices in Colombia and Haiti.[40]

OCHA Latin America always has accurate information on vulnerability of each country in the region related to disaster risk reduction by monitoring quantitatively the current states of disasters (The date and time of disaster, place, casualities, economic loss etc.) and resources for disaster risk reduction (The structure and epuiment countermeasuring the disaster for each country, contents for emergency support, a sum amount).,In Redhum, a project concerning disaster information sharing, not only OCHA but also major donors and NGOs collect information on disasters. A system to upload the collected data to a web site and to enable sharing of the information is being constructed in the project. The system is maintained and operated by OCHA with information provided by the organizations participating in the project.

(13) U.S. Agency for International Development/Office of US Foreign Disaster Assistance

[39] Both of the offices in New York and Geneva are considered as the headquarters (http://www.unocha.org/where-we-work/all-countries)

[40] http://www.unocha.org/where-we-work/all-countries

(USAID/OFDA: Agencia para el Desarrollo Internacional de los Estados Unidos / Oficina de los Estados Unidos de Asistencia para Desastres en el Extranjero)

Core offices for Latin America and the Caribbean (LAC) of USAID/OFDA are located in the head office in Washington D.C. and San Jose in Costa Rica. The Latin America/Caribbean Regional Office in the head office in Washington D.C. has five staff members (three experts and two information officers). San Jose Office is operated by one senior official, four programme officers and one assistant.

Only a small number of USAID/OFDA permanent staff is in the implementation structure and stationed in 18 countries within Latin America and Carribean area. Consultants working on a contract basis assigned to each country are the ones in charge of activities of USAID/OFDA (four local leaders and 20 experts in disaster risk management, many of whom are consultants with more than 10 years of work experience). In the system of USAID/OFDA, these consultants are to collect information from governmental organizations, communicate with governmental organizations and make reports to and communicate with the regional office in Costa Rica and headquarters in Washington D.C. The team of experts called Disaster Assistance Response Teams (DARTs) belongs to the regional office in San Jose and the headquarters in Washington D.C. whom are responsible for post-disaster emergency responses.

USAID/OFDA aims at protection of human life, mitigation of impact of disasters and reduction of economic impact in the target countries and formulate programs in such a way that national and local organizations can prepare for disaster and manage risks independently. The disaster risk reduction organization in the countries in LAC is improving their capacity in post-disaster responses.

USAID/OFDA also cooperates with NGOs working in those countries. It cooperates with CARE International and Catholic Relief Services (CRS: Servicios Católicos de Ayuda) in Nicaragua and Save the Children and CRS in El Salvador.

USAID/OFDA also recognizes CEPREDENAC as an important organization in the disaster risk reduction area in the Central America region. Since it maintains good relations with CEPREDENAC, USAID/OFDA intends to continue to cooperate with CEPREDENAC. Although contents of the assistance of USAID/OFDA are almost the same in all the countries in Latin America, USAID/OFDA changes them in accordance with specific conditions in certain countries. Examples of the activities in Guatemala and Costa Rica are mentioned below:

[Examples of the activities in Guatemala]

- USAID/OFDA has been cooperating with SE-CONRED, the Fire Department, NGOs, the Ministry of Education and related people in the area of the Environment since 1989.
- USAID/OFDA has been implementing the risk mitigation training (wildfires, firefighting, relief, and civil protection, etc.) since 1992.
- USAID/OFDA has experience in collaboration and cooperation between Spanish-speaking countries (*e.g.* dispatch of fire fighters between Guatemala and Spain).

[Examples of the activities in Costa Rica]

- USAID covers 32 countries in LAC from the office in Costa Rica.
- Examples of cooperation with other organizations: US Geological Survey (USGS) in monitoring of volcanic activities, National Oceanic and Atmospheric Administration (NOAA) in flood monitoring, PAHO in guarantee of hospital and medical service and water supply when a disaster occurs, Florida International University in Human Resource Development in disaster risk reduction, UN-ISDR, etc..
- USAID/OFDA prioritizes capacity development in disaster risk management, disaster prevention education and human resource development in disaster risk reduction.

(14) Spanish Agency for International Development (AECID: Agencia Española de Cooperación Internacional para el Desarrollo)

The policy of AECID for disaster risk reduction projects in the Central America region is assistance to CEPREDENAC and to the disaster risk reduction activities through NGOs. It also recognizes the importance of emergency response and, therefore, has an emergency response center in Panama. This center has a depot of food, water, medicines and other materials which can be sent to anywhere in Latin America, from Mexico to Chile, when disaster occurs. When Tropical Cyclone 12E caused severe damage in the Central America region including El Salvador in 2011, AECID made emergency response from the center in Panama.

In the recent past, AECID provided assistance through CEPREDENAC to a project for regional disaster management, construction of an organizational structure, establishment of a specific implementation process regarding disaster prevention, implementation methods and human resource development adapted in Guatemala and Costa Rica from 2006 to 2010.

For the period between 2010 and 2013, AECID's assistance is concentrated on infrastructure risk management. AECID and SIECA have prepared a plan to strengthen and manage infrastructure risk management and a manual for diagnosis and strengthening of transport infrastructure, including roads and bridges. The assistance is provided in four countries, El Salvador, Honduras, Nicaragua and Panama. Since the budget is limited (USD 0.8 million), a limited number of activities have been selected for the assistance. Although the manuals mentioned above have been prepared, there is no system to diagnose roads and bridges with the manuals.

Meanwhile, although disaster risk management is not included in the priority issues in the plan of cooperation of AECID for the period between 2010 and 2014, AECID is working on the three pillars (i. Diagnosis of disaster risk, ii. Emergency response plan and iii. Disaster risk reduction education) in cooperation with a Spanish NGO "Ingenieros sin Frontera" which is working worldwide. The NGO, Geologos del Mundo which is financially assisted by AECID is studying earthquake and volcanic disasters.

(15) UN Development Program (UNDP: Programa de las Naciones Unidas para el Desarrollo)

UNDP is a subsidiary body of the General Assembly of the United Nations for the development of countries in the world and assistance to the development. Its main duty is formulation and

management of projects for economic and social development of developing countries. While UNDP has an office in each country, interview surveys were conducted at the UNDP offices in Honduras and El Salvador and their activities in disaster risk reduction are confirmed in the surveys.

UNDP is implementing a disaster risk reduction project in El Salvador with its personnel assigned not to General Director for Civil Protection (DGPC: Dirección General de Protección Civil) but to the Office of President. There is insufficient communication between UNDP and DGPC and they do not seem to be satisfied with each other. UNDP's assistance, which is focused at the levels of municipality and community, has the following characteristics:

1. At the level of municipality, strengthening of the disaster risk reduction committees of municipalities with the use of the fund (loan) from Salvadoran Institute for Municipal Development (ISDEM: Instituto Salvadoreño de Desarrollo Municipal) is promoted. UNDP coordinates this activity. This approach of UNDP differs from that of BOSAI from the point that UNDP does not provide direct fund to municipalities.
2. Since UNDP provides assistance with the objectives of development and poverty reduction, disaster risk reduction is merely one of many components of their assistance.

Since similar projects are being implemented in the BOSAI project by JICA and actions for disaster risk reduction taken by DIPECHO, it is desirable to have more information exchange between them to have large effect and impact with limited inputs.

(16) Taiwan

As part of its assistance in Central America, Taiwan assisted introduction of GIS for its use in formulation of a disaster risk reduction plan in Nicaragua in 2009. In this assistance, Taiwan provided not only utilization of basic information but also technology to acquire and use satellite data. GIS is used in i) disaster prevention, ii) food production and iii) protection of cultural heritage. Taiwan has a clear defined strategy of providing assistance to the countries in Central America with transfer of advanced technologies. Taiwan plans to continue to provide assistance in the region in accordance with this strategy.

Taiwan developed a GIS platform during a period of one year from 2009 as a pilot plan in Nicaragua. The strategy of Taiwan is to expand the achievement in Nicaragua to other countries in the region.

Taiwan organized "Conferences on GIS" in five Central American countries, with exception of Costa Rica. Taiwan and UNDP jointly organized an "International Conference on GIS" at Ministry of Environment and Natural Resources (MARN: Ministerio de Medio Ambiente y Recursos Naturales) in El Salvador on May 20, 2011.

(17) Central American University Superior Council (CSUCA: Secretaría General Consejo Superior Universitario Centroamericano)

CSUCA was established in 1948. Its major objectives are inter-university cooperation among 20 public universities in Central America (including Belize and the Republic of Dominica) and standardization of the academic levels (requirements for awarding masters and doctorate degrees).

Table 11 University members of CSUCA[41]

Country	Participating University
Guatemala	University of San Carlos (USAC)
Belize	University of Belize (UB)
El Salvador	University of El Salvador (UES)
Honduras	National Autonomous University of Honduras (UNAN), National Education University of Francisco Morazan (UPNFM), National University of Agriculture (UNAG)
Nicaragua	National Autonomous University of Nicaragua-Managua (UNAN-Managua), National Autonomous University of Nicaragua-León (UNAN-León), National University of Engineering (UNI), National Agriculture University of Nicaragua (UNA)
Costa Rica	University of Costa Rica (UCR), National University of Costa Rica (UNA), Institute of Electricity, Costa Rica (ITCR), Estate Correspondence Education University of Costa Rica (UNED)
Panama	University of Panama (UP), University of Technology of Panama (UTP), Autonomous University of Chiriquí (UNACHI), Specialize University of Americas (UDELAS), International Marine University of Panama (UMIP)
Dominican Republic	Autonomous University of Santo Domingo

At present, it is headquartered in Guatemala. While its budget is financed by the member universities, it accepts financial assistance from foreign aid agencies at the project level. Main partners in the research on disaster risk reduction and climate change are researchers of the EU countries.

CSUCA has a system for providing constant support to its member universities. It holds a meeting of secretariats twice a year and a university meeting for the assessment of activities every five years.

CSUCA has the following six priority programs:

1. Harmonious, integrated and regional academic exchange
2. Guarantee of academic quality
3. Regional study and teaching method
4. Strengthening of the relationship between universities and society
5. Assistance to students' life
6. Information exchange and dissemination

Although CSUCA has never implemented a disaster risk reduction project, it dispatched 10 students from Central America to Uppsala University and other institutions in Sweden under the academic Project for Capacity Development in Disaster Prevention (with assistance from Sweden).

[41] http://www.csuca.org/index.php?option=com_content&view=article&id=117&Itemid=153&lang=en

They acquired doctorate degrees and found places of work in private consultancy companies, administrative and public organizations.[42]

In the research relating to disaster prevention and climate change, CSUCA has been cooperating with the EU researchers in the implention of the Interuniversity Cooperation Project (supported by Italy).University registered in CSUCA such as University of Palermo in Italy and the University of San Carlos and the University of El Salvador in Central America cooperate in the master's program in human resource development. Ninety people have so far participated in the project and they work at universities, in the government and in the private sector. Activities to create communication between academic staff of universities and communities in Central America on disaster risk reduction are also implemented in this project.

CSUCA has constructed a database of experts on disaster risk reduction sorted by language which they can use. If JICA submits a request, CSUCA can introduce experts to JICA. There were some who were of opinion that collaborative studies with JICA would provide a good opportunity to improve knowledge on disaster risk reduction of member universities and the region.

(18) Pan American Union of Associations of Engineers (UPADI : Unión Panamericana de Organizaciónes de Ingenieros)

UPADI is an association of engineers in North and South America including the Caribbean region, from Canada to Argentina. Engineers in the Central American countries are not members. At a plenary meeting held on April 12, 2012, Mr. Luis Eveline, the director of Honduras University of Engineering (UPI: Universidad Politécnica de Ingenieria), was elected the president of UPADI.

Table 12 Participating organizations to UPADI[43]

Country	Member Organizations
Guatemala	Guatemala Professionl Enginners Association (CIG : Colegio Ingenieros de Guatemala)
El Salvador	Salvadoran Association of Engineers and Architects (ASIA: Asociación Salvadoreña de Ingenieros y Arquitectos)
Honduras	Civil Engineers Association of Honduras (CICH: Colegio Ingenieros Civiles de Honduras)
Nicaragua	Engineers Association of Nicaragua (CIN: Colegio Ingenieros de Nicaragua) Nicaraguan Association of Engineers and Architects (ANIA: Asociación Nicaragüense de Ingenieros y Arquitectos)
Costa Rica	Federated Association of Engineers and Architects (CFIA : Colegio Federado de Ingenieros y Arquitectos)
Panama	Panamanian Union of Engineers and Architects (SPIA:Sindicato Panameño de Ingenieros y Arquitectos)

(19) International Federation of Red Cross Societies

The Red Cross societies in various countries are working under the International Red Cross or the International Red Crescent Organization. Each of the countries in Central America has a

[42] The specialties of the above-mentioned 10 former students are hydrology (Panama), meteorology (Costa Rica), landslides (Nicaragua), environmental hazard (Honduras), volcanology (El Salvador), national land management (Guatemala) and coastal area management (Belize).

[43] http://www.upadired.com/members

Red Cross headquarters, which is working in the framework of legislative systems and disaster risk reduction organizations. The organization consists of full-time employees (about 200 in Honduras) and registered volunteers (approximately 3,000 in Honduras and 2,000 in El Salvador).

The Honduras Red Cross, incorporated in the disaster risk reduction system stipulated in National System of Risk Management (SINAGER: Sistema Nacional de Gestión de Riesgo), has a role of taking part in preparations and disaster prevention in collaboration with Permanent Commission of Contingencies (COPECO: Comisión Permanente de Contingencias).

The El Salvador Red Cross, a member of the national disaster risk reduction meeting, attends a monthly meeting called by General Directorate for Civil Protection (DGPC: Dirección General de Protección Civil) and implements emergency responses in collaboration with DGPC.

The Red Cross society of each country helps disaster victims by securing and distributing food, water, medicines, daily commodities, etc.; helps the sick and wounded by providing care as an emergency hospital, supply of food and water, and pediatric health maintenance; helps disaster victims and evacuees by providing dwelling, epidemic control, health maintenance, production assets, and vocational training; and provides humanitarian support by protecting family bonds.

The Red Cross society of each country has regional organizations of volunteers and makes preparations at these bases at ordinary times. Once emergency responses are required, the Red Cross societies in the country and all over the world come together for the activities. The Red Cross society of each country makes activity plans and activity manuals.

Furthermore, The El Salvador Red Cross also participates in the events of the BOSAI project and hopes that JICA will provide assistance in enhancing the emergency response capacity, supplying ambulances, providing volunteer members with training, and teaching the method for disaster risk reduction education at schools.

(20) CARE International

CARE International is one of the largest NGOs in the field of international aid having its local offices in more than 70 developping countries and conflict areas in the world. Approximately 15,000 specialists are providing assistance to about 66,000 people for their independence every year. Their assistance covers the areas of income improvement, education, economic independence, health, water and sanitation, environment, and communitiy developmet. In the event of occurrence of natural disaster, the NGO takes advantage of its global network to provide urgent support to the affected communities. Also, even in ordinary times, the NGO provides assistance to vulnerable communities through the analysis of the factors of disasters and their risks.

In Central America, CARE International is working in four countries, Guatemala, Honduras, El Salvador, and Nicaragua. The El Salvador office has a role as the headquarters in the Central American region. The office of each country is located in its capital city and there are site offices at the places of activities.

In El Salvador's territory, there are site offices in the cities of San Salvador, San Francisco Gotera, Usulután, and Chalatenango. Disaster risk reduction is carried out only in Usulután city.

In El Salvador, CARE International carried out emergency response activities against Hurricane Mitch in 1998, the earthquake in 2001, Hurricane Stan in 2005, Santa Ana Volcano eruption in 2005, Hurricane IDA in 2009, Tropical Cyclone 12E in 2011, etc. For the earthquake in 2001, it was engaged in first-aid treatment, securing of water and food, preparation of provisional housing, support for construction of permanent housing, etc. until 2004.

In the disaster risk reduction project in Usulután city, it is entrusted by DIPECHO to perform DRM mainly consisting of preparation for disasters and disaster risk reduction education. In the entrusted projects DIPECHO 3, 4, 5, and 6, it collaborated with DGPC to carry out activities for community disaster risk reduction and establishment of warning and evacuation systems.

The Choluteca office in Honduras is implementing "Alimentation Security ond Economy Development Promotion for River Choluteca and Negro " (PROSADE:Promoción de la Seguridad Alimentaria y Desarrollo Económico en las cuencas de los ríos Choluteca y Negro) from 2010 to 2016. The project is targeted at seven municipalities in Choluteca department[44] and three municipalities in El Paraiso department.[45]

The fragility is assessed in a typical way using the matrix shown below. The purposes of the assessment are to (1) Find threats to major subsistence resources, (2) Find fragilities of major subsistence resources, and (3) Establish strategies for dealing with threats.

The activities of CARE International in Honduras are the most advanced among those in the Central American countries. The activities in Nicaragua, Guatemala, and El Salvador are conducted based on the experience of conducting them in Honduras.

Table 13 Vulnerability assessment matrix（evaluation example）[46]

Vulnerability of life	Fire	Landslide	Pollution	Drought	Flood	Total
Agriculture	2	2	1	3	2	10
Fishery	1	1	2	2	3	9
Private sector labor force	0	2	2	2	2	8
Sales (fish, miscellaneous food, fruit, sweets)	0	0	2	2	1	5
Tile, water	1	0	2	2	2	7
Livestock (cattle)	1	2	1	3	2	9

[44] Target municipalities in Cholteca department: Namasigue, Corpus, Apacilagua, San Maricos de Colón, Morolica, Choluteca
[45] Target municipalities in El Paraiso department: Soledad, Vado Ancho, Liure
[46] Data provided by Care International. Reprinted here as a reference for conceptual image of assessment using a matrix.

Livestock (pigs, chicken)	1	1	2	2	2	8

CARE International has been spreading its activities to Nicaragua, Guatemala, El Salvador based on the experience in Honduras mentioned above.

CARE International is teaching students about sanitation and food and water problems in the disaster risk reduction courses at University of El Salvador (UES: Unversidad de El Salvador) and Captain General Gerardo Barrios University (El Salvador). Additionally, CARE International is teaching students around ten years old about influences of climate change in community education and school education.

(21) Plan International

Plan International is an international NGO founded in 1937, which works on the theme of protecting the rights of children in 67 countries of the world. The NGO has its headquarters in UK and has established its funds in 20 countries including Japan to support its activities. In Central America, the NGO has local offices in Guatemala, El Salvador, Honduras and Nicaragua. The largest pillar of the activities of Plan International is the method of "community development with children" under which children independently take part in the processes from identifying problems of the local community to making and implementing project plans and assessing the outcome after the project.

With regard to disaster risk reduction, disaster risk management and mitigation are considered from the standpoint and viewpoint of children. Taking into consideration that children tend to be ignored or subject to violence or abuse, Plan International examines such disaster-time problems in advance and provides support by protecting children from neglect or abuse, ensuring health and sanitation of them, securing safe food and water for them, and helping them attend schools. The NGO also takes comprehensive approach to affected communities, although it is focused only on protection of children's rights and safety assurance at the time of disaster, by working together with Red Cross, Donor organizations, Universities of various countries, and local governments.

The following provides the information of disaster prevention projects in El Salvador.

- Before June 2011: Colaboration with General Directorate for Civil Protection (DGPC) upon activites regarding child protection during disaster with 24 municipalities.
- After July 2011:Activity regarding [Living in a community with child rights restoration capability]

In El Salvador, community disaster prevention projects are implemented in 61 municipalities in five departments, San Salvador, Cabañas, La Libertad, Chalatenango, and Cuscatlán. Plan International is working in collaboration with DGPC but evaluates that the latter organization is not paying sufficient attention to safety and protection of children. In July 2011, the next phase

started, which is based on the theme of "protecting the rights of children and living in a community with resilience."

On the nationwide level, Plan International in El Salvador is working with three goals: (1) Reinforcement of preparation for disaster risk reduction, (2) Decrease of fragilities, and (3) Response to climate change. It submitted "five requests" for the time of a disaster to the El Salvador government to ensure:

(1) Safety of schools,

(2) Psychological protection of children,

(3) Supply of information to children,

(4) Pursuit of disaster mitigation in communities,

5) Fulfillment of disaster risk reduction concepts for disaster mitigation.

The assisting, collaborating, and interacting government agencies with Plan International are the Ministry of Education, DGPC, Ministry of Enviroment and Human Resources (MARN), Ministry of Governance, Ministry of Justice and Public Security, and Ministry of Public Health and Social Welfare.

Among the funding donors of Plan International, EC comes first, followed by the Department for International Development, Department for International Development of UK (DFID). EC created data for ensuring safety of schools in the entire country in DIPECHO7. It has an experience of collaborating with JICA in 2009 on the theme of disaster/emergency activities.

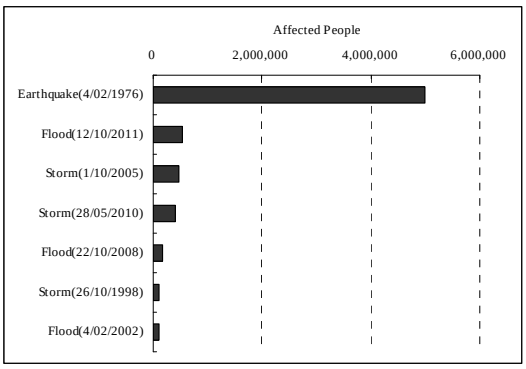
2.2 Guatemala

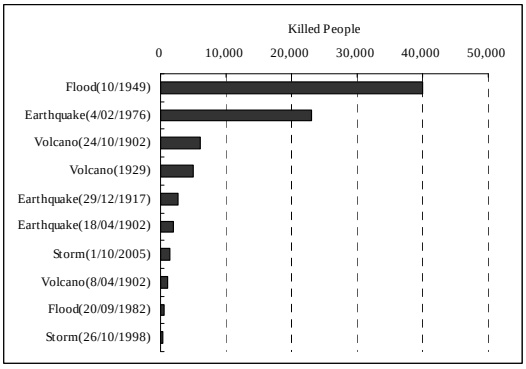
2.2.1 History of natural disasters

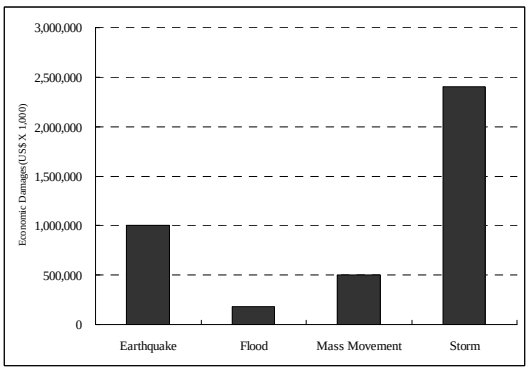
Guatemala's catastrophe list (affected people, killed people and economic damage) from 1900 to 2012 is shown in following table. [47]

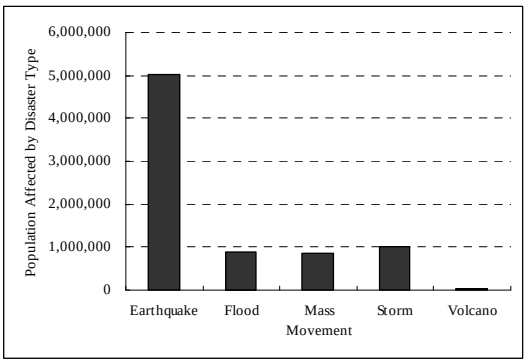
Table 14 Guatemala's catastrophe list (affected people, killed people and economic damage)

Affected People			Killed People			Economic Damage (thousand USD)		
Disaster	**Year**	**Affected**	**Disaster**	**Year**	**Killed**	**Disaster**	**Year**	**Cost**
Earthquake	4/02/1976	4993000	Flood	10/1949	40000	Earthquake	4/02/1976	1000000
Flood	12/10/2011	528753	Earthquake	4/02/1976	23000	Storm	1/10/2005	988300
Storm	1/10/2005	475314	Volcano	24/10/1902	6000	Storm	26/10/1998	748000
Storm	28/05/2010	397962	Volcano	1929	5000	Storm	28/05/2010	650000
Flood	22/10/2008	180000	Earthquake	29/12/1917	2650	Mass Movement	4/09/2010	500000
Storm	26/10/1998	105700	Earthquake	18/04/1902	2000	Flood	20/09/1982	100000
Flood	4/02/2002	98740	Storm	1/10/2005	1513	Flood	12/10/2011	61913
			Volcano	8/04/1902	1000	Flood	10/1949	15000
			Flood	20/09/1982	620	Storm	5/09/1969	15000
			Storm	26/10/1998	384			









(Population Affected by Disaster Type: Accumulation number of affected people by each disaster type from 1900 to 2012)

From late October to early November in 1998, Hurricane Mitch struck the northern Central America region to bring serious damage to Nicaragua, Honduras and Guatemala. In Puerto San José city in the southern Escuintla department of Guatemala, in particular, the maximum daily precipitation exceeded 467 mm and the seven-day continuous precipitation exceeded 1000 mm.

[47] The International Disaster Database (http://www.emdat.be/result-country-profile)

The human toll included 384 deaths (including those missing) and 56,125 evacuees. Additionally, serious damage was caused to bridges, waterworks, and agriculture, with economic loss amounting to USD 7.48 million.

Tropical Cyclone Stan brought heavy rain on October 4, 2005, and although having the weakest power in the hurricane category, nevertheless brought the highest precipitation on record in western Guatemala. In total, there were 1,513 deaths (including those missing) and 386 injuries, the most severe impact of torrential rain disasters in recent years. Many of the deaths were due to landslides, slope failures, or debris flows. Damage to infrastructure was concentrated mainly on traffic facilities such as roads and bridges and exerted a grave influence on the emergency activities, disaster relief activities, and recovery of local economy. Additionally, there was also serious agricultural damage, which was observed to farmland, irrigation facilities, etc. [48]

Figure 6 Route of hurricane STAN [49]

The tropical low pressure named Agatha brought about great damage to the southern part of Guatemala on 24 May 2010. The rain caused floods in many rivers in San Marcos Region and many landslides occurred. Muddy debris flows devastated the lives and agriculture on the foot of Pacaya and Agua volcanoes. National Coorinator for Disaster Reduction (CONRED: Coordinadora Nacional para la Reducción de Desastres) announced that 165 people died, 78 people became missing, and a total of 160,000 people were affected in the entire Guatemala. The damage to the infrastructure such as roads and rivers and the agriculture/livestock production was tremendous, and it resulted in an economic loss of 14 billion US dollars.

As to earthquake disasters, the Guatemala earthquake that struck on February 4, 1976

[48] The "Grant Aid for Disaster Prevention and Reconstruction in Guatemala (Disaster Reconstruction Assistance Program)" was implemented as recovery and reconstruction assistance for the disasters caused by Stan.
[49] Summary of impacts associated with hurricane "STAN" in Guatemala (http://www.insivumeh.gob.gt/folletos/Informe_STAN.pdf)

brought the largest damage including approx. 23,000 deaths, causing catastrophic damage over a wide area from northern Guatemala City, the capital, to the middle reach of the Motagua River.

As to major volcanic disasters, the eruption of the Santiaguito volcano in 1929 caused 5,000 deaths and the eruption of the Santa Maria volcano in 1902 caused 1,000 deaths. On May 27 and 28, 2010, the Pacaya volcano erupted, causing volcanic ash to fall in a wide area, having a substantial impact on the life of citizens.

The Republic of Guatemala has 31 major water systems, which can be divided into 314 tributary basins. According to a survey conducted by National Institute of Seismology, Volcanology, Meteorology and Hydrology (INSIVUMEH: Instituto Nacional de Sismología,Vulcanología, Meteorología e Hidrología), floods frequently occur particularly on the Samala, Achiguate, Maria Linda, and Motagua rivers.

2.2.2 Situation of disaster risk management (framework, organization/institution etc.)

The major agencies in charge of disaster risk reduction in Guatemala are National Coordinating Agency for Disaster Reduction (SE-CONRED: Secretaría Ejecutiva - Coordinadora Nacional para la Reducción de Desastres), National Institute of Seismology, Volcanology, Meteorology and Hydrology (INSIVUMEH), and Unit of River and Road, Directorate General of Road, Ministry of Communications, Infrastructure and Housing (UNIRIOS: Unidad de Manejo de Ríos y Canales, Dirección General de Caminos, Ministerio de Comunicaciones, Infraestructura y Vivienda). The agency that carries out risk management from the viewpoint of national land planning is Economic Planning Agency (SEGEPLAN: Secretaría de Planificación y Programación). The following sections summarize the overview, activities, collaboration with other organizations, and problems of the organizations and agencies on which data collection and interview survey were conducted in this study.

(1) National Coordinating Agency for Disaster Reduction (SE-CONRED: Secretaría Ejecutiva - Coordinadora Nacional para la Reducción de Desastres)

Based on the "Disaster Management Law (Executive Decree 109-96: CONRED Law)" enacted in 1996, CONRED is serving as a national coordinating agency for disaster risk reduction and emergency response. SE-CONRED has an authority to perform administrative control over the relevant agencies when a disaster is about to occur, is occurring, or has occurred. It is headed by the Executive Secretary and has two subdivisions, an Administrative Bureau and a Technological Strategy Bureau, each of which consists of 10 departments (department managers). There are 400 staff members throughout the country in total.

Figure 7 Organization chart of SE-CONRED [50]

From the upper to lower organizations, SE-CONRED consists of Consejo Nacional para la Reducción de Desastres, Junta y Secretaría Ejecutiva para la Reducción de Desastres, Consejo Científico para la Reducción de Desastres, Coordinadoras Regionales para la Reducción de Desastres, Coordinadoras Departamentales para la Reducción de Desastres, Coordinadoras Municipales para la Reducción de Desastres, and Coordinadoras Locales para la Reducción de Desastres.

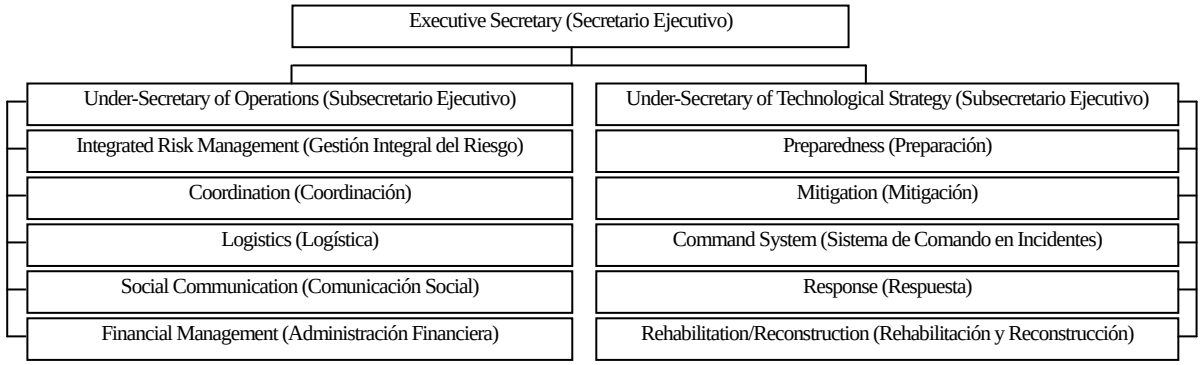


Figure 8 Organization chart of SE-CONRED's head office [51]

The SE-CONRED activities consist of preventive activities and emergency response activities. The preventive activities include integrated risk management, various forms of coordination, and education for disaster risk reduction. The activities at the emergency response department include preparation for activities, construction of an information collection system, and emergency response and recovery activities.

In the department for construction of an information collection system, a system for water level observation and communication has been established for two rivers on the Atlantic coast and six rivers on the Pacific coast, using the EWS (Early Warning System) that is in service in the eight basins throughout the country. In the volcanic activity information system, INSIVUMEH carries out constant observation on the Fuego, Pacaya, and Santiaguito volcanoes,

[50] Data provided by CONRED
[51] Data provided by SE-CONRED

communicating the observation information to SE-CONRED at all times.

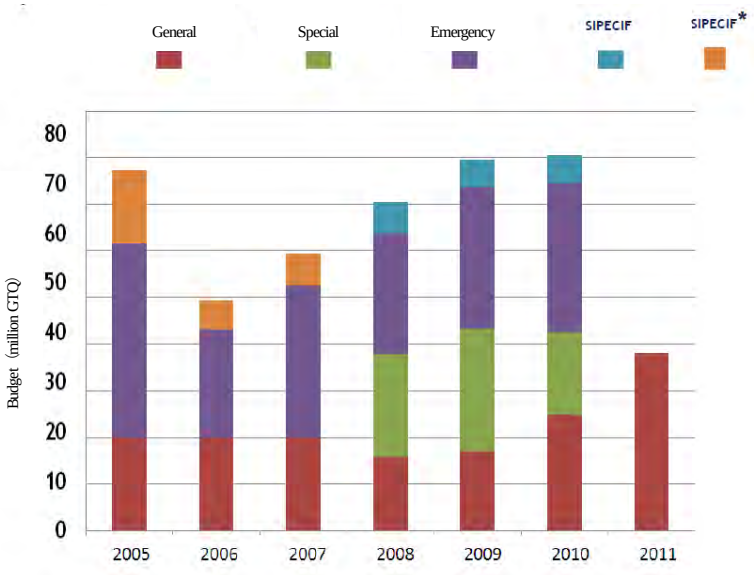


Figure 9 Budget allocations for disaster prevention/mitigation (2005 –) [52]

CONRED is collaborating with the responsible organizations and assistance organizations that it has determined in each sector as shown in the table below. The relevant organizations include volunteer fire brigades and the Red Cross.

Table 15 Role and responsible organization for disaster prevention/mitigation [53]

Function	Responsibility	Support
Building fire	Fire department	Fire brigade
Forest fire	SE-CONRED	National Institute of Forestry (INAB: Instituto Nacional de Bosques), Ministry of Agriculture, Livestock and Food (MAGA: Ministerio de Agricultura, Ganadería y Alimentación), National Council of Protected Areas (CONAP: Consejo Nacional de Areas Protegidas)
Rescue	Fire department	Fire brigade
Hospital	International Federation of Red Cross Societies	City and volunteer firefighters
Dangerous materials	Fire brigade	Volunteer firefighters, Ministry of Energy & Mines (MEM)
Management of dead bodies after disasters	National Institute for Forensic Sciences (INACIF)	Public Ministry (Office of the Attorney General) / Attorney General
Public safety	Ministry of Interior (MINGOB: Ministerio de Gobernación)	Ministry of Defense
Food	Secretariat for Food and Nutritional Security (SESAN: Secretaría de Seguridad Alimentaria y Nutricional)	Ministry of Agriculture, Livestock and Food (MAGA)
Emergency shelter	Secretariat for Social Works of the Wife of the President (SOSEP)	Ministry of Education (MINEDUC: Ministerio de Educación)
Shelter	Secretariat for Social Works of the Wife of the President (SCEP: Secretariat of Executive Coordination of the Presidency (Office of the President)	Ministry of Communications, Infrastructure and Housing (MICIVI: Ministerio de Comunicaciónes, Infraestructura y Vivienda)
Health, mental	Ministry of Public Health & Social	Social Security Institute (IGSS : Instituto

[52] Data provided by SE-CONRED
[53] National disaster response plan, SE-CONRED

care	Welfare (MSPAS)	Guatemalteco de Seguridad Social)
Logistics	MD	Social aid fund
Humanitarian aid	SE-CONRED	Ministry of Foreign Affairs
Human Resources	SE-CONRED	Ministry of Culture and Sports (MICUDE: Ministerio de Cultura y Deportes)
Storage management	Secretariat for Social Works of the Wife of the President (SOSEP)	Ministry of Education (MINEDUC)
Water supply and sanitation	Ministry of Public Health & Social Welfare (MSPAS)	Institute of Municipal Development (INFOM: Instituto de Fomento Municipal)
Communication	Ministry of Communications, Infrastructure and Housing (MICIVI)	Social aid fund
Public works	Ministry of Communications, Infrastructure and Housing (MICIVI)	Social aid fund
Energy	Ministry of Energy & Mines (MEM)	National Energy Commission (CNEE: Comisión Nacional de Energía Eléctrica)

On the other hand, it is also receiving assistance from the donors and implementing colaboration projects with them.

The DIPECHO project started with DIPECHO4 and proceeded to DIPECHO7 being implemented as of April 2012. After Hurricane Agatha struck in 2010, the emergency cooperation program of Italy, with a fund of USD 2.8 million, was implemented by an Italian NGO. There are also early warning and food safety programs by AECID and volunteer projects implemented by Organization of American States (OAS). IDB implemented a capacity development project for CONRED with a financial assistance of USD 600,000. JICA's BOSAI project deals with disaster risk reduction in the community with a high risk of eruption of the Fuego Volcano. At the national level, human resources development was implemented by SE-CONRED that is in charge of comprehensive management for disaster reduction.

Table 16 Ongoing projects [54]

Project Name	DIPECHO7	Emergency program by Italian cooperation[55]	BOSAI
Project Site	Escuintla, Izabal, Guatemala, Retalhuleu, Alta Verapaz, Sololà	El Progreso, Zacapa, Chiquimula, Baja Verapaz, Alta Verapaz, Jalapa, Santa Rosa, Quichè, Izabal	Fuego volcano
Implementation	SE-CONRED and NGO	NGO of Italy	JICA and SE-CONRED
Support	Action against Hunger (Acciòn contra el hambre)[56], Guatemalan Red Cross, Oxfam, COOPI[57]		CEPREDENAC
Donor	ECHO(EU)	Italian Cooperation Agency, Embassy of Italy	JICA
Period	2011-2012	2011-2012	2007-2012
Funds	10 million Euro	2.8 million USD	500,000 USD（JICA） 75,000 USD（CONRED）
Purpose and Content	Strengthening of local government agencies, early warning system,	Strengthening national and community level by DRM (early warning system, education, environment, food stockpiling, disaster	Strengthen the capacity of community for the Fuego volcano disaster

[54] Data provided by SE-CONRED
[55] http://www.cooperaitalia.org/programa%20de%20emergencia%20ran.html
http://www.cooperaitalia.org/Programa%20de%20emergencia/Progr.%20EME.pdf
[56] http://www.accioncontraelhambre.org/ficha_pais.php/id_map/91/pais/guatemala
[57] http://www.coopi.org/en/home/

	strengthening community	reduction, preparedness)	

Community-level education for disaster risk reduction is provided in BOSAI and DIPECHO projects for enhancing the disaster risk reduction capacity of communities and Community Equipment for Disaster Reduction (ECORED:Equipamiento de la Comunidad para Reducción de Desastres en Guatemala) with Italian assistance. ECORED, in which SE-CONRED takes the initiative, consists of training on using disaster risk reduction equipment, identifying risks, and carrying out rehabilitation activities. It was learned that the 104 communities in eight departments where ECORED had been implemented suffered only small damage and no deaths when Tropical Cyclone Agatha struck in 2010, demonstrating the effect of disaster risk reduction education.

As collaboration with neighboring countries, SE-CONRED has provisions for disasters and equipment for precaution in office buildings (including training for using the equipment and improvement of the installed equipment) and has a plan for joint use of such equipment by El Salvador and Honduras (Plan Trinacional Equipos Usar, USD 117,000). Regarding an early warning system to be used before disaster occurrence on the Atlantic side, three countries, Guatemala, Belize, and Honduras, are seeking to establish a prediction and warning system for hurricanes and tropical cyclones that occur on the Atlantic coast.

SE-CONRED is pursuing as priority issues the construction of an early warning system and the enhancement of disaster risk reduction readiness. Since INSIVUMEH carries out observation and SE-CONRED assesses risks and issues evacuation directives, they should become able to make early and correct assessment and communicate information quickly and smoothly. One possible solution under examination at present is to develop a system using smart phones instead of large machines to communicate local disaster information to the SE-CONRED head office and send back necessary information.

Table 17 Main projects in planning [58]

Project Name	DIPECHO8 Strengthening early warning systems in rural areas	DIPECHO8 DRM capacity development	Upcoming projects of BOSAI	Capacity Development for integrated DRM
Project Site	Guatemala City	Guatemala City	Plateau region, coastal areas, the central region	Urban area
Implementation	ECHO, UNESCO, CEPREDENAC, SE-CONRED	NGO, SE-CONRED	JICA y SE-CONRED	IDB, SE-CONRED
Support	ECHO, UNESCO			Ministry of Finance, SEGEPLAN
Donor	ECHO	ECHO	JICA	BID
Period	2013-2014	2013-2014	2013-2018	2011-2013
Funds	Pending	Pending	Pending	600,000 USD
Purpose and Content	Strengthening of early warning systems	Strengthening national and community level by DRM (early warning system, education, environment, food stockpiling food, disaster reduction, preparedness)	Dissemination of DRM in rural areas based on PCGIR/ National Disaster Management Plan	Strengthening of national policies for disaster risk reduction, improvement of CAPRA, improvement of GIS facilities, local administration planning for disaster reduction

The following lists projects also under contemplation and their budgets.[59]

- Comprehensive system enhancement (Enhancement of an information communication system including radio transmission): USD 7,500
- Smartphone-based communication to the national emergency operation center: USD 9,800
- Enhancement of machinery for immediate action of emergency rescue teams: USD 500
- Supply and enhancement of machinery for immediate action of emergency rescue teams: USD 480,000
- Improvement of wireless communication systems in mountains and mines: USD 5,000
- Protection of computers and equipment for communication to the national emergency operation center: USD 8,923
- Design drawing and survey for a new office building of SE-CONRED: USD 170,000

(2) National Institute of Seismology, Volcanology, Meteorology and Hydrology (NSIVUMEH: Instituto Nacional de Sismología,Vulcanología, Meteorología e Hidrología)

INSIVUMEH is an organization that carries out seismic, volcanic, meteorological, and hydrological observations and issues alarms if required by weather forecast or the conditions. The engineering department consists of four sections. Mr. Eddy Hardie Sánchez Benett, the director of this organization, has worked in this position from 1998 to the present (2012), a very long term, as far as the Study Team knows. Additionally, the highly skilled engineer who was a

[58] Data provided by SE-CONRED
[59] It is not confirmed that the main projects have assumed fund by donor or don not have it.

counterpart in JICA's Study for Establishment of Base Maps for GIS in the Republic of Guatemala (2000 to 2003) is still assigned to this office as of the present in 2012. In view of the relatively low frequency of personnel reshuffling and the resultant accumulation of knowledge and technology, this person is considered to have high capabilities in seismic, volcanic, meteorological, and hydrological observations.

INSIVUMEH has a role of supplying SE-CONRED and the mass media with disaster information such as precipitations and water levels to be observed by it for the sake of flood forecast and warning.

INSIVUMEH, a member of the Council chaired by SE-CONRED, surveys the disaster status when a disaster occurs and provides technical advice to the collaborative agencies and explanation to residents.

INSIVUMEH is a counterpart agency in the "Study for Establishment of Base Maps for GIS in the Republic of Guatemala", the results of which are released on the Web site of INSIVUMEH at present. Mr. Sanchez, the director, being satisfied with the outputs of the JICA project, is said to disclose these outputs whenever an opportunity arises and exhibit them in the Volcano Museum.

As to the nationwide hazard assessment, INSIVUMEH has created brief assessment maps. However, detailed maps are required because the existing small scaled maps are not sufficient to carry out specific disaster risk reduction activities. As of April 2012, the most detailed hazard maps are at a scale of 1:20,000, and the types are seismic (five cities), volcanic (four volcanoes), landslide (three cities, two areas), and flood (four river basins). All of these maps have been created in the JICA project (Study for Establishment of Base Maps for GIS in the Republic of Guatemala). Apart from them, US Geological Survey (USGS) has created accurate volcanic hazard maps.

INSIVUMEH made an inventory of landslide maps and introduced an early warning system for possible floods in six river basins.

From 2009 to 2013, INSIVUMEH is enhancing the organization with the assistance from Central American Bank for Economic Intergration (BCIE).[60] Since the monitoring equipment of INSIVUMEH is out of date, it is urgently required to renovate facilities and equipment such as seismometers, weather radars, and weather forecast systems.

INSIVUMEH explained to the Study Team that the future assistance that they expect of JICA included a real-time volcano monitoring system (equipment and capacity development), meteorological observation with a view to application to the agricultural sector, observation of

[60] Source: Answers to questionnaires to INSIVUMEH (Only "fortaleciemiento insituticional" was written about organization enhancement. The necessity of future survey in this regard is to be discussed.)

water levels and waves in the ocean, and landslide hazard prevention on roads and bridges.

(3) Unit of River and Road, Directorate Genaral of Road , Ministry of Communications, Infrastructure and Housing (UNIRIOS, DGC, ICIVI: Unidad de Manejo de Ríos y Canales, Dirección General de Caminos, Ministerio de Comunicaciones, Infraestructura y Vivienda)

In January 2006, UNIRIOS was founded as an organization that supervises road works for flood prevention. This agency, being virtually under the jurisdiction of the Directorate General of Road, is not yet stipulated by law and therefore has not even acquired sufficient budget.

The characteristic of road section in Guatemala are section that crosses the central highland area, a section that goes down from the highland area to the coastal lowland, a section that passes at the feet of volcanic mountains, a section that crosses rivers, and a section that runs parallel to rivers. These areas are topographically and geologically prone to damage caused by hurricanes and landslides and are therefore at high risk. UNIRIOS recognizes that it is not sufficiently organized to perform even the minimum required actions. There are two types of required actions, ones before and after a disaster. It is necessary to carry out pre-disaster, preventive and disaster mitigation actions, instead of post-disaster actions, in order to minimize economic losses. For this purpose, UNIRIOS considers that it is important to provide training to enhance the landslide and flood disaster management capacity (such as research, design, construction, and plan assessment and analysis).

(4) Economic Plannning Agency (SEGEPLAN: Secretaría de Planificación y Programación)

SEGEPLAN is under the jurisdiction of the Office of the President so that policies can be implemented directly and quickly. The agency, although not specializing in disaster risk reduction, carries out activities related to disaster risk reduction such as coordination between relevant agencies, and works as a liaison for international cooperation, and the management of international cooperation projects. It also undertakes activities for raising the awareness for disaster risk reduction in the communities, review of the national land development plan from the viewpoint of disaster risk reduction, provision of guidelines for diagnosis of public assets for disaster risk reduction, and preparation for the development council for land use.

SEGEPLAN creates development plans of local municipalities (or assists in creating them). The priority item is to make local municipality development plans by carrying out hazard diagnosis and identifying weaknesses and risks. Although the national land development plan is an important duty of SEGEPLAN, it is not necessarily carrying out appropriate national land development based on the said plan. This is because not all the investments are made through SEGEPLAN but most of them are for private-sector development.

Although the Development Council (Consejo de Desarrollo) consists of five-level development

committees in five different administrative division levels, SEGEPLAN commented that they are by no means sufficient in terms of risk management of land development.

SEGEPLAN has a risk management office, now in its second year after establishment, which is staffed by six analysts. It is surveying and analyzing risk awareness in the 18,000 communities out of the total of 23,000 throughout the nation. The outputs are reflected on the community development plans.

(5) Center for the Study of Safe Development and Disasters (CEDESYD: Centro de Estudios de Desarrollo Seguro y Desastres)

CEDESYD, in its fourth year after establishment as of April, 2012, is an organization that ensures safety of students (on campus) against disaster in University of San Carlos (USAC: Universidad de San Carlos). USAC has 18 campuses in the Republic of Guatemala and as many as 120,000 students on the main campus. The increase in the number of students is spotlighting the safety of campuses at the time of a disaster.

There are five CEDESYD staff members (three full-time and two part-time) to take charge of all the campuses, which have too few human resources in comparison with the amount of activities.

The CEDESYD activities target can be classified into three: (1) Campuses, (2) Campuses and communities, and (3) Campuses and relevant organizations (such as SE-CONRED). CEDESYD is putting evacuation signboards on campus and providing video-based education. However, parking lots are chosen as the place for evacuating students. In the future, it is necessary to examine the plan for safe evacuation places in collaboration with SE-CONRED.

The disaster risk reduction activities carried out on campus include awareness raising for disaster risk reduction, checking of evacuation routes, and evacuation drills.

The undergraduate students of USAC must choose either the writing of a thesis or participation in seminars as a requirement for graduation. The term of seminars is six to eight months. One of the seminar assignments is community disaster risk reduction. CEDESYD has created a manual on disaster risk management activities (ABC en Gestión de Riesgo para el Epesista) to help students carry out field activities for community disaster risk reduction. The students who choose the seminar stream use this manual to carry out disaster risk reduction activities in communities (about 100 students every year).As off-campus activities, students are sent to communities to carry out disaster risk reduction activities. The medical students serve as assistants at hospitals and temporary places for treatment. The possibility of such cooperation between the student activities and disaster reduction activities in the community with JICA will be expected.

(6) Center for Advanced Studies in Energy and Mines (CESEM: Centro de Estudios Superiores en Energía y Minas)

Whereas university disaster risk reduction study is mainly carried out by USAC, the disaster risk reduction education at the said university is provided only on a small scale by CESEM, etc.

CESEM, an organization based in the engineering department of USAC and founded in 1988, mainly consists of seismologists and geologists in Guatemala. This organization includes the members of government-related organizations (INSIVUMEH and SE-CONRED) and university organizations and the employees of private companies. It is a small organization consisting of approximately 50 members. The members work in their own organizations at ordinary times and participate in CESEM activities only when events and group surveys are held. CESEM does not implement projects but can refer to engineers related to geology and disaster risk reduction in the Republic of Guatemala.

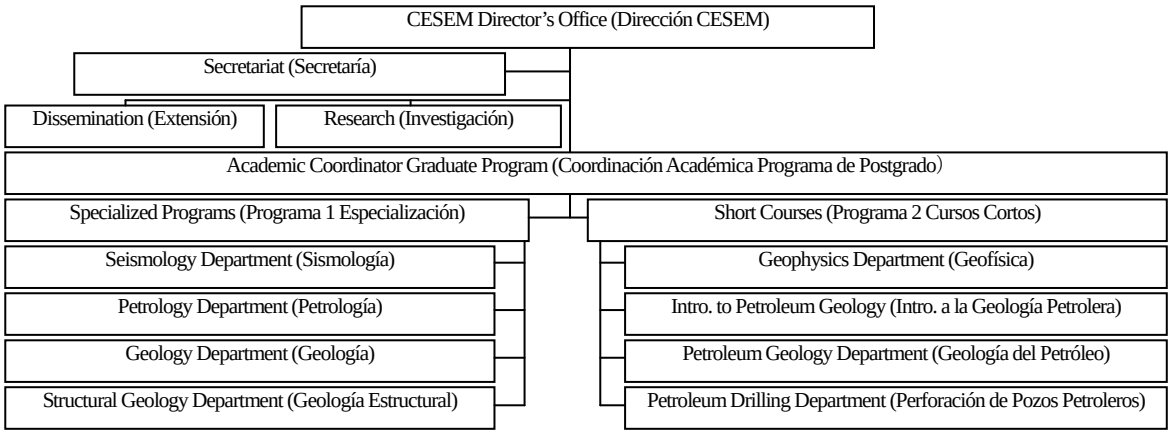


Figure 10 Organization chart of CESEM [61]

A member meeting is held every month to discuss activities and prepare for events. The main events hosted by CESEM are seminars, workshops, and training sessions on geology and disaster risk reduction for the general public (such as all the communities, university researchers, and private companies).

As a major event, CESEM co-hosts and participates in a meeting of geologists from the Central American countries once every two years. Recently in October 2011, a meeting was held in Panama, gathering approximately 50 geologists and geophysicists from Central America. The presentation topics included renewable energy, volcanoes, geotechnical, geological hazards, landslides, seismic tectonics, and environmental geology.

CESEM implemented such survey projects as "Fragility due to Sea Level Rise on Pacific Coast in Guatemala" and "Survey on Seismic Hazards of Guatemala City." After the subsidence in Guatemala City (diameter: 20m, depth: 150m), the government made an inquiry to CESEM, and

[61] http://cesem.ingenieria-usac.edu.gt/index.php?option=com_content&view=article&id=1&Itemid=8

SE-CONRED organized a group including CESEM to conduct a survey.

(7) Guatemala professional engineers Association (CIG: Colegio Ingenieros de Guatemala)

CIG is an association publicly recognized by law. Companies wishing to bid for public works are required to register as a member with CIG. The director of CIG was elected in March 2009 but remained non-operational for a while for internal reasons. However, the director was approved by the conference of university presidents in April 2011 and started to become operational after that. CIG is an industry group or public-interest corporation, and is an organization independent from the government. However, according to CIG, no sufficient activity is currently carried out even at present.

There are as many as 40 target technical fields, excluding agriculture and chemistry, where responsible professionals are referred to as "engineers". The committees related to land and disaster risk reduction include an infrastructure committee (in charge of the establishment of infrastructure standards by the national government), a subcommittee that creates housing design standards, a land use committee (land register, survey, and inquiry on settlement in a disaster-risk area), and a seismic committee. The land use committee is in charge of the land use control to prevent construction of buildings at places with a high disaster risk.

2.2.3 Japan's cooperation achievements

Japan's cooperation achievements in Guatemala are shown in following table. [62] [63]

Table 18 Japan's cooperation achievement in Guatemala

Scheme	Project Name	Period
Development Study	The Study for Establishment of Base Maps and Hazard Maps for GIS in the Republic of Guatemala	2000-2003
Development Study	Flood Control Plan of Antigua and Pantaleón River in the Republic of Guatemala	1983
Technical Cooperation	Project on Capacity Development for Disaster Risk Management in Central America "BOSAI"	2007-2012
Grant Aid	Reconstruction Assistance Plan of Tropical Cyclone Stan	2006
Grant Aid	Outline Design Survey for Disaster Reconstruction Grant Aid in Guatemala	2006
Grant Aid	The Project for Improvement of equipment and materials for Hurricane Disaster Recovery	1998
Emergency Assistance	Emergency Assistance for Torrential Rain Disaster by Tropical Cyclone Stan in Guatemala	2005
Emergency Assistance	Emergency Assistance for the Damage by Tropical Storm in Central America	2010

Although not providing direct assistance, JICA implemented the "Preparatory Survey for Disaster Prevention Program in Guatemala" aimed at identifying the status quo of disasters and disaster prevention, forming assistance subprograms, and examining individual projects. Through this survey, JICA proposed such projects as a master plan for comprehensive basin management, highway slope disaster survey, debris flow and flood monitoring system,

[62] JICA Knowledge Site (http://gwweb.jica.go.jp/)
[63] ODA project search site of the Ministry of Foreign Affairs (http://www3.mofa.go.jp/mofaj/gaiko/oda/search.php)

enhancement of meteorological information management systems, and disaster risk management program for the capital area.

2.2.4 Key donor engagements

Key donor engagements in Guatemala are shown in following table. [64]

The donors are providing assistance mainly on governance in HFA priority actions and identification of disaster risks, which seem to be emphasized on such efforts as improvement of legal systems and establishment of plans related to disasters, early warning, and risk assessment. On the other hand, there are few projects on reduction of potential risk factors and enhancement of preparation for emergency responses.

Table 19 Key donor engagements in Guatemala

Project Name	Funding Agency	Budget (USD)	Period	HFA Activity Area(s)*
Modernization and updating of the meteorological system in Guatemala	BCIE	12.5 million		2
Program for the Reduction of Vulnerability and Environmental Degradation Guatemala (PREVDA)	EC	3.34 million	2007-2011	2, 3
Development of scientific information to promote municipal planning to reduce disaster risks	WB (GFDRR)	730,000	2008-2010	1, 2, 3, 4
Disaster risk management development policy loan with a Catastrophe Deferred Drawdown option (CAT DDO)	WB	85 million	2009-2011	1, 2, 3, 4, 5
Strengthening of Information and Communication for CEPREDENAC and National Commissions	WB	446,000	2007-2009	1, 2
Development and application of a Risk Assessment Platform for Guatemala (CAPRA)	IDB	350,000	2009-2010	2, 3
Community Risk Management and risk mapping with local actors	GIZ	N/A		2, 3, 4
National Policy for Risk Reduction in Guatemala	IDB	750,000	2009-2010	1
Institutional support to technical groups related with risk reduction	UNDP	90,000	2009	1, 3
National program for risk reduction on the reconstruction process PROREC	UNDP, Sweden, NORAD USAID	13 million	2007-2010	
Regional Program of Environment in Central America (PREMACA)	Danish Cooperation (DANIDA)	N/A		2, 4
Earthquake Risk Reduction In Guatemala, El Salvador and Nicaragua With regional cooperation to Honduras, Costa Rica and Panama (RESIS II)	NORAD	2.4 million	2007-2010	2
Strengthening of CEPREDENAC and National Commissions for disaster vulnerability reduction in Central America	AECID	130,000	2005-2009	1
Regional Plan for Disaster Reduction (PRRD)	NORAD, AECID	400,000	2006-2011	1
Mesoamerican coordination system for territorial information	IDB	800,000	2009-2011	2
Strengthening of communication systems at national and regional levels (Regional	China (Taiwan)	1,130,000	2009-2011	3

[64] The World Bank, Global Facility for Disaster Reduction and Recovery: Country Notes

program)				
Urban Risk Reduction (Guatemala, Costa Rica, El Salvador, Honduras)	UNDP	300,000	2009-2010	3, 4
Action Plan AECID-CEPREDENAC (Regional level)	AECID	763,750	2009-2010	1, 2
Strengthening of CAPRA Implementation (Regional Level)	CEPREDENAC	50,000	2010	1, 2
Support for the development of territorial planning that integrates disaster risk considerations at the municipal level	INSIVUMEH, Municipalities	1.4 million	2009-2012	1, 2, 4, 5
Technical assistance to support the national program for disaster risk reduction and mainstreaming disaster risk reduction in other sectors	Vice-Presidency, SE-CONRED, Ministry of Finance	800,000	2009-2011	1, 2, 3, 4
Studies and designs for mitigation measures for critical infrastructure	SE-CONRED	1.2 million	2009-2010	1, 3, 4
Mitigation works in key sectors that will be identified during implementation of the National Program for Prevention and Reduction of Disaster (PNPMD)	Sectoral Ministries, Municipalities	980,000	2009-2011	1, 4
Support for the development a Risk Assessment Platform for Guatemala	Vice-Presidency, SE-CONRED, Universities, Sectoral Ministries, INSIVUMEH	564,000	2009-2010	1, 2

*: Classification of each project by the five priority action areas of HFA following table.

Priorities for action	Key activities
(1) Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation (Governance)	・ National institutional and legislative frameworks ・ Resources ・ Community participation
(2) Identify, assess and monitor disaster risks and enhance early warning (Identification of disaster risk)	・ National and local risk assessments ・ Early warning ・ Capacity ・ Regional and emerging risks ・
(3) Use knowledge, innovation and education to build a culture of safety and resilience at all levels (Education for DRM)	・ Information management and exchange ・ Education and training ・ Research ・ Public awareness
(4) Reduce the underlying risk factors	・ Environmental and natural resource management ・ Social and economic development practices ・ Land-use planning and other technical measures
(5) Strengthen disaster preparedness for effective response at all levels	・ At times of disaster, impacts and losses can be substantially reduced if authorities, individuals and communities in hazard-prone areas are well prepared and ready to act and are equipped with the knowledge and capacities for effective disaster management.

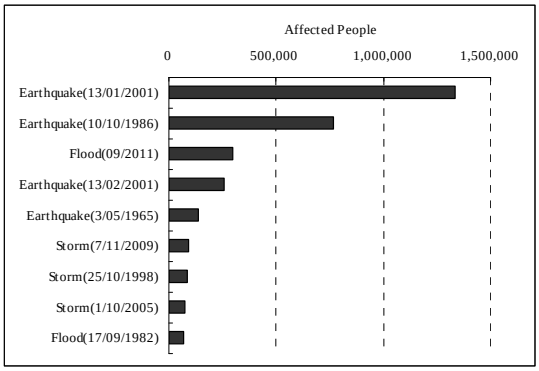
2.3 El Salvador

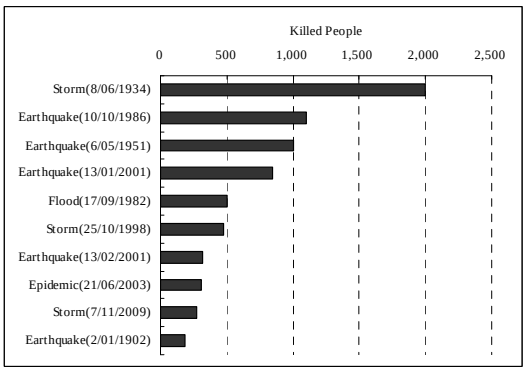
2.3.1 History of natural disasters

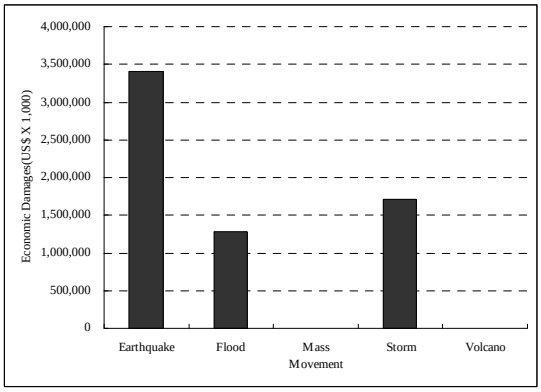
El Salvador's catastrophe list (affected people, killed people and economic damage) from 1900 to 2012 is shown in following table.[65]

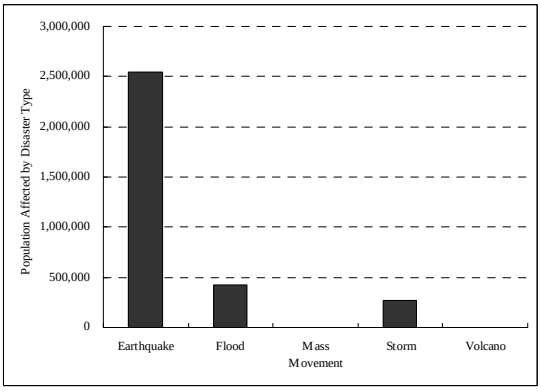
Table 20 El Salvador's catastrophe list (affected people, killed people and economic damage)

Affected People			Killed People			Economic Damage (thousand USD)		
Disaster	**Year**	**Affected**	**Disaster**	**Year**	**Killed**	**Disaster**	**Year**	**Cost**
Earthquake	13/01/2001	1334529	Storm	8/06/1934	2000	Earthquake	10/10/1986	1500000
Earthquake	10/10/1986	770000	Earthquake	10/10/1986	1100	Earthquake	13/01/2001	1500000
Flood	09/2011	300000	Earthquake	6/05/1951	1000	Flood	09/2011	1000000
Earthquake	13/02/2001	256021	Earthquake	13/01/2001	844	Storm	7/11/2009	939000
Earthquake	3/05/1965	139720	Flood	17/09/1982	500	Storm	25/10/1998	388100
Storm	7/11/2009	90000	Storm	25/10/1998	475	Storm	1/10/2005	355700
Storm	25/10/1998	84000	Earthquake	13/02/2001	315	Earthquake	13/02/2001	348500
Storm	1/10/2005	72141	Epidemic	21/06/2003	304	Flood	17/09/1982	280000
Flood	17/09/1982	68000	Storm	7/11/2009	275	Earthquake	3/05/1965	35000
			Earthquake	2/01/1902	185			









(Population Affected by Disaster Type: Accumulation number of affected people by each disaster type from 1900 to 2012)

Hurricane Mitch which hit northern Central America from the end of October to the beginning of November 1998 caused serious damage in El Salvador. The floods, landslides and debris flows caused by heavy rain killed 240 people and flooded 10,000 houses. Approximately 60,000 people lost their homes and 500,000 people were evacuated from their homes because of these floods,

[65] The International Disaster Database (http://www.emdat.be/result-country-profile)

landslides and debris flows. The hurricane also caused enormous damage to roads, river infrastructure, agriculture and the livestock industry. The economic loss reached up to USD 4 million.

When Hurricane Stan brought heavy rain on October 4, 2005, Santa Ana Volcano in the City of San Salvador also erupted. Because of the floods and mudflows caused by the flow of volcanic ash, 54,000 people in 300 communities were evacuated from their homes.

Hurricane Ida brought 450 mm of rainfall in three days, including 355 mm of rainfall in five hours at the peak of the rainfall. The damage caused by Hurricane Ida throughout El Salvador reached USD 369 million.

In May and June 2010, Tropical Storm Agatha brought 400 mm of rainfall in a few hours. The heavy rain caused floods and landslides, which killed 12 people and affected 120,000 people. After these disasters, the President of El Salvador declared a state of emergency and all resources in the country were used in the relief effort.

Tropical Cyclone 12E formed in October 2011, dropped 747 mm of rainfall, which is larger than the rainfall dropped by Hurricane Mitch, and caused damage in 181 out of the 262 municipalities in the country. The heavy rain raised water levels in rivers and caused flooding. More than 3 m of floodwater was still found in the areas most affected by the floods three weeks after the rain had stopped. Serious damage was found in the lower reaches of the Rio Lempa and along the Rio Grande de San Miguel. These areas were flooded for more than five weeks. Serious landslides occurred in the mountains. A 40m-wide, 200m-long and 20m-thick landslide occurred in the City of Comasagua. An area of 2,000 km^2, or 10 % of the total area of El Salvador, was affected by the tropical cyclone. Thirty-four people were killed and 56,400 people were evacuated from their homes in the disaster.

Earthquakes have also caused serious damage in San Salvador. In the recent past, a magnitude-7.7 earthquake, which occurred on January 13, 2001, killed 844 people, injured 4,723 and destroyed the houses of 108,266 people. Another earthquake on February 13, 2001 killed 315 people and injured 3,400.

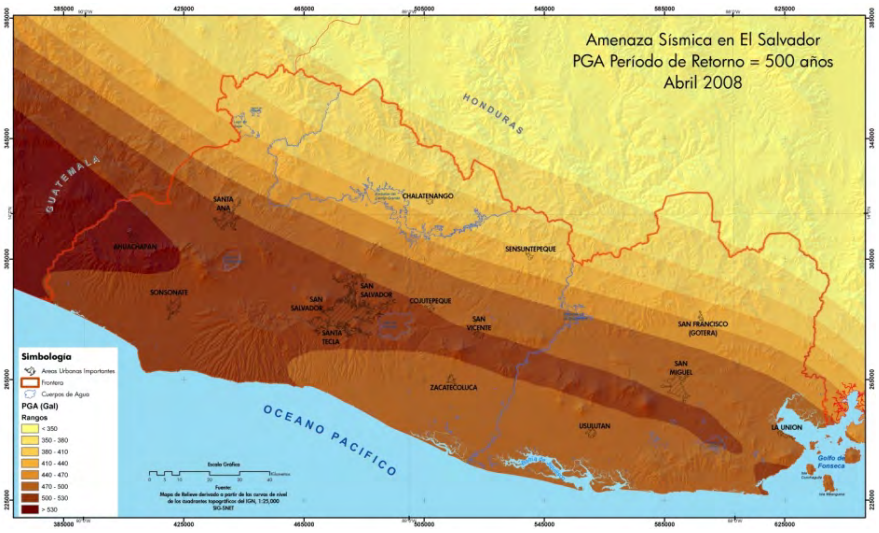


Figure 11 Expected value of seismic acceleration (500 years) [66]

A line of active volcanoes have caused frequent volcanic disasters in El Salvador. There is a historical record of a large-scale eruption that buried a town. In the recent past, 20,000 people were evacuated from their homes when Santa Ana Volcano erupted in October 2005.

Hurricanes, tropical cyclones and earthquakes have triggered landslides in El Salvador. Landslides caused most of the deaths in the above-mentioned hurricane and earthquake disasters. The disaster that occurred on San Vicente Volcano during heavy rainfall in November 2009 caused severe damage.

The vulnerability map and the risk map indicate that 88.7 % of the land area and 94.5 % of the population of El Salvador are vulnerable to natural disasters.[67]

Wildfires, droughts and tsunami (which have occurred rarely) are other natural disasters that are likely to occur in El Salvador.

2.3.2 Situation of disaster risk management (framework, organization/ institution etc.)

The General Directorate for Civil Protection (DGPC: Dirección General de Protección Civil), the Environmental Monitoring Division in the Ministry of Environment and Natural Resources (DGOA/MARN) and the Directorate for Climate Change/Risk Management in the Ministry of Public Works (MOP/DACGER: Dirección General del Observatorio Ambiental / Ministerio de Medio Ambiente y Recursos Naturales) are the main implementing organizations in disaster risk reduction in El Salvador. Decentralization of the implementation of and responsibility for disaster risk reduction is a policy of El Salvador. The policy specifies what each of those organizations has to do and what each of them has to implement with its own budget. Measures

[66] Data provided by MARN
[67] http://www.sica.int/busqueda/Noticias.aspx?IDItem=64481&IDCat=3&IdEnt=2&Idm=1&IdmStyle=1

for disaster prevention, in particular, are among those which those organizations have to implement with their own budget.

In the following, overviews, activities, cooperation with other organizations, and problems of the organizations/institutions at which the Study Team collected data and implemented interview surveys are summarized.

(1) General Directorate for Civil Protection (DGPC: Dirección General de Protección Civil)

The DGPC is responsible for coordination and promote cooperation among many government organizations and related organizations involved in disaster risk reduction. The DGPC had only 30 staff members in June 2009. However, a technical staff member was assigned to each of the 14 departments and the central government in November 2009. Although the DGPC is in the Ministry of Governance (under the supervision of the Minister of Governance), it is to have direct contact with the Office of President, bypassing the minister, in emergency situations under the current administration.

The following seven technical committees have been established under the National Disaster Risk Reduction Plan. For example, the Emergency Service Committee is discussing ways in which the National Fire Department and affiliated organizations implement search and rescue operations and provide emergency health care and protection in collaboration with the Red Cross and the police. [68]

1. Technical Committee for Shelters: To assist municipalities in management and operation (from opening to closure) of emergency shelters
2. Technical Committee for Infrastructure and Basic Services: To evaluate and rehabilitate basic services to the people and infrastructure in coordination with relevant organizations
3. Technical Committee on Physical Distribution: To plan, coordinate and manage domestic and international humanitarian assistance
4. Technical Committee on Health: To protect and assist recovery of the people affected by disasters
5. Technical Committee on Security: To take responsibility for ensuring security at the time of disaster.
6. Technical Committee on Emergency Care: To take responsibility for search, rescue and first aid of people affected by disasters, firefighting and handling of hazardous materials
7. Science and Technology Committee: To provide organizations in the central government involved in disaster risk reduction with scientific and technicaladvice on natural

[68] http://www.proteccioncivil.gob.sv/zonadescargas/Comisiones%20Tecnicas/Planes%20CTS.zip

phenomena which may cause disasters

The DPGC has a working relationship with DGOA/MARN/ an institution for scientific observation on disaster information. One of the seven technical committees mentioned above (the Science and Technology Committee) consists of staff members from Ministry of Enviroment and Natural Resources (MARN: Ministerio de Medio Ambiente y Recursos Naturales).

The DGPC is responsible for warning in the event of a disaster and receives technical advice from the environmental monitoring department in the Ministry of Environment (DGOA/MARN). The DGPC maintains a radio communication link with DGOA/MARN all the time and the cooperation between the two in information sharing has been firmly established. The DGPC cooperates with Ministry of Public Works, Transportation, Housing and Urban Development (MOP: Ministerio de Obras Públicas, Transporte Vivienda y Desarrollo Urbano) in measures on infrastructure, urban development and recovery/reconstruction.

In accordance with an executive order issued in 2011, the Director of the "Secretaría Presidencial de Asuntos de Vulnerabilidad (SAV)" was appointed in June 2011. However, SAV had no budget as of April 2012. No specific function has been given to SAV.

There is a fund for disaster risk reduction called Disaster Prevention and Reduction (FOPOMID: Fondo de Prevención y Mitigación de Desastres) which has an annual budget of USD 4 million. The fund is administered separately from the budget of each organization involved in disaster risk reduction and is used as supplementary budget. The fund is financed with ordinary budget, donations, working budget and interest from investment of its own money.[69]

Disaster management system, risk management, and emergency measures are being established and administered in line with decentralization policy. In the case of emergency measures, National Center for Emergency Operations takes the lead and the information and order are passed down to the subordinating 14 District Center for Emergency Operations and further down to 262 municipality COEs.

There are many NGOs working in El Salvador. The DGPC conducts surveys on their activities and knows their activities well. A few of the most important NGOs (including the Red Cross, Oxford Committee for Fammine Relief (Oxfam) and CARE International) are officially registered. There is a system enabling the DGPC to control their activities by, for example, giving advice.[70]

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[69] http://www.transparenciafiscal.gob.sv/portal/page/portal/PCC/SO_Administracion_Financiera/Instructivos/6_Instructivo_No_7011_Normas_especficas_para_el_manejo_del_FOPROMID.pdf

[70] http://www.proteccioncivil.gob.sv/index.php?option=com_weblinks&view=category&id=40:organismos-no-gubernamentales-link&Itemid=116
http://www.proteccioncivil.gob.sv/index.php?option=com_content&view=article&id=996:direccion-general-de-proteccion-civil-sostie

DGPC, in the past, was only instructing districts and cities but it extends its jurisdiction to municipalities including NGOs.

(2) Ministry of Environment and Natural Resources / Environmental Monitoring Division (DGOA /MARN: Dirección General del Observatorio Ambiental / Ministerio de Medio Ambiente y Recursos Naturales)

The restructuring of National Territory Study System (SNET:Sistema Nacional de Estudios Territoriales) to DGOA/MARN took place in January 2011 in accordance with the decision made by the Minister of Environment and Natural Resources. The reason for the restructuring is a need to expand the range and area of research. SNET had the Departments of Oceanography, Geology, Hydrology and Meteorology. When DGOA/MARN was established, a new department, the Department of Ecosystems, was established in addition to the four departments mentioned above. Therefore, DGOA/MARN has a total of five departments. DGOA/MARN has 75 staff members (an increase of 15 from the time of SNET) in the head office and approximately 60 staff members in the field. The relationship between DGOA/MARN and DGPC has, in principle, remained the same as that between SNET and DGPC. DGOA/MARN professionally analyzes observation data on climatic conditions, earthquakes, water levels and tide levels and provides DGPC with information on both natural phenomena which are occurring and those which are expected to occur derived from the results of the analysis. The monitoring center of DGOA/MARN is newly established and deals with detection of quake epicenters and recording of quakes, monitoring of volcanoes using cameras, detection and imaging of rainfall intensity using 8 radar rain-meters, detection and monitoring of water levels in rivers. The collection and recognition of these data items can be done real-time and the collected data is presented on their website and communication with DGPC is well established.

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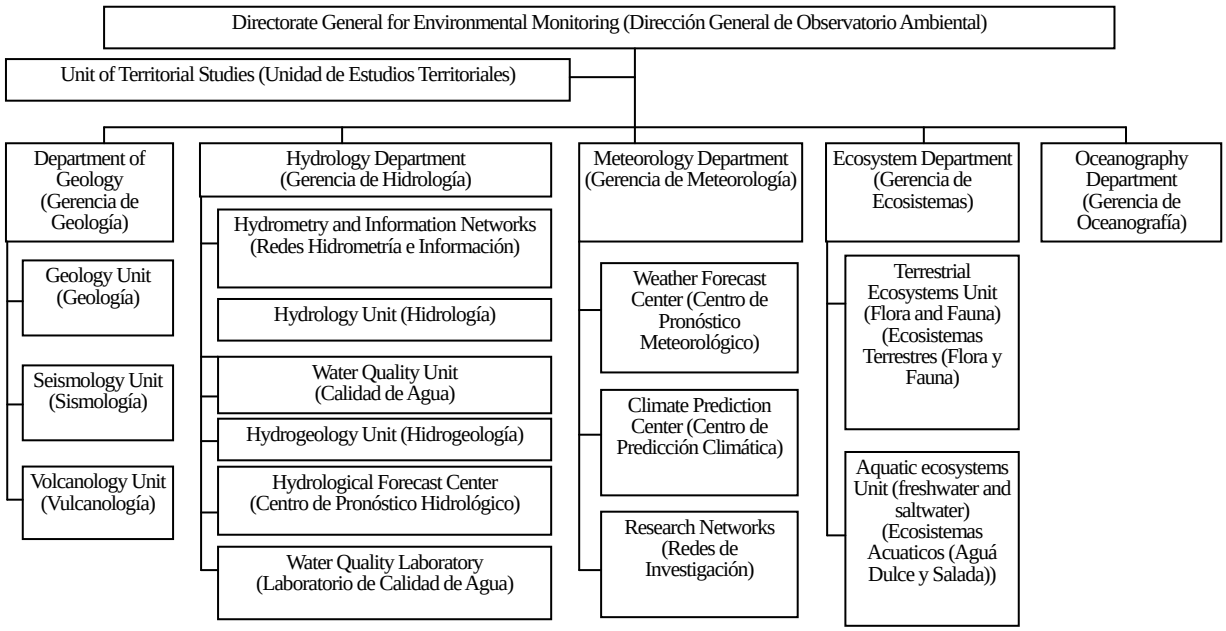


Figure 12 Organization chart of DGOA/MARN[71]

Table 21 Changes in observation equipment [72]

Observation equipment (Unit: set)	2009	2010	2011	2012
Remote meteorological observation	12	15	17	27
Traditional meteorological observation	27	27	27	27
Remote rainfall observation	11	13	25	29
Remote river flow observation	7	7	19	26
Traditional river flow observation	4	4	4	4
Broadband seismic observation	1	1	6	6
Short-period seismic observation (digital)	0	0	0	25
Short-period seismic observation (analog)	20	20	20	20
Local area weather radar	0	3	6	8
Seismic acceleration observation	20	17	29	30
Ocean observation	0	2	2	4
Observation well	13	0	0	6
Total	117	109	180	212

Project in progress 1: Programa Nacional de Reducción de Riesgo

This project is being implemented over a three-year period between 2010 and 2012 with financial assistance from IDB and BCIE. The objective of the project is to provide and upgrade monitoring equipment (including seismometers, meteorological observation equipment and air analyzers). IDB provided a loan of USD 8 million and BCIE provided grant of USD 3 million to the project.

The Programa Nacional de Reducción de Riesgo consists of i) a study on methods to analyze vulnerability, ii) a landslide and flood early warning system and iii) three-day training courses to residents in rural areas. A total of 600 people in rural areas have participated in iii) three-day training courses, which have been held five times so far. Three additional courses are planned for 2012. In the training course, residents in rural areas come to San Salvador to study basics of

[71] Data provided by MARN
[72] Data provided by MARN

disasters and methods to react to and prepare for disasters. Moreover, DGOA/MARN gives transceivers and mobile phones to the participants of the training and asks them to send information to DGOA/MARN.

It costs USD 25,000 to implement each training course. This amount includes the costs of providing raincoats, hats, shirts, bags, boots, lamps and simple rain gauges to the participants, in addition to the costs of their accommodations, meals and transportation. The participants receive certificates of completion in order to enhance their motivation.

Project in progress 2: A collaborative project with DIPECHO

This project began in 2004. The implementation of this project, currently in its eighth year, is expected to continue in future. Every second year, interested NGOs are invited to submit proposals. The EU evaluates submitted proposals and selects contractors. DGOA/MARN cooperates in the implementation of this project as a third party with a letter of cooperation submitted to the EU. DGOA/MARN participates in the implementation of the collaborative project with DIPECHO as a provider of observation data. With the funding of USD 3 million for two years from the EU, DGOA/MARN is implementing educational activities in disaster risk reduction in rural areas together with NGOs including the Red Cross-Spain, the Red Cross-El Salvador, Swiss Labour Assistance (AOS: Ayuda Obrera Suiza) and Oxfam.

Project in progress 3: Evaluación del Riesgo de Tsunami en la costa de El Salvador

DGOA/MARN is implementing this project in cooperation with Enviromental Hydraulics Institute of Cantabria (IH CANTABRIA:Instituto de Hidráulica Ambiental)[73]. It is wholly financed by AECID. Its objectives are the sorting of tsunami data and analysis of tsunami risk (including assessment of risk and vulnerability). The project period is four-year from 2009 to 2012. Therefore, it will be completed this year. The outputs of the survey have been published.

(3) Directorate for Climate Chage Adaptation and Strategic Risk Management, Ministry of Public Works, Transport, Housing and Urban Development (DACGER/MOP: Dirección de Adaptación al Cambio Climático y Gestión Estratégica del Riesgo, Ministerio de Obras Públicas, Transporte Vivienda y Desarrollo Urbano)

The Ministry of Public Works (MOP) consists of the Departments of Public Works, Transport, Housing and Urban Development and Risk Management. DACGER is a new organization established on December 13, 2010 after one year of preparation. As the previous administration did not prioritize risk management, emergency response and post-disaster response were its two main duties. However, because of the frequent disasters, the cost of emergency response became enormous. Such a situation has led to realization of the importance of "disaster mitigation," a

[73] A joint research center between the University of Cantabria and the Foundation for Environmental Hydraulics Institute (http://www.iccgov.org/Think_Tank_Map/schedeTT/ih_cantabria.htm)

concept that reduction in the cost of disaster risk management should be achieved through preventive measures such as improvement of infrastructure, and to input resources and money to infrastructure development to make it resistant to disasters as an implementation strategy of MOP.

In practice, construction of bridges resistant to flood waters, work for stabilization of slopes and development and improvement of urban drainage systems are being implemented as climate change adaptation measures. As climate change has created a need for new design standards adapted to it, the old standards are being revised. The revision work is close to completion.

DACGER has conducted 700 surveys of infrastructure including those on slopes and bridges using its own budget and resources and has assessed vulnerability and risk of facilities. It is also working on risk and vulnerability map of facilities and its evaluation, optimization of investment and disaster response, and dissemination of knowledge on vulnerability and risk management.

The staff members of DACGER are actively involved in the issues of climatic change and disaster prevention through the leadership of Mr. Bonilla. The areas of expertise of the members cover land slides, applied geology, road and bridge technologies and the members work closely together in field training and report writing to produce better outcome.

DACGER is constructing a new bridge on the Quesalapa River in the Lempa River Basin in accordance with the new standards. Also, from 2011 to 2013, it is implementing a JICA sponsored project "Project for assistance in climate change and risk management strategy for strengthing infrastructure". This project aims at upgrading the infrastructure (Landslide prevention, bridges, urban drainage), promoting the capacity of taking measures against disaster, establishing the system of fostering technicians.

The relationship with Sectretariat of Vulnerability Affairs (SAV) and MARN is important in the implementation of measures on infrastructure, urban development and post-disaster recovery and reconstruction. MARN is responsible for the construction of a system and data analysis for the implementation of emergency response and decision on risk of natural phenomena. On the other hand, MOP deals with rehabilitation of damaged infrastructure and construction of more resistant infrastructure including concrete urban planning. CEL (Comisión Ejecutiva Hidroeléctrica del Río Lempa) measures precipitation, controls water levels and operates water discharge systems as a means of flood control with dams. However, CEL has been working with little coordination with MOP. When Tropical Cyclone 12E brought 1,500 mm of rainfall in ten days in November 2011, CEL discharged a huge amount of water from a dam called "September 15th Dam." Consequently, the bridges downstream of the dam suffered damage. This case

clearly shows the importance of the cooperation between CEL and MOP.[74]

The Ministers of Public Works and ministers responsible for environmental issues of the member countries of SICA held a meeting and put their signatures on a document in which they agreed to cooperate with each other on climate change adaptation measures and to establish an organization for the cooperation. The contents of the agreement are as follows: The countries in Central America are vulnerable to climatic change and disasters. It was agreed among the participants that the Infrastructure Ministers and Environmental Ministers from the member countries will collaborate to promote measures to cope with climatic changes under the national strategy of each country including improvement of boarder areas, and construction of more disaster resistant infrastructure.

Meeting of the Ministers of Public Works and Ministers Responsible for Environmental Issues in Central America

◆ Title of the agreement

Adaptation of Social and Production Infrastructure to Climate Change (Adaptación de la Infraestructura Social y Productiva al Cambio Climático)

◆ Date: November 25, 2011

◆ Issues discussed

- Climate change causes a wide variety of phenomena, influence and damage.
- Impact of climate change is more pronounced in poorer areas.
- Damage caused by climate change is more severe in developing countries.
- It is hoped that the damage will be mitigated with the use of knowledge and technology and with assistance from aid organizations.
- The Ministries of Public Works, the Ministries of the Environment and SAVs of the member countries of SICA have agreed to hold a Strategic Meeting on Climate Change Adaptation Measures/Risk Management once a year.

◆ Issues reconfirmed

- Global warming affects not only people in the region but also all the people in the world.
- The countries in the Central America region, in particular, should act against climate change because of the rich biodiversity in the region.
- The first Strategic Meeting on Climate Change Adaptation Measures/Risk Management was held in San Salvador on November 24 and 25, 2011.
- The participants issued a statement on strategies and appropriate action for the climate change adaptation measures/risk management.

◆ Declaration

- MOPs, the Ministries of the Environment and SAVs of the member countries of SICA shall strengthen relationships among them as colleagues in the regional strategy.
- The participants of the meeting shall act against climate change in accordance with the resolutions of the United Nations Climate Change Conferences and the Kyoto Protocol.
- The participants of the meeting shall promote sustainable development, technology transfer and technical assistance in climate change adaptation measures/risk management.
- The participants of the meeting shall observe the resolutions of the United Nations Climate Change Conferences.
- The participants of the meeting shall respect agreements and orders of SICA on measures to prevent/mitigate natural disasters.
- The participants of the meeting shall promote establishment of national funds in their countries.
- The participants of the meeting shall promote higher education in integrated engineering for environmental protection.
- The participants of the meeting shall cooperate with CEPREDENAC, CCAD, SIECA and SISCA.
- The participants of the meeting shall endeavor to protect forests, jungles, mangroves and water resources, etc. with participation of relevant organizations.
- The participants of the meeting shall request CEPREDENAC, COMITRAN and CCAD to implement the environmental plan for the improvement of public infrastructure and productivity in Central America.
- The participants of the meeting shall work for establishment of a legal framework for opening national borders and free passage of equipment and aid materials

[74] http://www.desenredando.org/public/articulos/2003/sdrrllv-sa/sdrrllv-sa_abr-24-2003.pdf, http://pdf.usaid.gov/pdf_docs/pnacr105.pdf

- The participants of the meeting shall appreciate the relationships between poverty elimination, sustainable development and mitigation of phenomena and strengthen the capacity to mitigate climate change.
- The participants of the meeting shall improve preparedness to natural disasters and agreement on mitigation of natural disasters.

across the borders at the time of emergency.
- The participants of the meeting shall work for the development of the Central American road network.

◆ Priority Projects

- Creation of teams for the climate change adaptation measures/risk management
- Formulation of land development programs for border areas
- Disclosure of information on development in border areas
- Prioritization of construction and maintenance of bridges and roads in border areas
- Creation of a national fund in each member country
- Infrastructure development

- Creation of teams for the climate change adaptation measures/risk management
- Discussion on passage through national borders at the time of disaster
- Construction and maintenance of bridges and roads in border areas
- Measures on unstable slopes
- Drainage and water use
- Reliable housing and transport

(4) Central American University（UCA: Unversidad Centroamericana）(Earthquake—resistant housing project)

UCA is a private university and the counterpart organization in "The Project for Enhancement of the Construction Technology and Dissemination System of the Earthquake-Resistant "Vivienda Social" (TAISHIN Project)". In Phase 1 of the project, 48 people were trained as expert/tecnician in the training. Approximately half of them are working as teachers and the rest have found places of work in the private sector (mainly areas of architecture), etc. In Phase 2, 40 people were trained as expert/tecnician in the training.

The organizations involved in the TAISHIN Project are as follows:

- Salvadoran Foundation for Development and Minimum Housing (FUNDASAL: Fundación Salvadoreña de Desarrollo y Vivienda Mínima)
- Salvadoran Institute of Building Construction (ISC: Instituto Salvadoreño de la Construcción)
- University of El Salvador (UES: Universidad de El Salvador)
- Ministry of Land, Infrastructure, Transport and Tourism of Japan, Building Research Institute of Japan
- National Center for Disaster Prevention (CENAPRED of Mexico)

As a result of TAISIN project, the quake resistant construction rechnology has spread in El Salvador and many small residences (floor area less than 50 ㎡) mainly in urban areas are being constuctued with quake-resistant methods. Also, the standards for quake resistant construction are being reviewed and the results of the experiments on quake resistance of structures in TAISHIN project are expected to be incrporate.

Salavadoran Institute of Building Construction (ISC: Instituto Salvadoreño de la Construcción), Salvadoran Chamber of Construction Industry (CASALCO: Cámara Salvadoreña de la Industria de la Construcción), Salvadoran Association of Engineers and Architects (ASIA: Asociación Salvadoreña de Ingenieros y Arquitectos), Hábitat – an NGO implementing activities for improvement of living environments, Central American University (UCA: Unversidad Centroamericana), Ministry of Public Works, Vice Ministry of Housing and Urban Development (VMVDU: Ministerio de Obras Públicas, Vice Ministerio de Vivienda y Desarrollo Urbano), Consultants Association of El Salvador (ACODES: Asociación de Consultores de El Salvador), Colegio Arquitectos de El Salvador, Salvadoran Foundation for Development and Minimum Housing (FUNDSAL) and National Institute of Cement and Concrete (ISCYC: Instituto Salvadoreño del Cemento y del Concreto) are the major organizations of experts in construction and civil engineering in El Salvador. These public and private organizations are exchanging and

disseminating technologies.

UCA has no master's or doctorate program on anti-seismic engineering. The university sent 18 graduates to Japan for further study. Twelve of them received master's degrees and one received a doctorate degree. UCA is expected to begin a master's program in seismic engineering in 2013. The beginning of the master's program is considered as a possitive outcome of the assistance from JICA, which has been provided in the form of training and the TAISHIN Project. UCA has potential to be the center of human resource development in the area of seismic engineering in Central America.

UCA receives assistance from CENAPRED of Mexico in the scheme of the South-South Cooperation. The assistance from CENAPRED has been provided not on a regular basis but on a demand basis. At present, the two institutions communicate with each other once every three months or so. While the increase in the workload of the Mexican side can be considered as a reason for the reduction in the frequency of the communication between the two, CENAPRED considers the improvement in the technical level of the Salvadoran side as the reason. As a model of further development of the South-South Cooperation, the counterpart in "The Project for Enhancement of the Construction Technology and Dissemination System of the Earthquake-Resistant "Vivienda Social"" is providing assistance to "The Project for Improvement of the Earthquake-Resistant Housing Construction Technology (2010 – 2013)" in Nicaragua.[75] While UCA has a researcher studying earthquakes, it does not have an expert or a department studying geology or landslides.

(5) University of El Salvador : (UES: Universidad de El Salvador)

UES has departments involved in research in the areas of disasters and disaster risk reduction, such as the Departments of Volcanology, Seismology, Geology, Geo-thermal Dynamics and Mathematics in the Faculty of Science where basic research is conducted. The Department of Geotechnics in the Faculty of Engineering is engaged in comprehensive research on disasters. The Faculties of Science and Engineering maintain communication, though it is not very close. The Faculty of Science has not participated in disaster risk reduction projects very often, because it is focused on studies in basic science. UES has master's programs in civil engineering, agricultural engineering and water management/groundwater and an undergraduate course in risk assessment.

The School of Civil Engineering has five departments in five specialty areas; structural engineering, geotechnics, hydrology/environmental sanitation, construction/roads and graphic

[75] http://www.jica.go.jp/activities/issues/ssc/case/04.html

representation. The Department of Structural Engineering offers a master's program, while the other departments do not have master's programs. Dr. Edgar Armando Peña Figueroa, who received a doctorate degree from Yokohama National University, was appointed as the Director of the School of Civil Engineering in January 2012 for a term of four years. Salvadoran students have to study abroad, *e.g.* in the USA, Mexico, Colombia, Europe and Japan, to receive postgraduate degrees.

Members of the Department of Geotechnical Engineering in the Faculty of Engineering are conducting basic geotechnical research. However, because of the lack of required equipment, they carry out experiments with equipment borrowed from other institutions or in other institutions in collaboration with researchers in those institutions.

Students in the School of Civil Engineering of UES study the five specialty areas mentioned above in the first four years. In the fifth year, they choose one of the five areas as their specialty. At the same time, they have to do practical training outside the university. The School of Engineering takes a favorable view of participation of its students in BOSAI project during the one-year internship period before graduation.

With regard to the researchers and academic societies, Ms. Lesly Mendoza and Mr. Joaquin Cerreno are the lecturers in the courses on landslides and floods, respectively, of UES. There are researchers in volcanology in the Faculty of Science. Mr. Jorge of the Department of Construction/Roads is specialized in road disaster prevention/mitigation. Little has been studied on tsunamis in El Salvador. In fact, there is no researcher specialized in tsunami in El Salvador. There is hardly any cooperation between universities. Communication between UES and UCA is also very limited.

UES has a close relationship with a private organization, ASIA. Faculty members are often asked to give lectures in seminars sponsored by ASIA and members of ASIA are often asked to give lectures at UES.

(6) Salvadoran Association of Engineers and Architects (ASIA: Asociación Salvadoreña de Ingenieros y Arquitectos)

ASIA was established in 1929 and is an organization with a solid foundation and established rules. It has approximately 2,000 members. In other words, approximately 10 % of all the engineers in El Salvador (approximately 20,000) are members of ASIA. ASIA aims at i) development and protection, ii) acquisition of technology and knowledge and iii) provision of services (at the time of emergency, in particular). Although there are many members in ASIA, there are not enough experts on earthquakes, floods, landslides and emergency response in ASIA. It is a member of UPADI (Unión Panamericana de Organizaciones de Ingenieros, a group of

geologists and geotechnical engineers across the entire America region).

Its activities include geological and hydrological survey for bridge construction, surveys, diagnosis and analysis of bridges (40 members of ASIA are involved in the project implemented in 2011 under the agreement with MOP with the contract amount of USD 900,000), the Landslide Project in Berlin (under an agreement with an NGO with the contract amount of USD 40,000), repair of the Santa Tecla City Hall Building and preparation of a manual for construction waste disposal (commissioned by MARN in 2010). In addition, ASIA implements many technical training activities. Therefore, there is a possibility for cooperation between ASIA's activities and technical assistance projects of JICA.

(7) World Geologists (Geólogos del Mundo)

World Geologists is an NGO established in 2001 by geological engineers dispatched to El Salvador by Colegio Ilustre de Geólogos of Spain. It is engaged in technology development and human resource development for prevention/mitigation of natural disasters. The NGO has its office in El Salvador and when there are projects outside the country, it occasionally sets up a temporary office in that country. It is a small organization consisting of a director (an expert in geotechnics) and five full-time staff members, an expert each in seismology, risk management, geotechnics, hydrology and geology. All of them are Spanish. It maintains a network of engineers outside the organization and whenever it is necessary it can employ engineers of appropriate fields of expertise depending on the project.

World Geologists has implemented projects for hazard assessment of landslides, floods and volcanoes in the area of disaster risk reduction. A drawback of their work is the long time required for surveys because their surveys are so detailed. They began their activities in the area of environmental geology. In recent years, the number of disaster risk reduction projects has been on the increase. They have conducted surveys, identification of locations with GPS, analysis with GIS and risk assessment of landslides and proposals, cost estimation and investigation into the implementation process of countermeasure works in the cities of Mejicanos, Delgado and Cuscatancingo, etc. in an integrated manner.

They receive many orders from AECID. Most of their projects cost between 150,000 to 200,000 Euros. The largest project they have implemented cost 500,000 Euros. They exchange views with MOP/DACGER and DGOA/MARN It also keeps the reports and data of many projects conducted in El Salvador and appreciated as an information source.

2.3.3 Japan's cooperation achievements

Japan's cooperation achievements in El Salvador are shown in following table.[76] [77]

Table 22 Japan's cooperation achievement in El Salvador

Scheme	Project Name	Period
Development Study	Development Study for Flood Control and Water Resource Development of Grande San Miguel River Basin	1996-1997
Technical Cooperation	Enhancement of the Construction Technology and Dissemination System of the Earthquake-Resistant "Vivienda Social"	2009-2012
Technical Cooperation	Enhancement of Technology for the Construction of Earthquake-Resistant Popular Housing	2003-2008
Technical Cooperation	Project on Capacity Development for Disaster Risk Management in Central America "BOSAI"	2007-2012
Loan Aid	Technique Assistance Project for the Department of Adaptation for the Climate Change and Strategic Risk Management for Strengthening of Public Infrastructure in El Salvador	2012-2015
Grant Aid	Earthquake Disaster Reconstruction Plan	1986
Grant Aid	The Project for Improvement of equipment and materials for Hurricane Disaster Recovery	1998
Emergency Assistance	Emergency assistance for torrential rain disaster by tropical cyclone Stan in El Salvador	2005
Emergency Assistance	Emergency Assistance for Heavy Rain Disaster	2007
Emergency Assistance	Emergency Assistance for Torrential Rain Disaster	2009
Emergency Assistance	Emergency Assistance for Heavy Rain Disaster	2011

In addition, a Japan Overseas Cooperation Volunteer in rural community development (disaster risk reduction) of JICA is being dispatched to El Salvador (for the period from June 2010 to June 2012).

[76] JICA Knowledge Site (http://gwweb.jica.go.jp/)
[77] ODA project search site of the Ministry of Foreign Affairs (http://www3.mofa.go.jp/mofaj/gaiko/oda/search.php)

2.3.4 Key donor engagements

Key donor engagements in El Salvador are shown in the following table.[78]

Since there are many projects for identification of disaster risk and strengthening of advance preparation for emergency response among the priority activities in the HFA and a few projects on governance in the table, tendency of donors providing more assistance to projects for observation of disasters and human resource development through training on disaster risk reduction than to those projects for establishment of a legal framework and formulation of a plan for disaster risk reduction can be seen.

Table 23 Key donor engagements in El Salvador

Project Name	Funding Agency	Budget (USD)	Period	HFA Activity Area(s)
The Earthquake Emergency Reconstruction and Health Services Extension Project (RHESSA)	WB	169.4 million	2003-2009	3, 4, 5
PREVDA (Allocated Budget reflects amount budgeted for 2009 activities in El Salvador)	EC, CEPREDENAC	1.24 million	2007-2010	1, 2, 3
Institutional Strengthening for Watershed Management, Protected Area Management, and Natural Disaster Risk Management in El Salvador. Phase I	AECID	549332	2007-2009	1, 2
Institutional Strengthening for Watershed Management, Protected Area Management, and Natural Disaster Risk Management in El Salvador. Phase II	AECID	480000	pending approval	1, 2
Development of Geological and Seismological Studies towards Seismic Risk Mitigation.	Spanish Fund for Retooling Aid/ Spanish Debt Swaps Fund	80000		2
National and Local Capacity for Risk Prevention and Mitigation. National Reports on Risk and Vulnerability. Phase I	Spanish Trust Fund, UNDP	1.27 million	2007-2008	1, 2, 5
Risk Reduction II	Spanish Trust FundUNDP	1.36 million	2008-2010	1, 5
Study of the Tectonic and Structural Framework: Contribution to the knowledge of the tectonics of active volcanoes in El Salvador; Mapping Volcanic Hazard Scenarios	Secretary of Foreign Relations-National University of Mexico (UNAM)		2007	2, 5
Seismic Risks in San Salvador Metropolitan Area	Research Council of Norway (NORSAR) UCA-SNET		2008	2, 5
Central American Program for Regional Capacity Enhancement for Landslide Mitigation Measures	Norwegian Geotechnical Institute		2008	2, 3, 5
Mitigation of GeoRisk in Central America, Phase II	German Federal Institute of Geosciences and Natural Resources		2005-2009	2, 3, 4
Early Warning System for Central America: SATCA	United Nations World Food Program		2008	4, 5
Flood Early Warning System for San Salvador Metropolitan Area	IDB		pending approval	4, 5
Implementation of Vulnerability and Risk Indicators	IDB		pending approval	2, 3
Network of Atmospheric and Volcanic Change Monitoring (for the Santa Ana and San Miguel Volcanoes)	EC, Chalmers University, NOVAC	56965	2007-2009	2
DesInventar	United Nations World Food Program		2007	2, 3
Support to Local Risk Management in 10 municipalities of the Department of Sonsonate	COSUDE		2008	3, 5

[78] The World Bank, Global Facility for Disaster Reduction and Recovery: Country Notes

Information System, Monitoring and Early Warning for Southern Ahuachapan	EC (DIPECHO)		2008	2, 5
Preparation of the National Report on Risks and Vulnerability Project	United Nations World Food Program		2007	1, 3
Flood Risk Management in the Rio Grande de San Miguel and the Rio Paz watersheds	IDB	1.2 million	-2009	2, 3, 4, 5
El Salvador - Central American Probabilistic Risk Assessment (CAPRA)	WB, IDB	450000		1, 3, 4, 5
Flood Risk Prevention through Improved Forest Vocation Land Management in ES	IDB	150000	2008-ongoing	1, 2
Model for Water Resources Management	IDB	720000	2005-2007	2, 4
Environmental Action Plan at the Municipal Level	IDB	388700	2003-2007	1, 2, 4, 5
Sustainable Development Lower Rio Lempa Program	IDB	298650	2001-2005	2, 3, 4, 5
Desertification Initiatives	IDB	110000	2000-2002	2, 4
Tri-national Lempa Watershed Management Project	IDB	175000	1999-2000	2, 4, 5
National Environment Protection Program	IDB	30.0 million	1997-2007	1, 2, 3, 4, 5
Safe School Program	WB, GFDRR, Government of Brazil	50000	2010-2011	3, 4, 5
Central America Mitch + 10 Report and Summit	WB, GFDRR	270000		1, 2, 3, 4, 5
Tropical Storm Ida Post-Disaster Damage, Loss, and Recovery Needs Assessment	WB, GFDRR	100000	2009	1, 2, 3, 4, 5
Tropical Storm Agatha Post-Disaster Damage, Loss, and Recovery Needs Assessment	WB, GFDRR	125000	2010	1, 2, 3, 4, 5
Disaster risk management development policy loan with a Catastrophe Deferred Drawdown Option (CAT DDO)	WB	50 million		1, 4, 5

HFA Activity Area(s)
(1) Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation (Governance)
(2) Identify, assess and monitor disaster risks and enhance early warning (Identification of disaster risk)
(3) Use knowledge, innovation and education to build a culture of safety and resilience at all levels (Education for DRM)
(4) Reduce the underlying risk factors
(5) Strengthen disaster preparedness for effective response at all levels

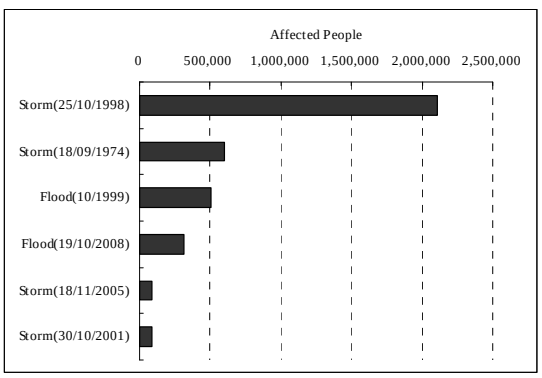
2.4 Honduras

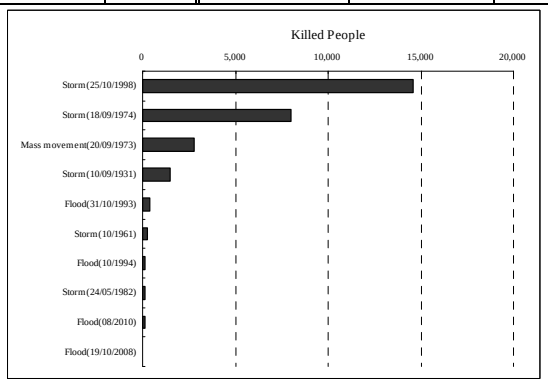
2.4.1 History of natural disasters

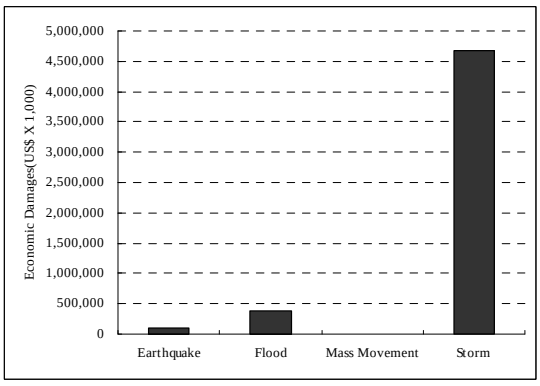
Honduras's catastrophe list (affected people, killed people and economic damage sum) from 1900 to 2012 is shown in following table.[79]

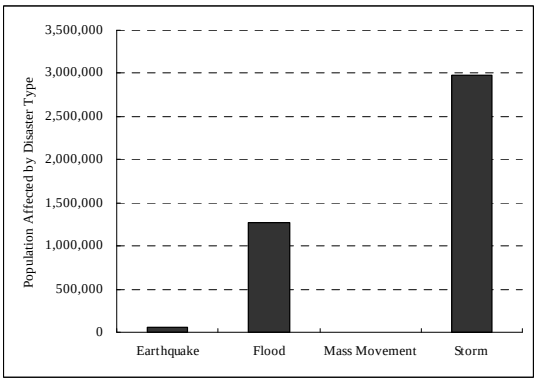
Table 24 Honduras's catastrophe list (affected people, killed people and economic damage)

Affected People			Killed People			Economic Damage Sum(thousand USD)		
Disaster	**Year**	**Affected**	**Disaster**	**Year**	**Killed**	**Disaster**	**Year**	**Cost**
Storm	25/10/1998	2112000	Storm	25/10/1998	14600	Storm	25/10/1998	3793600
Storm	18/09/1974	600000	Storm	18/09/1974	8000	Storm	18/09/1974	540000
Flood	10/1999	503001	Mass movement	20/09/1973	2800	Storm	24/05/1982	101000
Flood	19/10/2008	313357	Storm	10/09/1931	1500	Flood	9/11/1990	100000
Storm	18/11/2005	90000	Flood	31/10/1993	374	Flood	23/05/2002	100000
Storm	30/10/2001	86321	Storm	10/1961	275	Storm	28/09/2005	100000
			Flood	10/1994	150	Earthquake	28/05/2009	100000
			Storm	24/05/1982	130	Storm	29/05/2010	90000
			Flood	08/2010	117	Flood	2/09/1993	57600
			Flood	19/10/2008	67	Flood	31/10/1993	56700









(Population Affected by Disaster Type: Accumulation number of affected people by each disaster type from 1900 to 2012)

In Honduras, disasters caused by hurricanes and tropical cyclones are the most serious. Hurricane Mitch that struck the northern part of Central America from late October to early November 1998 brought the most severe damage to Honduras of all the Central American countries. The torrential rain brought by the hurricane caused floods, landslides, and debris flows, inflicting suffering on numerous people including approximately 14,600 deaths and missing

[79] The International Disaster Database (http://www.emdat.be/result-country-profile)

and 13,000 injuries and such damage to houses, infrastructure, and agricultural facilities that nullified several years' worth of development efforts. According to the Report[80] on the Hurricane Mitch Reconstruction Project Formation Survey in 2000 by JICA, it is said that the direct economic loss was USD 2.76 billion (about 60% of GDP), the indirect damage was USD 600 million, and the damage to the agriculture that accounts for 70% of the exports of this country was USD 185 million.

Tropical Cyclone Agatha that struck in May and June 2010 caused floods and landslides, resulting in 20 deaths and four missing. There were about 20,000 evacuees and 45,000 people affected. There was severe damage to the infrastructure facilities including 396 damage cases on national highways, 120 cases on bridges, 398 cases on sewage systems, and 310 cases on water supply systems. Additionally, there was also severe damage to industries such as agriculture and fishery (cultivation of shrimp).

There is much less earthquake disasters than in other Central American countries. On the Caribbean side, relatively large earthquakes occur in the Gulf of Honduras. The earthquake of magnitude 5.7 that occurred on June 8, 2009 reportedly caused damage to buildings, and collapse and damage of bridges on the Caribbean side. On the Pacific coast, earthquakes due to a submerging plate from the Central America trench frequently occur. Unlike El Salvador or Nicaragua, however, Honduras is not close to an ocean trench and therefore there are few epicenters in this country. Near the Gulf of Fonseca, earthquakes of magnitude 6 or less sometimes occur.

Landslides are disasters that are the most serious and cause major human suffering in Honduras. Landslides are triggered by hurricanes, tropical cyclones, and earthquakes. Landslides caused many of the deaths in the hurricane disasters listed above. Taking the data of the capital city Tegucigalpa as an example, the risks for landslides are increasing due to geological fragility, steep topography, on-going deforestation, and expansion of slopes to residential areas. Tropical Cyclone Agatha caused floods and landslides in the southern region, salinization of farmland near the coasts, and serious damage to the production infrastructure.

In the southern region despite its high risks of sediment disasters and floods, the disaster risk reduction infrastructure is underdeveloped, leaving houses as well as agriculture and fishery (cultivation of shrimp) highly fragile. A likely disaster scenario in the southern region includes, in addition to the above, drought damage to sugar cane fields, damage to roads and bridges by riverbank erosion, wildfires, and tsunami (the Gulf of Fonseca).

The malnutrition problemof citizen due to irregular weather in agriculture is also drawing

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[80] http://libopac.jica.go.jp/search/detail.do?rowIndex=1&method=detail&bibId=0000169755

attention. In Honduras where double cropping is customary, the first crop after the end of the rainy season is important. Scant rain in the first harvesting season drastically decreases the crop yield for the year, decreasing the income of farmers which are many in low income bracket and worsen the acquisition of sufficient nutrition.

2.4.2 Situation of disaster risk management (framework, organization/institution etc.)

The major agencies in charge of disaster risk reduction in Honduras are Permanent Commission of Contingencies (COPECO: Comisión Permanente de Contingencias), Municipal Emergency Committee (CODEM: Comité de Emergencia Municipal), Local Emergency Committee (CODEL: Comité de Emergencia Local), and Ministry of Public Works, Transportation and Housing (SOPTRAVI: Secretaría de Obras Públicas, Transporte y Vivienda). With administrative decentralization in progress, the central government agencies are generally not so capable in terms of both budgets and human resources and do not have much capability for carrying out projects. In the BOSAI project, too, the Tegucigalpa city government is more actively working than COPECO that is not substantially participating.

The following sections summarize the overview, activities, collaboration with other organizations, and problems of the organizations and agencies on which data collection and interview survey were conducted in this study.

(1) Permanent Commission of Contingencies (COPECO: Comisión Permanente de Contingencias)

Permanent Commission of Contigencies (COPECO) is specified by law 151-2009 (Sistema Nacional de Gestión de Riesgo: SINAGER, enacted in December 2009) as an organization that adjusts and enhances National System for Risk Management (SINAGER: Sistema Nacional de Gestión de Riesgo). It is positioned above (on top of) the public and private sectors and NGOs and therefore has great responsibility and authority. COPECO has 12 departments in its headquarters and seven local offices as shown below.

It has roles of making all preparations, supplying assistance, and comprehensively participating in activities to protect the life and assets of all the inhabitants. COPECO is responsible for carrying out the items listed below in accordance with SINAGER.

- Achievement of the purpose by acting responsibly regarding emergency activities and improvement of SINAGER.
- Implementation of risk management plan in cooperation with SINAGER.
- Coordination and holding the executive committee.
- Monitoring national strategy, policy implementation regarding to risk management plan.
- COPECO fines or sanctions on individuals/companies that do not follow the responsibilities stated in SINAGER.
- Coordination of countermeasure, survey, assessment and preparedness for risk by climate change.
- Coordination of preparedness and reconstruction activities.
- Coordination for community DRM activities of domestic and international support.
- Proposal to labor relations commission for achievement of DRM plan purpose.
- Delivering opinions of coordination of obligation actions for vulnerability reduction.

- COPECO calls or publicly announces the names of individuals/companies that do not follow the national DRM.
- Submission of the special plan of municipality/sector to SINGER, and coordination for implementation.
- Submission the stipulated obligations to SINAGER.
- Coordination of plan with public/private organization.
- Management, strengthening of budget, equipment and human resource.
- Follow-up of the implementation plan.
- Official decision of the executive committee.
- Coordination of necessary system for achievement of DRM plan purpose.
- Approval of the contract by SINAGER's authorization.
- Strengthening or support of implementation by DRM committee.
- Coordination of victims.
- Set of terms in case of emergency status.
- Preparation of reports to the President's Conference.

SINAGER specifies a system centered around COPECO. All of the relevant ministries and agencies, local organizations such as CODED, CODEM, and CODEL, municipalities, NGOs, and donors are positioned in this system.

Additionally, the National Disaster Risk Reduction Plan is going to be established in mid-June 2012.

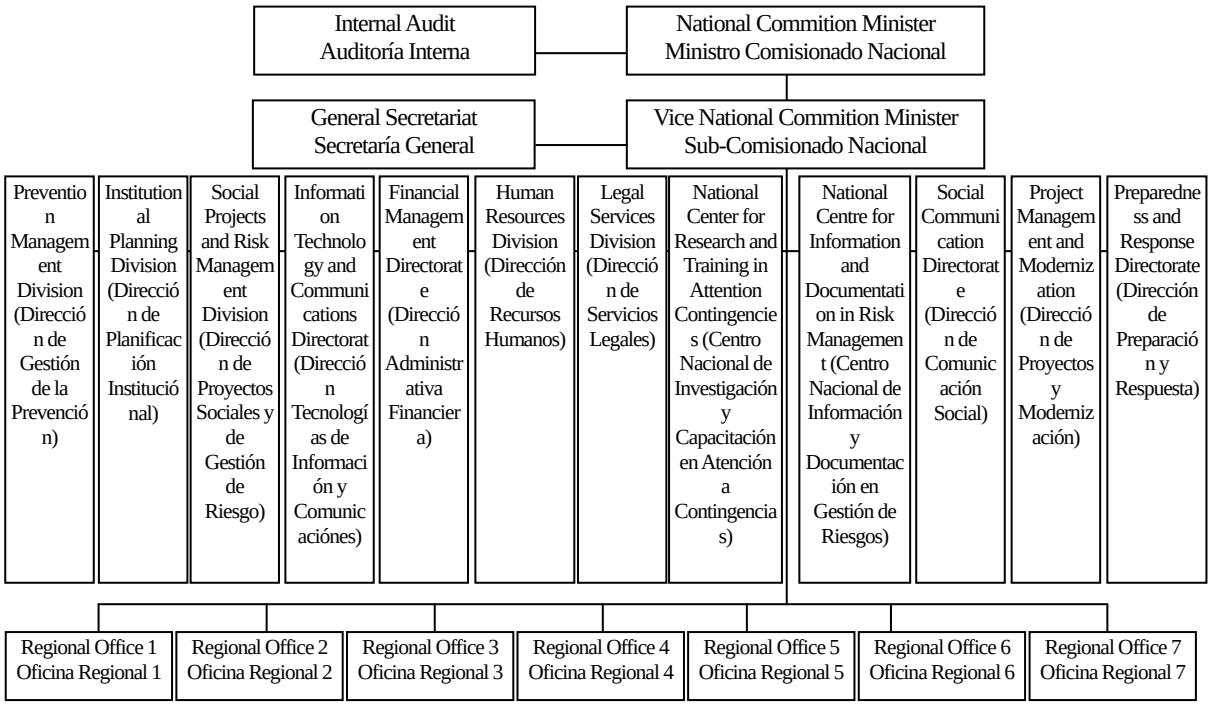


Figure 13 Organizational Structure of COPECO[81]

(2) Ministry of Planning and International Cooperation (SEPLAN: Secretaría Técnica de Planificación y Cooperación Externa)

SEPLAN is a liaison organization for the donors' projects. The BOSAI project is expected to maintain and enhance the public assets with a focus on resilient urban and regional development. The assistance trend (disaster risk reduction project status) and the acceptance policies have been summarized using the result of questionnaires given in another project. The future disaster risk reduction projects involving SEPLAN are a project for landslide/earthquake risk reduction and

[81] http://copeco.gob.hn/t/sites/default/files/ORGANIGRAMA%20COPECO,Honduras.pdf

climate change management by UNDP and a financing project for disaster mitigation by the World Bank.

(3) Ministry of Public Works, Transportation and Housing (SOPTRAVI: Secretaría de Obras Públicas, Transporte y Vivienda)

SOPTRAVI roughly consists of the public works and housing department and the transportation department. The former department is in charge of national highways, rivers, and houses.

The interview survey on the department manager in charge of public works found the circumstances of flood control mainly in Honduras.

One major project related to disaster risk reduction on rivers is the flood control in the Valle de Sula region in northern Honduras. After the Comisión Ejecutiva Valle de Sula was established, flood control measures are being implemented to develop the Valle de Sula region, foster industries, and protect infrastructure.

SOPTRAVI is carrying out river development in the northern region of the country (Caribbean coast) and the central region including the Olancho, Copán, and Comayagua departments. In the southern region (Pacific coast), Tropical Cyclone 12E in 2011 caused great damage to the Choluteca department. In the basin of the Choluteca River, most of the upper reaches are mountainous areas where landslides frequently occur and heavy rain causes huge sediment runoff, making it necessary to provide embankment protection and prevent riverbed rising of the mainstream of the Choluteca River. SPTRAVI recognizes the importance of countermeasures in the form of structures (facilities) such as improvement of bank protection and embankment but the projects are slow to progress. Recently, the government recognized that there are limits to the efforts made only by itself and is about to amend the law to change the administrative mechanism so that flood control can be achieved by collaborative efforts of the government and the private sector.

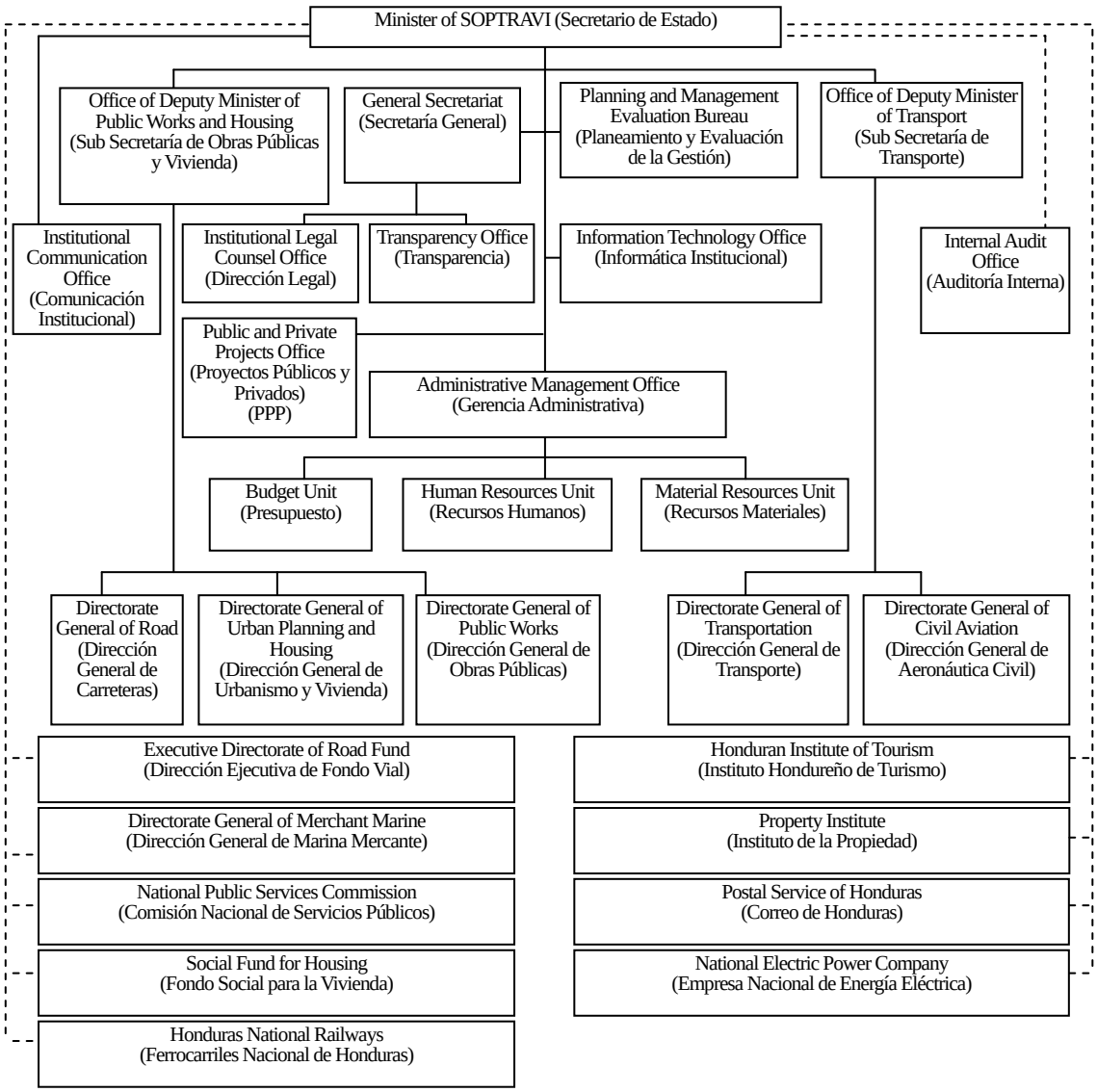


Figure 14 Organization chart of SOPTRAVI [82]

(4) Ministry of Natural Resources and Environment (SERNA: Secretaría de Recursos Naturales y Ambiente)

SERNA has the following four departments:

1. Headquarters, personnel, legal, foreign collaboration, modernization, climate change, etc.
2. Energy bureau: Environmental measures, water resources, forestation, etc.
3. Environment bureau: Environment, environmental information system, Mesoamerican Biological Corridor, environmental assessment and control, commerce and environment, pollution study and control, biodiversity, etc.
4. Decentralized organizations.

SERNA has a working group for comprehensive problem solving for environmental risks.

[82] Data provided by SOPTRAVI

SERNA, working on climate change as the main theme, is pursuing national-level information integration. For Información de Control Institucional de Cambio Climático national agencies, research institutes, universities, and private companies are collecting and sharing information as an organization of which they are members. This organization, also including the agricultural and infrastructure sectors, is sorting information into political-level problems and technical matters. The climate change department plans to reach an agreement for measures based on the result of identifying the current climate change risks. The agreement lists implementation items required to find adaptive measures for climate change based on national and public intentions.

The group stipulated by law 151-2009, National System for Risk Management (SINAGER) enacted in 2009 are collecting information of various levels regarding environmental management and examining, e.g., how the information can be used and how climate change can be predicted. Based on the result of these activities, it is going to define public policies and establish political strategies to solve such problems as regional development, harmonious industrial development, measures for indigenous people, and aging society problems.

After the 2010 financing by Global Environmental Facility (GEF), USD two million out of the total budget of USD 10 million is appropriated to climate change. The budget for climate change also includes the input of USD three million as the special climate change fund related to the Ministry of Agriculture, USD 1.4 million in relation to the energy sector, and USD 5.6 million as the adaptive measure fund.

(5) Municipal Emergency Committee (CODEM: Comité de Emergencia Municipal)

CODEM is a coordinating and responsible agency (administrative organization) for activities such as those for raising the awareness for disaster risk reduction, preparation for disasters, disaster responses, and rehabilitation with an aim to protect the life and assets of citizens and the environment. CODEM, with assistance from inside and outside of the city and inside and outside of the country, is carrying out activities through the mayor and in collaboration with Permanent Commission of Contigencies (COPECO).[83] This section describes the status quo of CODEM of Tegucigalpa city where an interview survey was conducted and the problems in disaster risk reduction in the said city. CODEM has the logistics department (vehicles, warehouse, etc.), execution and training department with 21 members, and engineering and planning department with eight members.

In Tegucigalpa city, 156 areas are assessed to be dangerous. Of the total city population of 1.3

[83] http://lacapitaldehonduras.com/prevencin-y-mitigacin/codem/

million, 350,000 citizens are considered to live in dangerous areas. Many of these people face the danger of floods and landslides.

The Tegucigalpa city CODEM is making risk maps with the residents as part of the resident education for disaster preparedness. The Tegucigalpa city CODEM, based on the policy of allowing the residents to think and act for themselves, has its sub-organization CODEL form a resident association, which invites volunteer coordinators to carry out AVC (Analysis, Vulnerability, and Capacity) activities.

There was an opinion that the relationship between COPECO and CODEM is insufficient so an interview survey was conducted regarding this point. The person in charge at the Tegucigalpa city CODEM expressed his opinion that they have a good relationship with COPECO. COPECO, being a nationwide organization, think that it is not a problem not to participate in all the CODEM meetings and activities. COPECO and CODEM are communicating with each other, according to that person.

(6) Marcovia City

The Gulf of Fonseca region where Marcovia city is located is suitable for agriculture (such as cultivation of sugarcane and fruits) and fishery (such as coast fishing and shrimp cultivation), and is an important region in terms of production of agricultural or marine products. On the other hand, it is suffering from floods on the Choluteca River and rising of the river bed. Sedimentation of earth and sand from the upper reaches is making it more likely for floods to occur. Dredging of riverbeds did not have much effect. Against such a backdrop, United Nations Development Program (UNDP) is carrying out a basic survey for flood control of the Choluteca River.

Additionally, the area surrounding the Gulf of Fonseca has been appointed by the government as a model area with high development potential. The government has established the Consejo Visión de País y Plan de Nación to promote development in this area with priority. However, natural disasters are recognized to be one of the bottlenecks in development.

(7) Honduras University of Engineering (UPI: Universidad Politécnica de Ingeniería)

UPI is a new private university founded in 2007 with strength in engineering, particularly civil engineering and aims to foster engineers for new national land development. At UPI, overseas senior volunteers and experts delegated by JICA in "Hazard Geology Focusing on the Landslides in Tegucigalpa" are giving lectures and teaching students. The overseas senior volunteers are instructing the basics of landslide surveys, interpretation of aerial photography, and assessment of landslide hazards. UPI is enthusiastic in learning and hopes for continued assistance by

Japanese experts. However, the current level of UPI is at such a relatively low technical level that the volunteers and experts are instructing elementary skills such as interpretation of landslide topographies using aerial photographs.

UPI has members many of whom are the same as those of Honduras Institute of Geoscience (IGH), an organization to be described later, and therefore has close relationships with geology experts and the geology industry. Both the current students and graduates of UPI are expected to participate in landslide projects in the future.

(8) National Autonomous University of Honduras / Honduran Institute of Earth Science (UNAH /IHCIT: Universidad Nacional Autónoma de Honduras / Instituto Hondureño de Ciencia de la Tierra)

UNAH, founded in 1847, provides high-level education and performs academic-level coordination of master's and doctor's degrees. As to disaster risk reduction study, UNAH founded IHCIT after Hurricane Mitch, based on the recognition of the importance of geological study and education in terms of disaster risk reduction. This institute studies the formation of disaster risk reduction culture, mechanisms of disasters, and prediction and warning systems for disasters. In 2007, it became able to carry out activities with its own budget using the funds that it acquired in the said year.

Currently, IHCIT is seeking to establish future research and study plans and planning to make more detailed disaster risk maps. The institute, although having no interaction with UPI, is positive about promoting interactions with external organizations including JICA in the future.

IHCIT has five geosciences education and research departments: (1) geophysics, (2) risk management, (3) hydrogeology, (4) weather and climate change, and (5) GIS technology. Geosciences are taught in the liberal arts course at the university, and risk management is covered in it.

IHCIT has received assistance from United Nations Development Program (UNDP) in 2009 to 2011 and from Swiss Agency for Development and Cooperation (COSUDE) in 2011 and 2012. The following lists projects under implementation.[84]

1. Estimation of loss due to drought
2. Landslide risks (cities of Tegucigalpa, Marale, and Yorito)
3. Creation of climate maps
4. Creation of various risk maps
5. Creation of a database for risk management
6. Disaster survey in Choluteca city in 2010
7. Flood damage survey throughout Honduras
8. Enhancement of disaster risk reduction readiness in the 153 priority municipalities
9. Landslide measurement and analysis using geophysical techniques
10. Wildfire survey throughout Honduras

(9) Honduras Institute of Geoscience (IGH: Instituto de Geociencia de Honduras)

IGH is closely related to UPI. IGH does not operate on a routine basis but the members

[84] It is not confirmed that all projects are conducted by support of UNDP and COSUDE or not.

gather to exchange information on a project-by-project basis. Since all the activities are carried out on a voluntary basis, the members give priority to their respective duties and positions. IGH, consisting of eminent members in the academic, administrative, and private sectors, has a high technical level in Honduras. Two of the members, Mr. Raul Calix (geology) and Mr. Anibal Godoy (mining geology), work in a wide range of specialty areas and can perform landslide survey. With regard to floods, Mr. César Morales (hydrology) can join in the efforts for flood control.

IGH has abundant experience in projects of landslide survey and countermeasure research in Honduras, and JICA can consider it as a candidate for expertise-field projects such as those for landslides and ground analysis. Furthermore, related engineers and experts can be gathered with the help of IGH. Note that Dr. Gutiérrez, the director of IGH, specializes in geological and geotechnical engineering and has experience of participating in a landslide survey conducted by JICA.

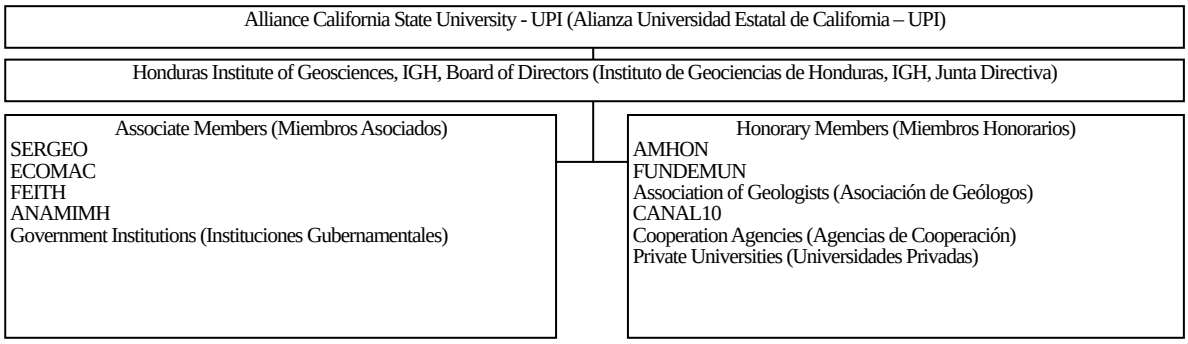


Figure 15 Organization chart of IGH [85]

[85] Data provided by IGH

2.4.3 Japan's cooperation achievements

Japan's cooperation achievements in Honduras are shown in following table.[86] [87]

Table 25 Japan's cooperation achievement in Honduras

Scheme	Project Name	Period
Development Study	Development Survey for Flood and Landslide Emergency Countermeasure of Metropolitan Area in Honduras	2001-2002
Development Study	Development Survey for Flood and Erosion Control Plan of:Chamelecón River in Honduras	1992- 1994
Technical Cooperation	Project on Capacity Development for Disaster Risk Management in Central America "BOSAI"	2010-2012
Grant Aid	Project for Landslide Prevention in Tegucigalpa Metroplitan Area	2010-2013
Dispatch of Experts	Hazard geology focusing on the landslides in Tegucigalpa	2012-2014
Grant Aid	Flood and Erosion Control Plan of:Chamelecón River	1997-2001
Grant Aid	Project for Landslide Prevention in Metroplitan Area(El Berrinche,El Reparto and El Bambú)	2011-2013
Grant Aid	Project for Replacement of GuymonBridge	2007
Emergency Assistance	Emergency Assistance for Torrential Rain Disaster by Tropical storm Gamma in Honduras	2005
Emergency Assistance	Emergency Assistance for the Damage by Tropical Storm in Central America	2010
Emergency Assistance	Emergency Assistance for the Heavy Rain Damage	2011

Furthermore, JICA's Japan Overseas Cooperation Volunteers for disaster risk reduction, delegated to Honduras, are assigned to the city government and engaged in activities for disaster risk reduction in Namasigue city in the southern part of the country. They have established a disaster risk reduction section in the city office, organized a disaster risk reduction committee with local residents, and are seeking to create disaster risk reduction maps to prepare for landslides, mudslides, and floods.

[86] JICA Knowledge Site (http://gwweb.jica.go.jp/)
[87] ODA project search site of the Ministry of Foreign Affairs (http://www3.mofa.go.jp/mofaj/gaiko/oda/search.php)

2.4.4 Key donor engagements

Key donor engagements in Honduras are shown in following table. [88]

The donors are implementing projects mainly on alleviation of potential risk factors in HFA priority actions and identification of disaster risks and there are only few projects on disaster risk reduction education. The donation sum of relief organizations such as World Bank, Inter-American Development Bank (IDB), Spanish Agency for International Development (AECID) is large. World Bank is corresponding broadly on HFA priority actions. IDB is taking seriously the reduction of potential risk factor while AECID is attempting to improve the emergency response capacity on food secure at river areas.

Table 26 Key donor engagements in Honduras

Project Name	Funding Agency	Budget (USD)	Period	HFA Activity Area(s)*
Natural Disaster Mitigation – Additional Scale-Up Financing	WB	9 million	2007-ongoing	1, 2, 3, 4, 5
Forests and Rural Productivity	WB	32.7 million		2, 4
Integrated Disaster Risk Management Program	IDB	75 million	2009	1, 2, 3 ,4, 5
Bay Islands Environmental Management	IDB	19,080,000	1995-2005	2, 4
Country Environmental Strategy	IDB	652,000	2000-2004	1, 4
Ecosystem Management of the Bay Islands	IDB	355,000	2002-2004	2, 4
Emergency Program. Flood Protection Work	IDB/ Spanish Fund for Consultants	EUR 366,618	1999-2002	2, 4, 5
Honduras Country Environmental Analysis	IDB	110,000	2005-2008	
Strengthening Disaster Risk Management System	IDB	1,100,000	2008-ongoing	1, 2, 3, 4, 5
Support for the Modernization of National Environmental Impact Evaluation System	IDB	165,000	2008-ongoing	1, 2, 4
Promoting Food Security in Basin of Choluteca River and Negro River	AECID	12.6 million	2010-2017	5
Promoting Food Security in Basin of Nacaome River and Goascarán River	AECID	11.6 million	2010-2016	5
Project for Natural Disaster Risk Reduction	IDB	19 million	2010-2017	2
Program of Risk Management	COSUDE	2.1 million	2009-2012	2
Tegucigalpa City Landslide and Earthquake Risk Reduction	UNDP	0.2 million	2010-2012	2
Challenge to the Climate Change Risk	UNDP	5.2 million	2011-2016	2

HFA Activity Area(s)
(1) Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation (Governance)
(2) Identify, assess and monitor disaster risks and enhance early warning (Identification of disaster risk)
(3) Use knowledge, innovation and education to build a culture of safety and resilience at all levels (Education for DRM)
(4) Reduce the underlying risk factors
(5) Strengthen disaster preparedness for effective response at all levels

[88] The World Bank, Global Facility for Disaster Reduction and Recovery: Country Notes

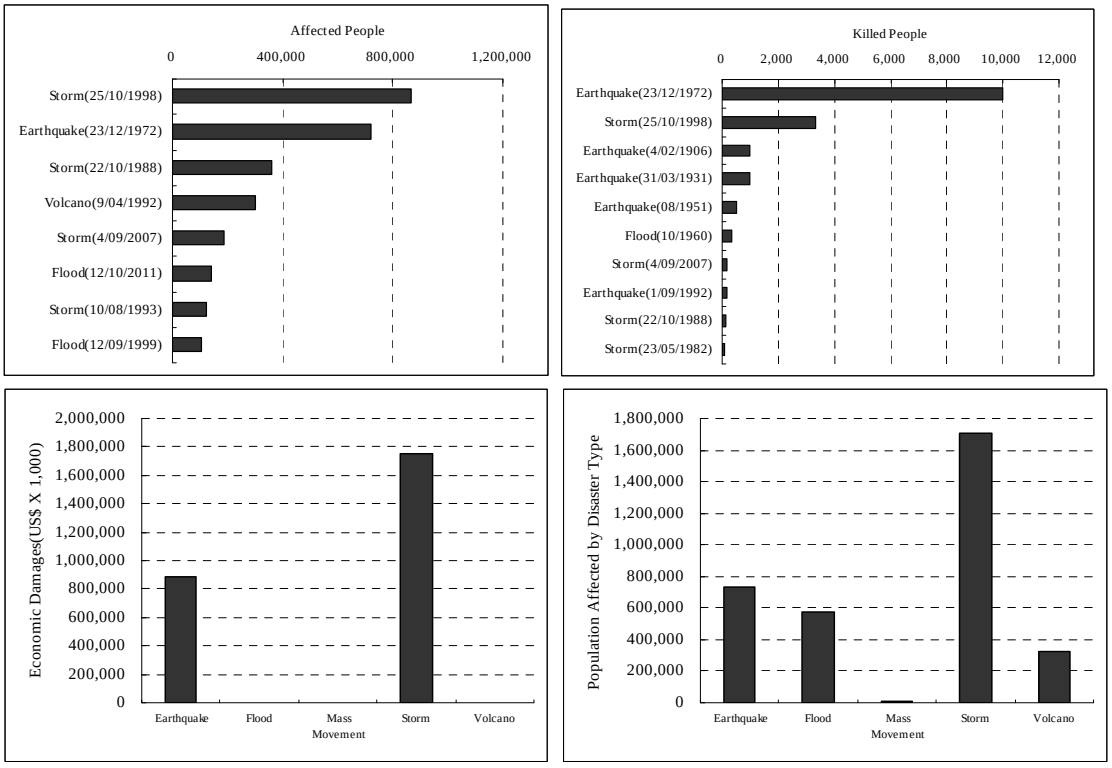
2.5 Nicaragua

2.5.1 History of natural disasters

Nicaragua's catastrophe list (affected people, killed people and economic damage sum) from 1900 to 2012 is shown in following table. [89]

Table 27 Nicaragua's catastrophe list (affected people, killed people and economic damage)

Affected People			Killed People			Economic Damage (thousand USD)		
Disaster	**Year**	**Affected**	**Disaster**	**Year**	**Killed**	**Disaster**	**Year**	**Cost**
Storm	25/10/1998	868228	Earthquake	23/12/1972	10000	Storm	25/10/1998	987700
Earthquake	23/12/1972	720000	Storm	25/10/1998	3332	Earthquake	23/12/1972	845000
Storm	22/10/1988	360278	Earthquake	4/02/1906	1000	Storm	22/10/1988	400000
Volcano	9/04/1992	300075	Earthquake	31/03/1931	1000	Storm	23/05/1982	356000
Storm	4/09/2007	188726	Earthquake	08/1951	500	Wildfire	15/01/1991	80000
Flood	12/10/2011	143018	Flood	10/1960	325	Earthquake	1/09/1992	25000
Storm	10/08/1993	123000	Storm	4/09/2007	188	Earthquake	31/03/1931	15000
Flood	12/09/1999	107105	Earthquake	1/09/1992	179	Storm	28/07/1996	10000
			Storm	22/10/1988	130	Earthquake	4/01/1968	2000
			Storm	23/05/1982	71			



(Population Affected by Disaster Type: Accumulation number of affected people by each disaster type from 1900 to 2012)

The Pacific area of Nicaragua, including all major urban areas, is located in zones of high or very high seismic risk. Nicaragua as a whole is situated on two tectonic plates: the Caribbean Plate and the Cocos Plate.[90] And, there are 25 volcanoes in Nicaragua, distributed along the central mountain range.

[89] The International Disaster Database (http://www.emdat.be/result-country-profile)
[90] National Institute for Territorial Studies (INETER).

Large parts of Nicaragua's territory are susceptible to flooding, especially in the lower basins and valleys of the principal rivers. Landslides occur frequently as a result of the topography in the north of the country.

On the other hand, rapidly increasing urban population has intensified Nicaragua's exposure to adverse natural events. Unplanned urban growth has disproportionately increased Nicaragua's vulnerability to adverse natural events. Informal settlements tend to be situated in areas of high risk and are a physical and spatial manifestation of poverty and inequality in cities.

2.5.2 Situation of disaster risk management (framework, organization/institute, etc.)

Nicaragua is considered a leader in Central America because of its legal framework that enables a comprehensive and multi-sectoral approach to DRM. Nicaragua created the National System for Disaster Management and Prevention (SINAPRED in Spanish), regulated by the Law 337, in November 2000. This framework facilitated the creation of a comprehensive National Disaster Prevention and Response Plan.

Nicaragua has built a National System for Disaster Management and Prevention (SINAPRED: Sistema Nacional para la Prevención, Mitigación y Atención de Desastres en Nicaragua) based upon the National Disaster Prevention and Response Plan. With public and private sector participation, SINAPRED is responsible for: (i) the prevention and mitigation of risk, (ii) attention to emergencies, and (iii) the rehabilitation of territories affected by disasters. The system is coordinated by the Executive Secretariat of SINAPRED (SE-SINAPRED: Secretaría Ejecutiva - Sistema Nacional para la Prevención,Mitigación y Atención de Desastres en Nicaragua) and has an operative arm coordinated by a National Operative Committee and a technical/scientific arm coordinated by the Nicaraguan Institute for Territorial Studies (INETER: Instituto Nicaragüense de Estudios Territoriales). There are regional, departmental and municipal committees presided over by the provincial governors and mayors. Nicaragua, through its National System for Disaster Management and Prevention, has been a leader in instituting a policy and legal framework that enables a comprehensive and multi-sectoral approach to disaster risk management.

Since 2003, Nicaragua has decentralized disaster risk management responsibilities and has made disaster risk management a national development priority. The current Government has focused on disaster risk management, but has not yet developed a financial strategy that would ensure medium- to long-term DRM commitments for Nicaragua.

With regards to the education for disaster prevention and human resources development, at least two higher-education institutions in Nicaragua offer post-graduate training and specialization in risk management. At primary and secondary school levels, the curricula include

concepts and good practices for risk management. The Government has developed and implemented various tools and strategies to train teachers and community leaders on how to incorporate disaster risk management in the school curricula.

The introduction of risk reduction includes both aspects of hard measures such as seismic reinforcement, and soft measures, such as relocation of people living in high-risk areas (mainly Managua). Most of the investments in risk reduction in Nicaragua at a municipal level are made by the national government and donors.

(1) Executive Secretariat, National System for Prevention, Mitigation and Attention of Disasters in Nicaragua (SE-SINAPRED: Secretaría Ejecutiva-Sistema Nacional para la Prevención,Mitigación y Atención de Desastres en Nicaragua)

Below is the organizational chart of SE-SINAPRED. There are around 14 workers in total, consisting of División Administrativa Financiera, División de Gestión y Desarrollo, División de Planificación, Dirección de Preparación para la Respuesta, Dirección de Prevención y Coordinación Territorial, and Dirección de Organización y Operaciones, etc., for establishing the legal framework for the disaster risk management through a comprehensive and multi-sectoral approach, as well as to take the lead in the mainstreaming of disaster prevention.

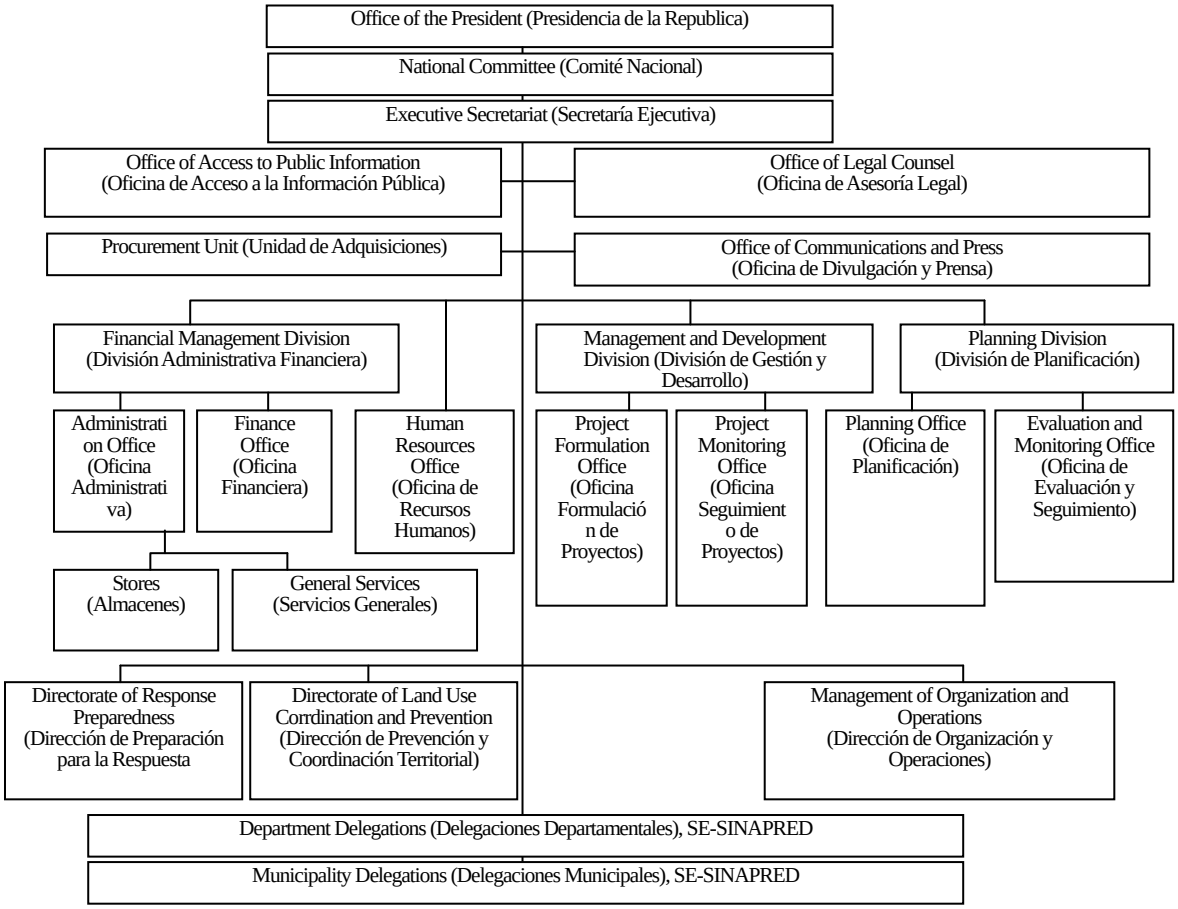


Figure 16 Organization chart of SE-SINAPRED [91]

SE-SINAPRED is also a coordinating agency for disaster response (before and after the disaster) in the event of flood, volcano, tsunami, earthquake, or hurricane, etc., based on the information from Nicaraguan Institute for Territorial Studies (INETER. Since 2007, it is also in charge of the preparedness for disaster, and is promoting the enlightenment and awareness against disaster response to the people through various events related to disaster.

In Nicaragua, the disaster response structure has several levels of organization that increase the complexity of decision-making during an emergency. Since 2004, the National System for Disaster Prevention and Response has been providing training at local, municipal, and departmental levels through committees for disaster prevention and response, in order to improve such complexity of decision-making. To test existing capacity, simulations and drills have been carried out in Managua. The latest and largest exercises have been earthquake simulations in Managua in 2004, 2008 and 2010. National/district authorities and the general population participated in the exercise. In recent emergency situations, including the passing of Tropical Depression 12E, which caused major flooding in Nicaragua and other Central American nations

[91] Website and material issued by SE-SINAPRED
(http://www.sinapred.gob.ni/index.php?option=com_content&view=article&id=57&Itemid=132)

during late 2011, when the response capacity of the entire system was put to the test, its performance has been adequate. However, there is still room for improvements in key areas, including better communication and coordination capabilities among the several government administration levels to ensure ready access to critical information and to decision- makers.

The disaster prevention activities in the community, including the BOSAI Project of JICA, or those collaborating with the Ministry of Education, Red Cross, fire department, religious organizations, and local schools, are implemented under the assistance of the government COMUPRED (Comités Municipales de Prevención, Mitigación y Atención de Desastres) and the mayor are the chairmen of this disaster prevention activity community, where activities are collaborated with COLOPRED (Comités Locales de Prevención y Desastres), which is related with NGOs or churches.

As for the top priority issue for the future, promoting the approaches to disaster prevention involving tsunami is being reviewed with the donors, for the highly populated areas such as Managua or cities along the Pacific Ocean coastline.

Regarding the disaster prevention education, SE-SINAPRED has worked with the Ministry of Education to incorporate risk management in the school curricula and to train teachers.

SE-SINAPRED is establishing a Disaster Risk Information System. The system will provide a platform for agencies to further develop the National System for Disaster Management and Prevention in order to effectively manage and share information about vulnerability and risk, including scientific and technical data, and geographic information. Some modules focused on response and disaster preparedness have been developed. This project needs additional assistance to reach its objectives since it is not dynamic and is currently very expensive to update. SE-SINAPRED will receive a grant from DIPECHO to improve the module on Damage and Needs Assessment (EDAN in Spanish).In order to facilitate a comprehensive understanding of disaster risk and risk management, SE-SINAPRED and INETER worked with the World Bank on a proposal to expand the Central American Probabilistic Risk Assessment Platform (CAPRA) to cover Nicaragua. CAPRA provides a broad set of sectors with a baseline catalogue of data required for risk evaluations, as well reference methodology and interactive software tools to support risk identification and applications for risk analysis.

(2) Nicaraguan Institute of Territorial Studies (INETER : Instituto Nicaragüense de Estudios Territoriales)

INETER is monitoring and investigating/researching earthquakes, volcanoes, hurricanes, intense rainfall, storm surges, landslides, tsunamis, and floods etc. that may risk our lives, properties, and the economy. More specifically, the activities include the early-warning system

based on the meteorological observation data, creating hazard maps for tsunamis and volcanoes, and creating evacuation maps. Further information is gathered for reducing the damages through a regional and detailed analysis, while monitoring the earthquakes of other countries in the Caribbean, Central America. In addition, INETER is simulating tsunami and earthquake disasters. It is acknowledged by INETER that the risk management capacity of Nicaragua is higher compared to other countries (for having a tsunami warning system at the tsunami warning center on the Pacific Ocean coastline).

Nicaragua has strengthened information collection, early warning capacity, and risk mapping for hydrological, seismic and landslide events. With resources from the national budget and technical assistance from various donors, INETER has purchased and installed equipment to update existing systems for monitoring catastrophic events, especially for seismicity and tsunamis; however, this network is insufficient and additional resources are needed to establish an effective system. Nicaragua has organized and improved the flow of information for vulnerability and risk evaluations and also risk reduction programs. At a scale of 1:50,000 for municipal areas and 1:5,000 for urban areas, Nicaragua has risk maps with excellent resolution (including hazard, vulnerability and risk maps) for 30 municipalities and has developed final products for land use planning and risk management plans. Urban landslide and flooding hazard maps have been produced by INETER in some vulnerable municipalities. This information is publicly available and has been used for prioritizing investments in risk reduction.

Disaster prevention plans or topographic maps are jointly created by disaster prevention related organizations of Nicaragua. These are the operating bodies of JICA's development study, "Study on Disaster Prevention Map and Information Infrastructure Development Plan of Nicaragua". Furthermore, information on earthquakes is provided from similar organizations of neighboring countries such as INSIVUMEH of Guatemala or COPECO of Honduras. Additionally, the sea water level is being observed by these organizations as a member of the seismic monitoring workgroup of United Nations Educational, Scientific and Cultural Organization (UNESCO: Organización de las Naciones Unidades para la Educación, Ciencias y Cultura). National Autonomous University, Center for Geosciences Research (UNAM-CIGEO: Universidad Nacional Autónoma, Centro de Investigaciónes Geocientificas) is managing the technical factor, while INETER is in charge of monitoring. INETER and UNAM-CIGEO have legally agreed to share the monitoring data.

Below is the organizational chart of INETER.

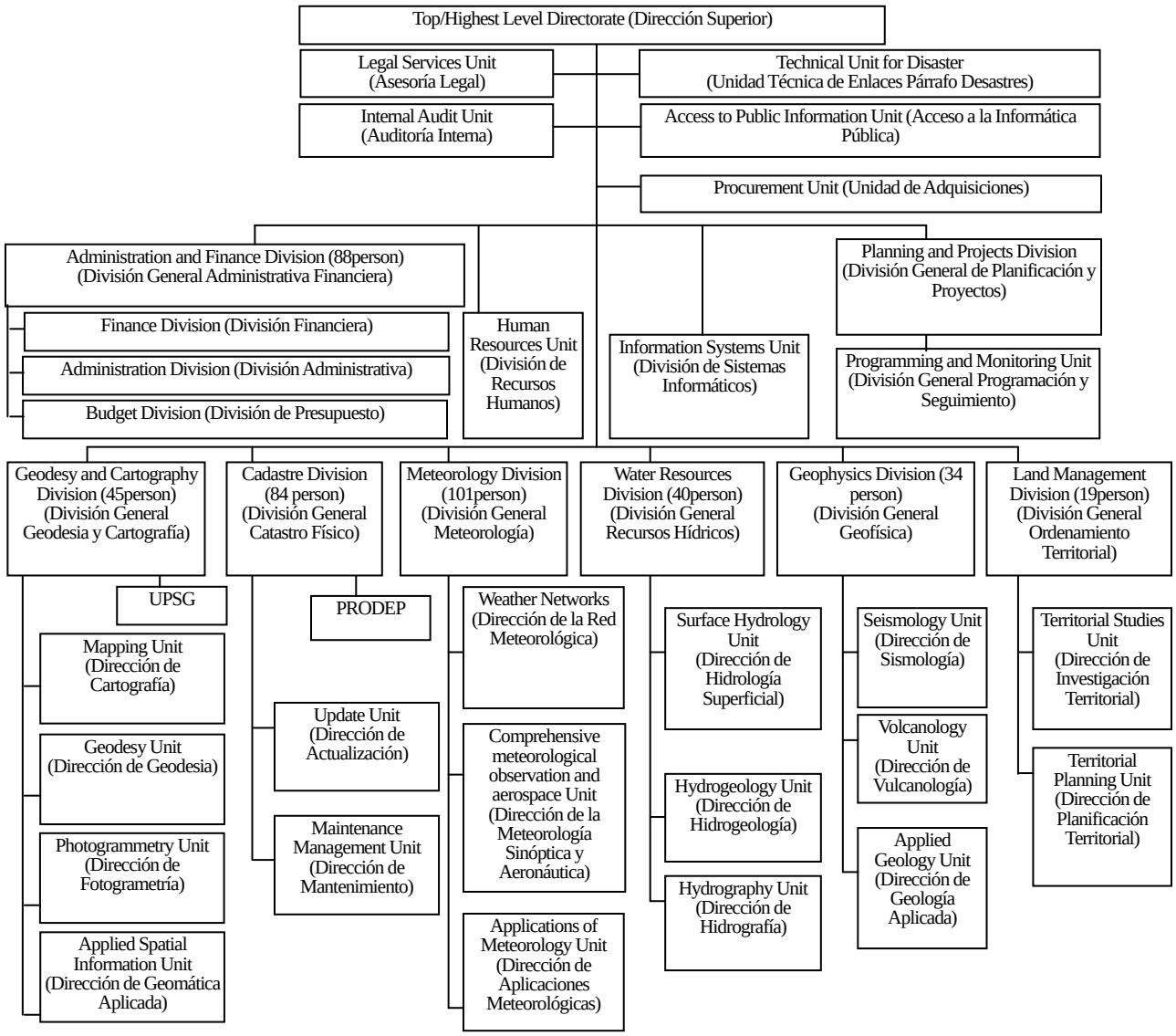


Figure 17 Organization chart of INETER [92]

In the future, INETER is planning to reduce the risks of disasters in highly populated areas based on the nationwide monitoring system, and to especially focus on the early tsunami warning system on the Pacific Ocean coastline. Specifically, establishing the central monitoring center based on the observation system of the past shall be focused, however, upgrading and funding for the equipment, as well as lack of human resource (those with master's or doctor's degree) are the issues.

Currently, CEPREDENAC is coordinating the collaboration between INETER and research organizations in the countries of Central America.

Below are the detailed activities and projects of INETER.

- A joint project on strengthening the tsunami disaster response capacity (early-warning) in

[92] Based on INETER's response to the questionnaire

León and Las Peñitas, by the city office of León and the Ministry of Education (BOSAI project of JICA).

- A joint project on tsunami disaster hazard management (early-warning) in San Rafael del Sur and Masachapa, by the Red Cross and Swiss Agency for Development and Cooperation (COSUDE: Agencia Suiza para el Desarrollo y la Cooperación).
- A joint project on earthquake/volcanic eruption/debris flood disaster hazard management capacity (early-warning) in Ometepe island, by the city office of Ometepe, Defensa Civil, and SINAPRED (financed by a subsidy from DIPECHO).
- A joint project on strengthening disaster reduction capacity in San Juan del Río Coco, by Defensa Civil and SINAPRED, administered by Association for Cooperation in South (ACSUR: La Asociación para la Cooperación en el Sur).
- A joint project on strengthening the residents' response to volcanic action and earthquake (early-warning) in the four blocks in Managua, by Defensa Civil, city office of Managua, Ministry of Education, and the municipality (financed by a subsidy from DIPECHO).
- A joint project on reduction of volcanic/seismic disaster in Masaya, by Defensa Civil, SINAPRED, and National University of Engineering (UNI: Universidad Nacional de Ingeniería), administered by CARE International (CARE: CARE Internacional).

In order for its staff to acquire master's and doctor's degrees, INETER has entered alliances with various universities in the U.S. and England. Additionally, INERTER and DIPECHO are jointly funding the NGOs activities for the project related to early tsunami warning system (2 cases), volcanic action (3 cases), and landslide (1 case). Furthermore, there is a project for the early warning of landslides by the Institute of Technology, Norway.

(3) Civil Defense (Defensa Civil)

Defensa Civil is an army unit which under the law "Ley de Defensa Civil", and by the National Disaster Committee of the presidential office, has a bureau for protecting the lives and properties of the citizens during a disaster, all citizens must participate in the emergency response activities under this law, and Defensa Civil is in charge of the coordination in such event.

SINAPRED and Defensa Civil are obliged to cooperate under law No. 377. (For example, cooperate in alert for early-warning, or review and announce advisory or instructions at necessary stages.) In addition, in the event of a disaster, the headquarters of Defensa Civil must establish an emergency operation center.

(4) Ministry of Transport and Infrastructure (MTI: Ministerio de Transporte e Infraestructura)

By the law established by SE-SINAPRED, all ministries must establish a liaison office within

the ministry for the contact with SE-SINAPRED. MTI also has a liaison office for SINAPRED, where coordination between other organizations and MTI are made. The detailed role of this office includes; in case of a damage in the road in a disaster, the MTI staff shall investigate the site, calculate the restoration cost, and based on this investigation, the liaison office shall report to the Ministry of Finance and Public Credit, in order to secure the budget for the restoration (special budget is not allocated for MTI in case of a disaster).

MTI prioritizes planning of maintenance of major arterial roads and bridges, as well as investigations on vulnerability of new/existing bridges.

The funding for the studies on areas of high risk is provided by the Nordic Development Fund. (4.4 million USD).

(5) National Autonomous University, Center for Geoscience Research (UNAM –CIGEO: Universidad Nacional Autónoma, Centro de Investigaciones Geocientíficas)

At UNAM-CIGEO, geology, geophysics, and disaster prevention (landslide, earthquake, and volcano) are researched. The master's degree course (period of two years) for disaster prevention was established in this university 10 years ago, where 19 students from countries in Central America are studying at the moment. They were the counterpart of the "Evaluation of Multi-hazards in the South Basin of Lake Managua, Nicaragua" of JICA's dispatch of science and technology researchers (of JSPS), and their efforts in studying were in good condition.

UNAM-CIGEO stands as a part of SINAPRED, and is creating hazard maps or providing expertise.

The subject being focused by UNAM-CIGEO is the renewal of the hazard map based on the detailed fault investigation in Managua, as well as the tectonic survey in León and Estelí, modeling of the crustal structure along the Pacific coastline, and landslide survey in Estelí.

Aids from other donors include scholarship, exchanges of personnel, provision of equipment and funding, and joint research, from Sweden, COSUDE, Italy, and DIPECHO, etc.

(6) National University of Engineering (UNI: Universidad Nacional de Ingeniería)

UNI is the operating body of the aid of JICA, "Improvement of the Earthquake-Resistant Housing Construction Technology". A course for the master's degree for disaster prevention is available at the Innovation Center of UNI. The subjects taught in this course include i) land utilization plan for disaster prevention, ii) risk management (risk assessment, hazards of an earthquake, and identification of hazardous areas), and, iii) climate change, etc.

As for the disaster prevention related activity, a method for evaluating a safe construction site is under development, which is applied to Central or South America (Chile, Argentina, and Ecuador). Also, UNI is advising the central government on how to minimize the risk of disasters.

For other activities, UNI is collaborating with the American Planning Association to create a manual for the planning for residential quarter after a disaster. Additionally, the information department of UNI is participating in developing software that automatically updates the vulnerability information of the municipalities of Central America and the Caribbean.

Regarding the collaboration between organizations, UNI is giving technical advice to the municipalities or NGOs. Moreover, UNI is holding training on disaster risk management for Defensa Civil or municipality workers.

(7) Nicaraguan Chamber of Construction (CNC : Cámara Nicaragüense de la Construcción)

The Nicaraguan Chamber of Construction consists of around 150 persons including companies related to construction or construction materials, consultant firms, as well as individual consultants and individual architects. The role includes assistance of public works contracts, follow up of construction statistics and business meetings, while providing support for establishing building standards as a part of the activity related to disaster prevention. The Government's role is to establish a legal system for construction, and on the other hand, the role of the Nicaraguan Chamber of Construction is to create the draft of the law.

In the occurrence of a disaster, the Nicaraguan Chamber of Construction is the coordinator for SINAPRED as the operating body for the construction sector, and in such case may provide heavy machinery or equipment to member companies or individuals.

2.5.3 Japan's cooperation achievements

Japan's cooperation achievements in Nicaragua are shown in the following table. [93] [94]

Table 28 Japan's cooperation achievement in Nicaragua

Scheme	Project Name	Period
Development Study	The Study on Vulnerability Reduction for Major Roads in the Republic of Nicaragua	2002-2003
Development Study	Study on Hazard Mapping and Information Infrastructure Development in the Republic of Nicaragua	2003-2006
Technical Cooperation	Rural Community Development Project for Vulnerability Reduction Against Natural Disasters at Municipality of Villa Nueva	2003-2008
Technical Cooperation	Improvement of the Earthquake-Resistant Housing Construction Technology	2010-2013
Technical Cooperation	Project on Capacity Development for Disaster Risk Management in Central America "BOSAI"	2007-2012
Dispatch of Experts	Evaluation of Multi-hazards in the South Basin of Lake Managua, Nicaragua	2010-2012
Training Program	Countermeasure for Disaster in Central America	2003-2003
Training Program	Capacity Development for Flood Countermeasure using Integrated Flood Analysis System	2010-2012
Training Program	Capacity Development for Volcano Disaster Countermeasure	2010-2012
Training Program	Recovery Policy of Earthquake disaster/earthquake resistance	2010-2013
Grant Aid	Improvement of Equipment for the Recovery of Hurricane Disaster	
Emergency Assistance	Emergency Assistance for the Hurricane disaster Damage	2007

[93] JICA Knowledge Site (http://gwweb.jica.go.jp/)
[94] "Japan's ODA", website of the Ministry of Foreign Affairs of Japan (http://www3.mofa.go.jp/mofaj/gaiko/oda/search.php)

Emergency Assistance	Emergency Assistance for the Heavy Rain Damage	2011

Of the above, "Rural Community Development Project for Vulnerability Reduction Against Natural Disasters at Municipality of Villa Nueva" was outsourced by an NGO, Association for the Survival and Local Development (ASODEL: Asociación para la Sobrevivencia y el Desarrollo Local). This was a pioneer project assisted by JICA, for the disaster prevention in the communities in Central America, positioning the approaches of disaster prevention by the community for rural community development. This project was effective in not only the direct disaster prevention technology, but also by improving the livelihood or health and hygiene, therefore is an example for when making approaches for the "mainstreaming of disaster prevention". It was also unique that the community's vulnerability assessment developed by ASODEL was implemented in this project.

2.5.4 Key donor engagements

Key donor engagements in Nicaragua are shown in following table. [95]

There are many aids for identifying the disaster risks under the HFA (Hyogo Framework for Action) such as assessment of disaster risks, vulnerability, or early-warning, etc. from the donors, which further enhancement of capacity or development are anticipated. On the other hand, there are not many aids regarding strengthening of the preparation for emergency response, therefore is predicted to be one of the fields to be requested for the aid in the future.

Table 29 Key donor engagements in Nicaragua

Project Name	Funding Agency	Budget (USD)	Period	HFA Activity Area(s)*
Nicaragua Disaster Vulnerability Reduction Project	World Bank	10 million	2001-2009	1, 2, 3, 4, 5
Hurricane Felix Emergency Recovery	World Bank	17 million	2008 -2011	4
Support for DesInventar online disaster database creation of the National Disaster Prevention and Management Information System (SIAPAD)	Prevención de Desastres en la Comunidad Andina (PREDECAN)	N/A	2008-2009	2
Seminars and guidance for municipalities on risk reduction	Prevención de Desastres en la Comunidad Andina (PREDECAN)	N/A	2008-2009	2
A study to update the Disaster Risk Management Indicators	IDB		2009	2
Development of a Risk Assessment Platform for Nicaragua	WB (GFDRR)	350,000	2009-2010	2,3
Program for the Reduction of Vulnerability and Environmental Degradation in Nicaragua (PREVDA)	EC	3.33 million	2007-2011	1, 2, 4
Regional Plan for Disaster Reduction (PRRD)	NORAD, AECID	400,000	2006-2011	1
Disaster Risk Management for volcanic and landslide hazards in Ometepe island	DIPECHO	520,000	2008-2011	2, 4
Training on disaster risk management to local authorities	UNDP	400,000		1
Disaster risk reduction program for Nicaragua	COSUDE	2.2 million	2008-2012	1, 2, 3, 5
Earthquake Risk Reduction in Guatemala, El Salvador and Nicaragua with regional cooperation support to Honduras, Costa Rica and Panama (RESIS II)	NORAD	2.4 million	2007-2010	2
Regional Program of Environment in Central	DANIDA	N/A		2, 4

[95] Global Facility for Disaster Reduction and Recovery: Country Notes, by the World Bank

America(PREMACA)				
Mesoamerican coordination system for territorial information	IDB	800,000	2009-2011	2
Technical assistance to strengthen Information and Communication Tools for CEPREDENAC and National Commissions	WB	446,000	2007-2009	1, 2
Technical assistance for vulnerability reduction and response in Nicaragua (five local projects)	DIPECHO	N/A		3, 4, 5
Strengthening of communication systems at national and regional levels (Regional program)	China (Taiwan)	1,130,000	2009-2011	3
Action Plan AECID-CEPREDENAC (Regional level)	AECID	763,750	2009-2010	1, 2
Strengthening of CAPRA Implementation (Regional level)	CEPREDENAC	50,000	2010	1, 2
Support for the Pilot Project on Early Warning Systems for Hydrometeorological Hazards in Central America	WB (GFDRR), World Meteorological Organization	266,000	2009-2011	1, 2, 3, 4, 5
Phase II in the development of a Risk Assessment Platform for Nicaragua	IDB, UN ISDR, CEPREDENAC, SINAPRED, INETER, Municipalities, CSUCA	600,000	2009-2010	2, 3
Strengthening of local, municipal, departmental disaster risk management	SINAPRED, Municipalities, UNDP	2.1 million	2009-2012	1, 2, 3, 4, 5
Institutional strengthening of SINAPRED and support to develop mitigation projects	SINAPRED, Municipalities	1.4 million	2009-2011	1, 2
Implementation of communication and educational strategies at national and local levels	SINAPRED, Minister of Education, National Communication Agency	460,000	2009-2012	1, 2, 3
Project for Strengthening Communication Platforms and Information Management at National Level and Regional under the Integrated Risk Management for Disaster Reduction	Taiwan	25,000	2012-	2

HFA Activity Area(s)
(1) Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation (Governance)
(2) Identify, assess and monitor disaster risks and enhance early warning (Identification of disaster risk)
(3) Use knowledge, innovation and education to build a culture of safety and resilience at all levels (Education for DRM)
(4) Reduce the underlying risk factors
(5) Strengthen disaster preparedness for effective response at all levels

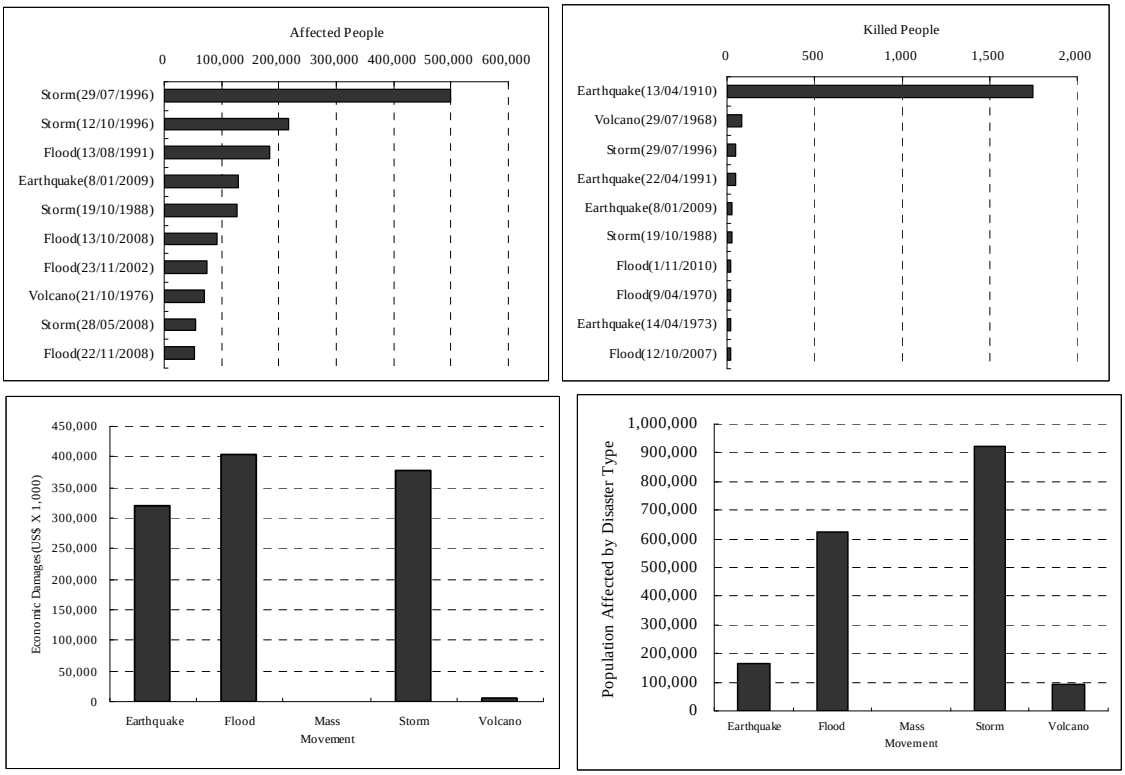
2.6 Costa Rica

2.6.1 History of natural disasters

Costa Rica's catastrophe list (affected people, killed people and economic damage) from 1900 to 2012 is shown in following table. [96]

Table 30 Costa Rica's catastrophe list (affected people, killed people and economic damage)

Affected People			Killed People			Economic Damage (thousand USD)		
Disaster	**Year**	**Affected**	**Disaster**	**Year**	**Killed**	**Disaster**	**Year**	**Cost**
Storm	29/07/1996	500000	Earthquake	13/04/1910	1750	Flood	7/02/1996	250000
Storm	12/10/1996	216000	Volcano	29/07/1968	87	Storm	29/07/1996	200000
Flood	13/08/1991	185021	Storm	29/07/1996	51	Earthquake	8/01/2009	200000
Earthquake	8/01/2009	128618	Earthquake	22/04/1991	47	Earthquake	22/04/1991	100000
Storm	19/10/1988	127500	Earthquake	8/01/2009	31	Storm	25/10/1998	91090
Flood	13/10/2008	92000	Storm	19/10/1988	28	Flood	12/10/2007	80000
Flood	23/11/2002	75040	Flood	1/11/2010	24	Storm	19/10/1988	60000
Volcano	21/10/1976	70000	Flood	9/04/1970	23	Flood	11/01/2005	25000
Storm	28/05/2008	55000	Earthquake	14/04/1973	21	Flood	4/12/1970	24000
Flood	22/11/2008	53000	Flood	12/10/2007	19			



(Population Affected by Disaster Type: Accumulation number of affected people by each disaster type from 1900 to 2012)

Due to its geographic location and geotectonic characteristics, Costa Rica is exposed to a variety of natural hazards, including hydrometeorological and geophysical hazards. The country has recently experienced floods, hurricanes, earthquakes, and landslides.

The frequency of floods has been increasing in Costa Rica and this natural hazard currently

[96] The International Disaster Database (http://www.emdat.be/result-country-profile)

represents the main source of losses in the country, namely ,tropical storms. In October 2011, Tropical Depression 12E affected the entire Central American region. In Costa Rica, the storm caused widespread flooding, landslides, damaged transport infrastructure, and destroyed agricultural lands. During the heavy rains in October 2007, a total of 14 people died in a landslide in the city of Atenas (approx. 20 ~ 30km west from the capital, San Jose). After the January 2009 earthquake, at least 10 people died in another landslide in Cinchona, a rural community 80 km west of the capital city, San José. Hurricane Mitch, one of the most destructive events in Central America, caused economic losses amounting to approximately tens of millions of USD.

2.6.2 Situation of disaster risk management (framework, organization/institution etc.)

Costa Rica has a comprehensive legal and institutional framework for disaster risk management (DRM). The strengthening of the institutional and the legal frameworks is reflected in key disaster risk management actions such as the adoption of Law No. 8488 of 2006 and its consequent regulation (Executive Decree No. 34 361-MP of 2008). The law requires all central government entities and local governments to allocate resources for relevant disaster and risk activities in their programs and budgets. The Law also established a mandatory contribution of 3 percent of financial surplus or profit from all governmental institutions to be transferred to the National Emergency Fund.

The Costa Rica National Platform has adopted the recommendations of the strategic objectives and priority actions of the "Hyogo Framework for Action: Building the Resilience of Nations and Communities to Disasters." In agreement with the Framework guidelines, Costa Rica has a national platform for a DRM framework that includes the National Risk Prevention and Emergency Management Commission (CNE: Comisión Nacional de (Prevención de Riesgos y Atención de) Emergencias), the National System for Risk Management, the National Plan for Risk Management, and coordinating entities. The CNE monitors and reports annually on the country's progress in its "National Report on the Implementation of the Hyogo Framework for Action."

The Government of Costa Rica recognizes the importance of mainstreaming disaster risk management (DRM) and significant progress has been made in this area.

The National Plan for Risk Management was updated according to Law 8488. A National Forum for Risk Management (October 14-16, 2009) proposed the National Plan for Risk Management, which was approved in January 2010.

The National Risk Management System has been mainstreamed by the Government of Costa Rica. DRM was incorporated into the 2006–2010 National Development Plan. The country continues to take important steps towards strengthening its institutional framework by

establishing a platform to follow up on the goals stipulated in the new 2010-2015 National Risk Management Plan, which was approved by the Government Council in January 2010.

The National Plan for Risk Management recognizes the need to carry out disaster risk reduction and mitigation activities. This involves coordinated participation of civil society and the private sector, and national and local government institutions throughout the country. Increased private sector participation is essential to further reduce the underlying risk factors in Costa Rica. The country is trying to improve participation of the private sector in the DRM process by implementing mechanisms on a voluntary basis and also through the enforcement of the existing legal and regulatory frameworks.

The Costa Rica Government has greatly enhanced its ability to ensure the effective and efficient allocation of resources for disasters. All central government entities and local governments must allocate resources for relevant disaster and risk activities in their programs and budgets. In addition, 3% of financial surplus or profit from all governmental institutions must be transferred to the National Emargency Funds to finance the National Risk Management System. This strengthens the government's capacity to effectively support disaster mitigation activities in a sustainable manner. In the event of a declaration of national emergency, National Emargency Funds are readily available to the CNE, which has the authority to allocate those funds as appropriate, without having to follow the lengthy administrative processes needed for allocations of funds during non-emergency situations.

Highly qualified scientists and engineers are involved in a wide variety of DRM topics such as the development of national networks of volcanological and meteorological monitoring stations and detailed geographic and geological studies.

To further disseminate information on DRM, the Government of Costa Rica is implementing the "National Educational Plan for the Reduction of Risk of Disasters" under the Ministry of Public Education. Public universities in Costa Rica are also incorporating DRM training courses in the programs of those careers related to environmental sciences, health, geography, geology, and psychology.

(1) National Emergency Commission (Risk Prevention and Attention) (CNE: Comisión Nacional de (Prevención de Riesgos y Atención de) Emergencias)

The organization chart of CNE is shown in the following figure. The number of the organization is 166, and composed by Board of Directors, President, Institutional communication, International Relations and Cooperation, Executive Director, Risk Management Division, Directorate of Administrative Management and so on.

The Government of Costa Rica strengthened its institutional framework and established the

legal framework to guarantee the reduction of the causes of risk and timely, coordinated risk management in times of disaster. Through the 2006 approval of Law No. 8488, the regulations define in greater detail the DRM system, the mandate and role of the CNE, the Government of Costa Rica's disaster prevention responsibilities, the process of a declaration of a state of emergency, a general emergency plan, and financial resources. To facilitate timely coordination, the CNE's Board of Directors is composed of the CNE President, the Ministers of Presidency, Health, Public Works and Transport, Public Security, Environment and Energy, Housing and Human Settlements, and Finance, the heads of the Institute of Social Assistance, the National Insurance Institute, and a representative from the Red Cross of Costa Rica. In the event of a national emergency, the CNE acts as the highest-ranked coordinating authority.

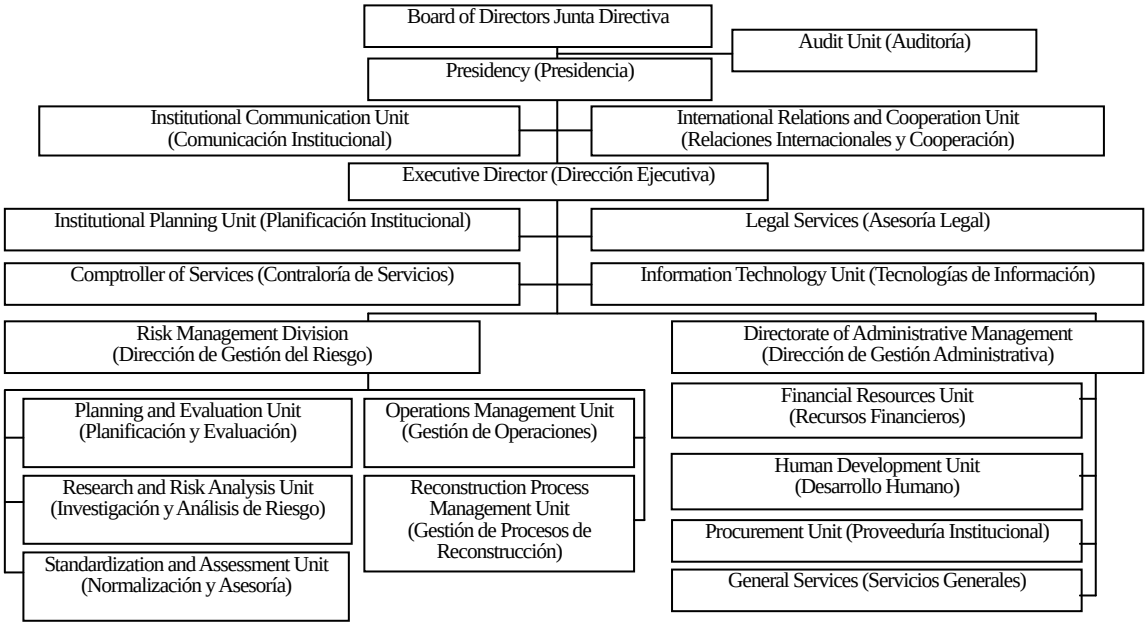


Figure 18 Organization chart of CNE [97]

National System for Risk Management shows the relationship between central government and local government, role, positioning, asset management, decentralization and so on. This structure is shown in the following figure. The CNE also coordinates a network of 400 community-level, 100 municipal-level, and 6 regional-level Emergency Management Committees.

[97] Based on CNE's response to the questionnaire

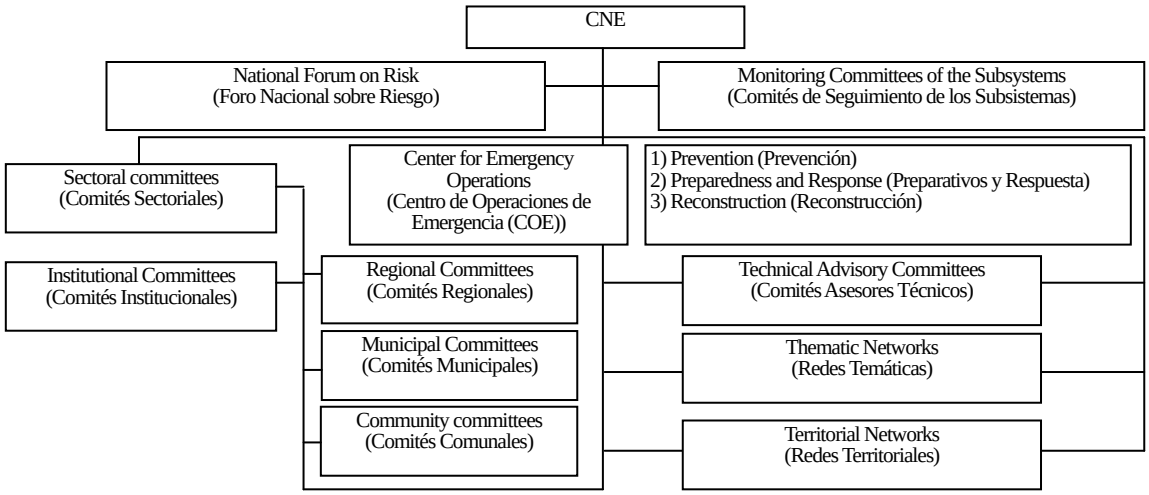


Figure 19 Cost Rica's Organization structure of central/local government on DRM [98]

- The Sector Committee is in charge of coordination between sectors, and the Organization Committee for hazard management is in charge of internal coordination between the decentralized organizations including the central management, local government, private sector, and organization of the citizens.
- The Emergency Operation Center manages the initial response in the occurrence of a disaster, and additionally, assembles public organizations and NGOs nationwide, and coordinates between these organizations.
- The Professional Engineer's Committee consists of engineers and scientists specialized in preparation and emergency response of disasters, and gives advice to CNE, Emergency Operation Center, or other organizations relevant to the National System for Risk Management.
- The community, city, and the Community Committee are in charge of the coordination between private organizations relevant to risk and disaster, NGO, and citizen's groups.
- The Agenda Network and Local Network are in charge of investigation, aid, planning, and coordination against hazards.
- The National Risk Management Council assists above all organizations as a whole. Here, the review and trainings are held for the progress of the risk management policy.
- The Subsidiary System Assistance Committee assists the programs of the subsidiary organizations of the "National System for Risk Management".

The country has a National Risk Atlas at the national and municipal (county) levels. Working closely with several national universities and research institutions, the CNE develops and maintains national- and local-level risk assessment maps for each type of hazard. The goal is to

[98] Based on CNE's response to the questionnaire

provide each municipality with up-to-date maps that can be integrated—using computer-based technologies such as GIS mapping—as inputs for the preparation of the municipal urban zoning and land use maps, and enforcement of zoning and building codes. A major constraint in the process of delivering information to the local municipalities is the level of local technical capacity to absorb this information. Some municipalities have sophisticated mapping systems, while others have very little or no technical or human resources to fully benefit from the available information on hazards and related risks.

The CNE coordinates a national network of early warning stations for monitoring and registering rain data, river flows, and landslides. Every station in the network has access to radios and/or phones to help relay their data in real time.

The national government has clear policies on the development of e-government and the CNE has made important progress in developing its own website, where up-to-date information is published and made readily available to the general public. Important resources such as a catalogue of natural hazard maps, along with important studies related to DRM in Costa Rica, can be accessed through CNE's website.

The CNE also builds its own technical capacity for the data gathering, analysis, and dissemination of knowledge about threats, and is developing maps of hazards, and databases that are used as inputs for the preparation of municipal and local regulatory plans (zoning plans). Land use and urban development recommendations derived from these zoning plans are legally binding, and the CNE has the authority to stop public and private works that do not abide by them.

(2) National Union of Local Governments (UNGL: Unión Nacional de Gobiernos Locales)

UNGL is a union of local governments established in 1977, managing the funding of the revenue share from the Government for the legal system for the local governments to improve the environment, as well as the approaches to the transfer of authority. For the purpose of improving the disaster prevention knowledge of the Government and the citizens, UNGL is participating in the disaster prevention review forum held by the State University of Distance Learning, together with UNGL, CNE, Institute of Municipal Development and Assistance (IFAM: Instituto de Fomento y Asesoría Municipal), JICA, United Nations Human Settlements Programme (UN HABITAT: Programa de Naciones Unidas para los Asentamiento Humanos), and United Nations Development Program (UNDP: Programa de las Naciones Unidas para el Desarrollo), etc.

(3) Ministry of Housing and Human Settlements (MIVAH: Ministerio de Vivienda y Asentamientos Humanos)

MIVAH manages the housing and land utilization policy of the National Development Plan,

targeting for a land utilization policy from the perspective of disaster prevention. Additionally, MIVAH is creating the guideline for the land utilization policy of the local government.

A strict enforcement of the construction standard is the main issue for the local government. The poverty group illegally occupy the high-risk areas in the cities, and tend to reside in these areas, therefore plans or policies for reducing the risks in such areas are in need. MIVAH is one of the organizations which measure these issues as well as CNE or the local governments.

A draft for the standard of emergency response in a disaster is under preparation, which includes investigation of disaster affected buildings, reconstruction, or aid, etc.

A former participant of JICA's Third Country Training Program, "Urban Planning System and Land Management Instruments" has joined MIVAH. Additionally, MIVAH is utilizing this former participant's follow up aid by JICA (dispatch of third country experts from the National Planning Department of Colombia), for the national development plan, land utilization policy, and establishment/dissemination of urban planning.

Regarding the joint activities by organizations, there is an urban planning activity from the perspective of disaster prevention, implemented by JICA and Die Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ: Agencia Alemana de Cooperación Internacional).

(4) Institute of Municipal Development and Assistance (IFAM : Instituto de Fomento y Asesoría Municipal)

IFAM is a part of decentralization and Ministry of Municipal Development, and provides technical guidance and funding to the development of all 81 municipalities in Costa Rica. IFAM is also following up the land utilization plan from the environmental perspective, which is included in the National Development Plan.

Activities related to the establishment of land utilization plan from the perspective of disaster prevention is also implemented by IFAM together with CNE, Institute of Housing and Urban Planning, and Costa Rican Institute of Tourism.

(5) National Directorate of Community Development (DINADECO: Dirección Nacional de Desarrollo de Comunidades)

DINADECO is an internal bureau of the Ministry of Home Affairs. It was established 45 years ago based on the law No. 38-59.

The corporate state is granted to the Community Committee by DINADECO, which also assists the institutionalization. So far, 3,154 communities have been granted the corporate state. Additionally, DINADECO is funding various activities of the communities, such as sewage, levee for preventing flood, community center for the use of evacuation shelter, and disaster response, etc.

DINADECO also holds training for disaster response with CNE. The content of the training is developed by CNE, and DINADECO is in charge of coordination in order to enable the training for the Community Committee.

(6) Ministry of National Planning and Economic Policy (MIDEPLAN : Ministerio de Planificación Nacional y Política Económica)

MIDEPLAN is responsible organization of the National Development Plan (NDP). DRM was incorporated in the 2006–2010 National Development Plan (NDP) and again fully incorporated into the current 2010-2015 NDP. The incorporation of DRM in the NDP obliges all relevant ministries to include risk analysis and mitigation initiatives in their annual programs.

MIDEPLAN added a disaster risk review in the project proposal format for national investments, through the Executive Orders 34 694-PLAN-H of August 2008 (Public National Investment System), 35 098-PLAN of March 2009 (National Public Investment Plan) and 35 374-PLAN of July 2009 (Technical Standards, Guidelines and Procedures for Public Investment).

(7) Program for Scientific and Technological satellite service to the prevention and mitigation of disasters, University of Costa Rica (PREVENTEC: Programa de Información Científica y Tecnológica Satelital al Servicio de la Prevención y Mitigación de los Desastres, Universidad de Costa Rica)

PREVENTEC was established in 2007 as one of the programs of the University of Costa Rica. It consists of 10 staff who are teachers or researchers of the 26 departments of the University of Costa Rica (specialized in economy, seismology, sociology, geology, engineering, psychology, programming, statistics, remote sensing, and GIS, etc.). While the staff works as teachers and researchers, they also take part in the research or activities related to disaster prevention, from the perspective of their specialty. The financial resources are; i) Budget of the University of Costa Rica, ii) Aid from CNE, and, iii) Aid on projects and activities from overseas.

The satellite images are utilized by PREVENTEC for disaster risk reduction. Specifically, through the cooperation from the space agencies from all the countries of the world, the satellite images are supplied (at the time of disaster), which are pretreated and analyzed, and are finally provided to disaster prevention organizations of Costa Rica such as CNE (satellite image was used in February 2009, at the Chinchona Earthquake).

Moreover, PREVENTEC is funded by CNE, and holds a national disaster meeting every two years (latest was November 2010, and the next is planned for July 2012). This meeting has the following four themes; i) Activity of PREVENTEC immediately after the disaster, ii) Disaster prevention education, iii) Disaster prevention and risk communication, and, iv) Good practice at each community level. In the last meeting, the necessity of information infrastructure and development/strengthening of disaster prevention capacity of various organizations were

confirmed.

As for the linkage between organizations, a community activity for tsunami disaster prevention education is being held. In the future, a project with the Ministry of Education for strengthening the disaster prevention capacity at a national level is planned. In addition, a monitoring and warning system for river flood is under development with the Ministry of Science and Technology (a warning message is sent to mobile phones when the water reaches the flood level). Other activities include the joint research with MIDEPLAN on economic impact due to disaster, as well as land utilization, etc.

(8) Volcanological and Seismological Observatory of Costa Rica, National University of Costa Rica (OVSICORI: Observatorio Vulcanológico y Sismológico de Costa Rica, Universidad Nacional de Costa Rica)

OVSICORI is a research institute where seismic activities are monitored, and the risk of earthquake is announced to the citizens through the media. OVSICORI consists of the following three groups; i) seismology (including monitoring), ii) volcanology, and, iii) application research (such as research on the seismic activity of Nicoya Peninsula). [99] There are around 25 staff (3 doctor's degree, 4 master's degree, 6 research assistants, and 8 administration staff, etc.).

An education on geological structure and crustal movement process for the children in the community is also being held. In order to give back the achievements of the researches, information is provided to the community, government agencies (Department of Justice, Institute of Electricity Costa Rica (ICE: Instituto Costarricense de Electricidad), or CNE, etc.). The information of OVSICORI is available for anyone.

OVSICORI is a member of a worldwide seismic observation network consortium, [100] and has 20 fixed points of seismological network (online and real-time observation). OVSICORI has played a lead role in seismic observation in Central America.

The following four organizations are operating the seismic observation network; i) OVSICORI, ii) University of Costa Rica, Department of Geology, iii) Engineers association (observing major earthquakes only, supported by Kyoto University), and, iv) Small-scale observation network of ICE on hydro and geothermal power generation. The alliance of these organizations requires the prevention of overlapping of the observation point, and building an integrated platform for the seismic observation.

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[99] Clear definition were not confirmed by the laws, but there is information regarding to activities of the DRM data provision by OVSICORI. (http://www.ovsicori.una.ac.cr/index.php?option=com_content&view=article&id=53&Itemid=95)

[100] AGU : American Geological Union, Nuclear Monitoring Commission of the United Nations for comprehensive nuclear test ban treaty, ALMAS : Alliance for Middle America Seismology = Alianza Mesoamericana de Sismología, IRIS : Incorporated Research Institutions for Seismology, GEOSCOPE (a worldwide seismic observation network of France), COCONET : Consortium of GPS stations in Mesoamérica, CONARE : Consejo Nacional de Rectores, Seismological Society of America, Non-profit union of universities for promoting the research and education of geodesy and geoscience (UNAVCO : University Navstar Consortium)

(9) Federated Association of Engineers and Architects（CFIA：Colegio Federado de Ingenieros y Arquitectos)

A construction standard is under development in Costa Rica, and both public and private sectors are jointly preparing the standard for minimizing the risk of disaster. CFIA plays an important role in this preparation. CFIA consists of the following five fields, and is a group of 24,000 members; i) Civil engineering, ii) Technical engineering, iii) Machinery, iv) Terrain, and, v) Architects.

CFIA is in charge of the legal system on earthquake resistance, foundational strengthening, and electric, etc., and the standards for earthquake resistance, foundational strengthening, and construction is updated every 5 years by civil engineering technicians. The standard on construction is reviewed and created jointly by research institutes or concerned parties of the association, on CFIA's initiative.

Unless registered to CFIA, works related to engineering cannot be carried out. [101] If not compliant to the standard of CFIA, there is a penalty (suspension of business). In the occurrence of a disaster, CFIA dispatches specialists for investigating the damage of buildings, regardless of domestic or overseas.

Trainings for disaster prevention are held periodically for the members. Additionally, the trainings are held on demand including the contents, when requested by the local government.

Regarding the linkage between organizations, CFIA is investigating vulnerability to disaster when being requested, or inspecting and advising government agencies on the quality of buildings.

[101] Enforced by the law（http://www.cfia.or.cr/descargas/leyes/10.pdf?!=a%20para%20Edificaciones.pdf）

2.6.3 Japan's cooperation achievements

Japan's cooperation achievements in Costa Rica are shown in following table. [102] [103]

Table 31 Japan's cooperation achievement in Costa Rica

Scheme	Project Name	Period
Technical Cooperation	Project on Capacity Development for Disaster Risk Management in Central America "BOSAI"	2007-2012
Grant Aid	Improvement of Equipment for the Recovery of Hurricane Disaster in Four Countries of Central America	2006
Emergency Assistance	Emergency Assistance for the Heavy Rain Damage	2010

2.6.4 Key donor engagements

Key donor engagements in Costa Rica are shown in following table. [104]

Many of the aids are related to the disaster risk identification through HFA, aiming to strengthen the capacity on early-warning, or disaster risk / vulnerability assessment. On the other hand, there are less aids for disaster prevention training or human resource development.

Table 32 Key donor engagements in Costa Rica

Project Name	Funding Agency	Budget (USD)	Period	HFA Activity Area(s)*
Integration of Disaster Risk Information in Costa Rica Planning System	WB (IDF)	450,000	2009-2012	2, 3, 4
Support for the Pilot Project on Early Warning Systems for Hydrometeorological Hazards in Central America	WB (GFDRR), World Meteorological Organization	262,000	2011-2013	1, 2, 3, 4, 5
Costa Rica Public Asset Catastrophe Risk Insurance Facility Feasibility Study	WB (GFDRR)	460,000	2008-2011	1, 3, 4, 5
Probabilistic Risk Measurement for Central America (CAPRA)	WB (GFDRR)	360,000	2008-2010	2, 3
Costa Rica Catastrophe Deferred Drawdown Option (CAT DDO)	WB	65 million	2008-2014	1, 3, 5
Strengthening a Municipal Information System for Disaster Prevention in Latin America and the Caribbean (SIMPD) Mitigation National Disasters	International Development Research Centre (Canada)	100,000*	2006-2009	2
Disaster Risk Management in Talamanca	UNDP	100,000	2006-2008	2, 4
Web-COE Project	Southern Command of the United States Army	N/A	permanent	5
" Prevention is Better " Community Intervention Strategy	ProVention Consortium, Organization of American States, British Red Cross, Finland Red Cross, Disaster Preparedness Programme of DIPECHO	50,000*	2007-2008	3
Regional Humanitarian Information Network (REDHUM) for Latin America and the Caribbean in the event of disasters	AECID, COSUDE, Government of Kuwait	100,000*	2006-2009	3, 5
Regional Program for the Reduction of Vulnerability and Environmental Degradation (PREVDA)	EC	1.65 million	2007-2011	1, 2, 4
Regional Plan for Disaster Reduction (PRRD)	NORAD, AECID	400,000	2006-2011	1

[102] JICA Knowledge Site (http://gwweb.jica.go.jp/)
[103] "Japan's ODA", website of the Ministry of Foreign Affairs of Japan (http://www3.mofa.go.jp/mofaj/gaiko/oda/search.php)
[104] Global Facility for Disaster Reduction and Recovery: Country Notes, by the World Bank

Earthquake Risk Reduction In Guatemala, El Salvador and Nicaragua with regional cooperation support to Honduras, Costa Rica and Panama (RESIS II)	NORAD	2.4 million	2007-2010	2
Regional Program of Environment in Central America (PREMACA)	Danish Cooperation (DANIDA)	N/A		2, 4
Mesoamerican coordination system for territorial information	IDB	800,000	2009-2011	2
Strengthening of Information and Communication for CEPREDENAC and National Commissions	World Bank	446,000	2007-2009	1, 2
Support the development and implementation of: (i) a monitoring mechanism for disaster risk prevention and reduction investments by key line ministries, that will support the implementation of the National Plan for Risk Management 2010-2015; (ii) a collection mechanism for the National Emergencies Fund	Ministry of Finance, CNE, MIDEPLAN	400,000	2010-2012	1, 2, 4
Enhance CNE's institutional capacity and DRM activities by: (i) supporting the implementation of CNE's restructuring plan; (ii) strengthening DRM activities at the sectoral level; and (iii) supporting vulnerability reduction efforts by improving CNE's safety and resilience programs at the community level	CNE, MIDEPLAN	1 million	2010-2012	1, 3, 4
Support phase II of the development of a Risk Assessment Platform for Costa Rica	WB (GFDRR)	750,000	2010-2012	2, 3, 4, 5
Support phase II of the development of Costa Rica Public Asset Catastrophe Risk Insurance Facility Feasibility Study for including hydrometeorological risk	WB (GFDRR)	500,000	2010-2012	1, 3, 4, 5

HFA Activity Area(s)
(1) Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation (Governance)
(2) Identify, assess and monitor disaster risks and enhance early warning (Identification of disaster risk)
(3) Use knowledge, innovation and education to build a culture of safety and resilience at all levels (Education for DRM)
(4) Reduce the underlying risk factors
(5) Strengthen disaster preparedness for effective response at all levels

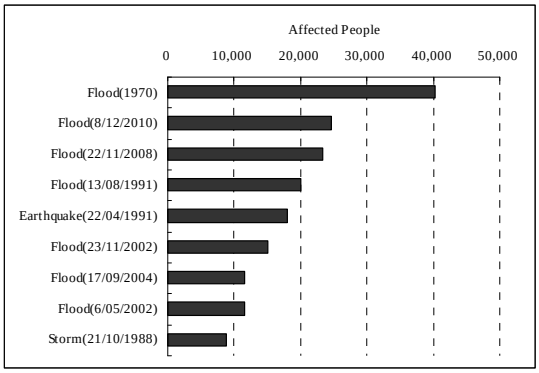
2.7 Panama

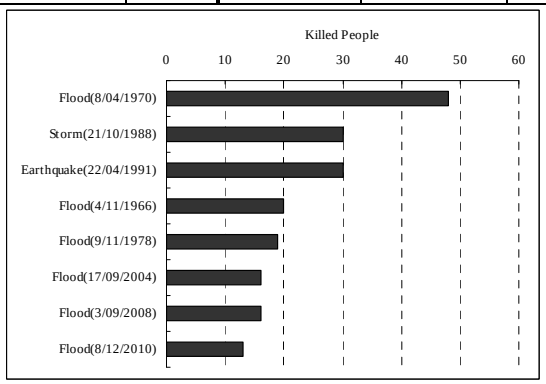
2.7.1 History of natural disasters

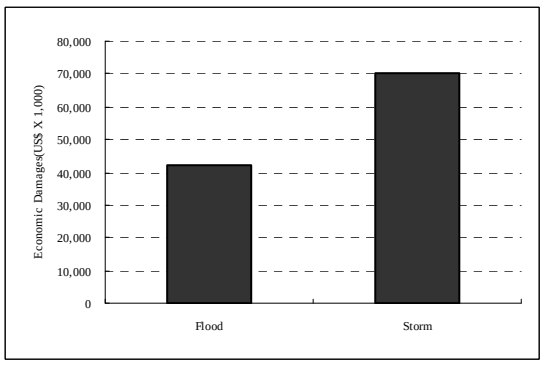
Panama's catastrophe list (affected people, killed people and economic damage) from 1900 to 2012 is shown in the following table. [105]

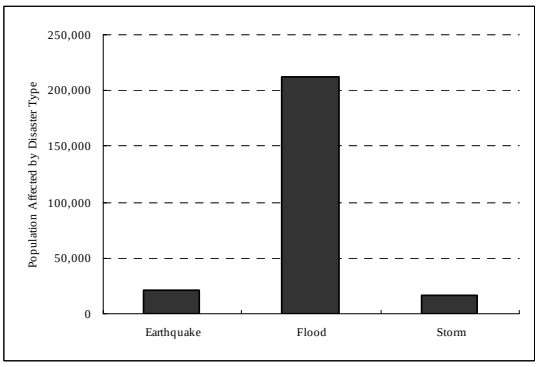
Table 33 Panama's catastrophe list (affected people, killed people and economic damage)

Affected People			Killed People			Economic Damage (thousand USD)		
Disaster	**Year**	**Affected**	**Disaster**	**Year**	**Killed**	**Disaster**	**Year**	**Cost**
Flood	1970	40345	Flood	8/04/1970	48	Storm	21/10/1988	250000
Flood	8/12/2010	24610	Storm	21/10/1988	30	Flood	8/04/1970	200000
Flood	22/11/2008	23292	Earthquake	22/04/1991	30	Storm	6/07/1992	200000
Flood	13/08/1991	20061	Flood	4/11/1966	20	Flood	22/11/2008	100000
Earthquake	22/04/1991	18060	Flood	9/11/1978	19	Flood	10/10/1995	91090
Flood	23/11/2002	15000	Flood	17/09/2004	16	Flood	11/01/2005	80000
Flood	17/09/2004	11650	Flood	3/09/2008	16	Flood	09/2000	60000
Flood	6/05/2002	11500	Flood	8/12/2010	13	Flood	4/11/1966	25000
Storm	21/10/1988	8732				Flood	6/05/2002	24000
						Flood	10/1986	









(Population Affected by Disaster Type: Accumulation number of affected people by each disaster type from 1900 to 2012)

Panama is located over a segment of the Caribbean tectonic plate[106]. Due to its geographical location and geotectonic characteristics[107], the country is exposed to a variety of natural hazards, including hydrometeorological and geophysical hazards. Panama is characterized by very intense

[105] The International Disaster Database (http://www.emdat.be/result-country-profile)
[106] The ontinental plate which containts Caribbean Sea, a part of Central America, a part of South America Continental.
[107] Plate tectonics is a scientific theory that describes the large-scale motions of Earth's lithosphere

and long-lasting rainfall, windstorms, floods, droughts, wildfires, earthquakes, landslides, tropical cyclones, tsunamis and El Niño-La Niña episodes.

Earthquakes have continued to strike Panama. In 2003 a magnitude 6.0 earthquake struck Panama near the Costa Rican border; the event was followed by more than 60 aftershocks (of magnitude higher than 4.0) during the following few weeks. Soil liquefaction occurrences were widespread, creating more damage to the infrastructure.

The most important recent disasters in Panama have resulted from vulnerability to floods, landslides, earthquakes, windstorms, wildfires and storms. A high proportion of the low-income population in Panama lives in areas most exposed to natural hazards and resides in poorly designed and inadequately built structures. The poor enforcement of national and local land use regulations, the uncertainty about compliance with building codes, rapid demographic growth and unplanned urban and industrial expansion are responsible for most of the current and significant increases in vulnerability. Cities in Panama have grown steadily and have thereby heightened vulnerability due to the increased concentration of the population, infrastructure and production of goods and services (Panama City, David city, Colón city and etc.). Although the country has a comprehensive anti-seismic building code (based on the State of California's construction code), its implementation in new buildings and towers is uncertain, and provisions for retrofitting existing buildings are not efficiently enforced.

2.7.2 Situation of disaster risk management (framework, organization/institution etc.)

The Government of Panama is making important efforts in the Strategic Plan 2010-2014 (GPSP) toward mainstreaming environmental protection in the sectoral planning processes. The GPSP recognizes that current efforts to promote sustainable land use have been incomplete, with poor planning, and without effective enforcement of zoning regulations.

Panama has adopted the recommendations and priority actions of the "Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters" as part of the Government of Panama's efforts to improve its DRM capacity. Panama is an active participant in regional and international DRM forums, including the Central American Coordination Center for the Prevention of Natural Disasters (CEPREDENAC: Centro de Coordinación para la Prevención de los Desastres Naturales en América Central) and the United Nations International Strategy for Disaster Reduction (UN-ISDR: Plataformas Nacionales Para la Reducción del Riesgo de Desastres). The Government of Panama established and maintains an active CEPREDENAC's National Commission. In addition, as part of its increasingly proactive DRM agenda, the Government of Panama signed the Central American Policy for Comprehensive Disaster Risk Management, adopted at the 35th Central American Integration System (SICA:

Sistema de la Integración Centroamericana)'s Ordinary Meeting of Heads of State and Government, held in Panama in June 2010.

The Government of Panama acknowledges that there is still a need to further strengthen existing DRM institutions and policies. Actions explored by the Government to improve disaster risk management in Panama include: (i) strengthening the National Civil Protection System (SINAPROC: Sistema Nacional de Protección Civil)'s institutional capacity, (ii) reducing vulnerability in urban areas, (iii) developing the country's risk assessment and monitoring capacity, (iv) developing risk reduction strategies for emergency response and diversified risk management instruments, and (v) strengthening the environmental institutions.

Panama has nationwide networks of volcanological and meteorological monitoring stations and has implemented regional and local flood early warning systems. Panama implemented the first early warning system in Central America that integrates voice and text messaging for communities at risk. Earthquakes in Panama are monitored by two seismological networks: the Western Earthquake Observatory [108] and the National Seismological Network. [109] The Hydrometeorological Management Office of the Electric Transmission Company acts as the national climatologic, meteorological and hydrological monitoring service in Panama. Hydrometeorological hazards are also assessed at this bureau with coordination links to Executive Secretariat of National Civil Protection System (SE-SINAPROC: Secretaría Ejecutiva - Sistema Nacional de Protección Civil) and Center for Emergencies Operations.

The National Civil Protection System and the Ministry of Education have begun incorporating risk management and disaster topics in the programs and curricula of early childhood education, primary, middle and high schools, and the first DRM manual has been released for teachers at primary levels. The National Civil Protection System and the University of Panama's Faculty of Education initiated coordination activities towards developing qualified DRM personnel to strengthen the Operative Plan for the School Safety Program.

(1) Executive Secretariat, National Civil Protection System (SE-SINAPROC: Secretaría Ejecutiva - Sistema Nacional de Protección Civil)

As part of its regional binding commitments, through Executive Decree No. 402 of November 12, 2002, the Government of Panama created the National Commission of CEPREDENAC (CEPREDENAC-PANAMA). The Commission was delegated the responsibility for coordinating CEPREDENAC's activities in Panama. The commission is comprised of a representative of SE-SINAPROC, who presides; along with representatives of the Ministries of Foreign Affairs,

[108] Managed by the Western Earthquake Observatory (http://www.osop.com.pa/equipos/central/descripcion_Central_Automatica.pdf)
[109] Managed by Institute of Geosciences, University of Panama (http://www.geocienciaspanama.org/sismos-panama)

Economy and Finance, Education, Public Works, Health, Housing, and Agricultural Development; a representative of the National Environment Authority (ANAM); a representative of the Social Security Administration (CSS: Caja del Seguro Social); representatives of the Civil Engineering Department and the Institute of Geological Sciences of the University of Panama; and a representative of the governmental Electricity Transmission Company (ETESA: Empresa de Transmisión Eléctrica S.A.). SE-SINAPROC, working closely with relevant DRM stakeholders, who were also involved in the drafting of the National Risk Management Plan, concluded the process for updating the National Risk Management Plan, as mandated by Executive Decree No. 177 of April 30, 2008, which regulates Law No. 7 of 2005. SE-SINAPROC is responsible for coordinating DRM in Panama as the highest-ranking authority in the event of a natural catastrophe or man-made emergency. As the leading DRM authority in Panama, SE-SINAPROC maintains responsibility for the development and implementation of the National Emergencies Plan and the country's Risk Management Plan. The National Emergencies Plan defines roles, responsibilities and general procedures for institutional preparedness and response, establishes an inventory of resources, coordinates operational activities, and conducts assessments in order to safeguard life, protect property, and restore normalcy as soon as possible after the occurrence of a hazardous event. The Risk Management Plan guides risk reduction activities, emergency preparedness, and disaster recovery efforts.

SE-SINAPROC roughly consists of the following five divisions; i) Disaster prevention academy (including international cooperation, training, community activities, and administration), ii) Volunteer Division, iii) General Affairs Division, iv) Emergency Response, and, v) Clinic (health management of the staff). There are around 280 staff working, as well as 1,500 volunteers allocated by the municipalities under the law. On weekends, these volunteers spare their time on emergency response or disaster prevention training. As a preparation for disaster, SE-SINAPROC is focusing on the academy.

In 2010, the "Política Nacional de Gestión Integral del Riesgo de Desastres" was established taking HFA into consideration. SE-SINAPROC's activity is based on this policy. In addition, collaboration between other organizations is also based on this policy.

In the event of an emergency, SE-SINAPROC operates and coordinates the Center for Emergency Operations, in which 31 government organizations participate. This entity was created in 2000 with funding from the Southern Command of the United States Army. Equipped with the latest ICT, GIS and Remote Sensing technology and managed by civil servants, the Center for Emergency Operations (COE: Centro de Operaciones de Emergencia) has a command-and-control structure, with clearly defined hierarchical authorities and responsibilities.

Their following activities are for the preparation for disaster; i) Investigation on vulnerability,

ii) Statistics of disasters (original statistics, which are not shared with other organizations), iii) Raising the citizens' awareness towards emergency response, conducted by the academy, iv) Training for the government workers, v) Training for teachers for securing safety in schools (for example, preparation for disaster such as disaster prevention training, in case of last year, 100,000 students nationwide participated in the emergency drill on the International Day for Disaster Prevention), and, vi) Disaster prevention activities in the community (creation of hazard maps, installation of signage of evacuation route, etc.).

SE-SINAPROC is receiving information on seismic observation from the Institute of Geosciences of the University of Panama, and hydrological data from ETESA, the national electric power communication company. Based on these data, SE-SINAPROC is announcing evacuation warnings, etc. to the citizens.

SE-SINAPROC is one of the members of CEPREDENAC, and through CEPREDENAC, below supports are provided.

- European Commission (EC: Comisión Europea) and Spanish Agency for International Developmen (AECID: Agencia Española de Cooperación Internacional para el Desarrollo): Training and implementation of comprehensive national disaster prevention policy.
- World Bank: 60 million USD is prepared in case of an emergency (funding is available since the national disaster prevention policy is established).
- Inter-American Development Bank (IDB: Banco Interamericano de Desarrollo): Technical assistance related to climate change and disaster prevention.
- USAID/OFDA, United States Southern Command, Red Cross: Training for emergency response.
- Architects of Panama, engineers association: Assist the establishment of a comprehensive national disaster prevention policy.

For the mainstreaming of disaster risk mitigation, SE-SINAPROC is promoting disaster prevention education campaign on radio and television. In addition, the Disaster Prevention Academy of SE-SINAPROC is holding training for emergency response in case of disaster.

SE-SINAPROC has a disaster prevention and mitigation department (3 staff). The main role is the contact window and coordination for international cooperation projects. Approaches to disaster prevention were taken based on past aid projects by AECID (early-warning), EU and Organization of American States (OAS: Organización de Estados Americanos) (early-flood warning), Norway (landslide), IDB (landslide and flood). Another project on earthquake measures (prediction of damage by seismic intensity based on the investigation of buildings) was implemented jointly with the city office of Panama, in La Chorrera as a pilot site.

SE-SINAPROC is currently undergoing restructuring, therefore the latest organizational chart

was not issued. Below is the organizational chart of before the restructuring, as a reference.

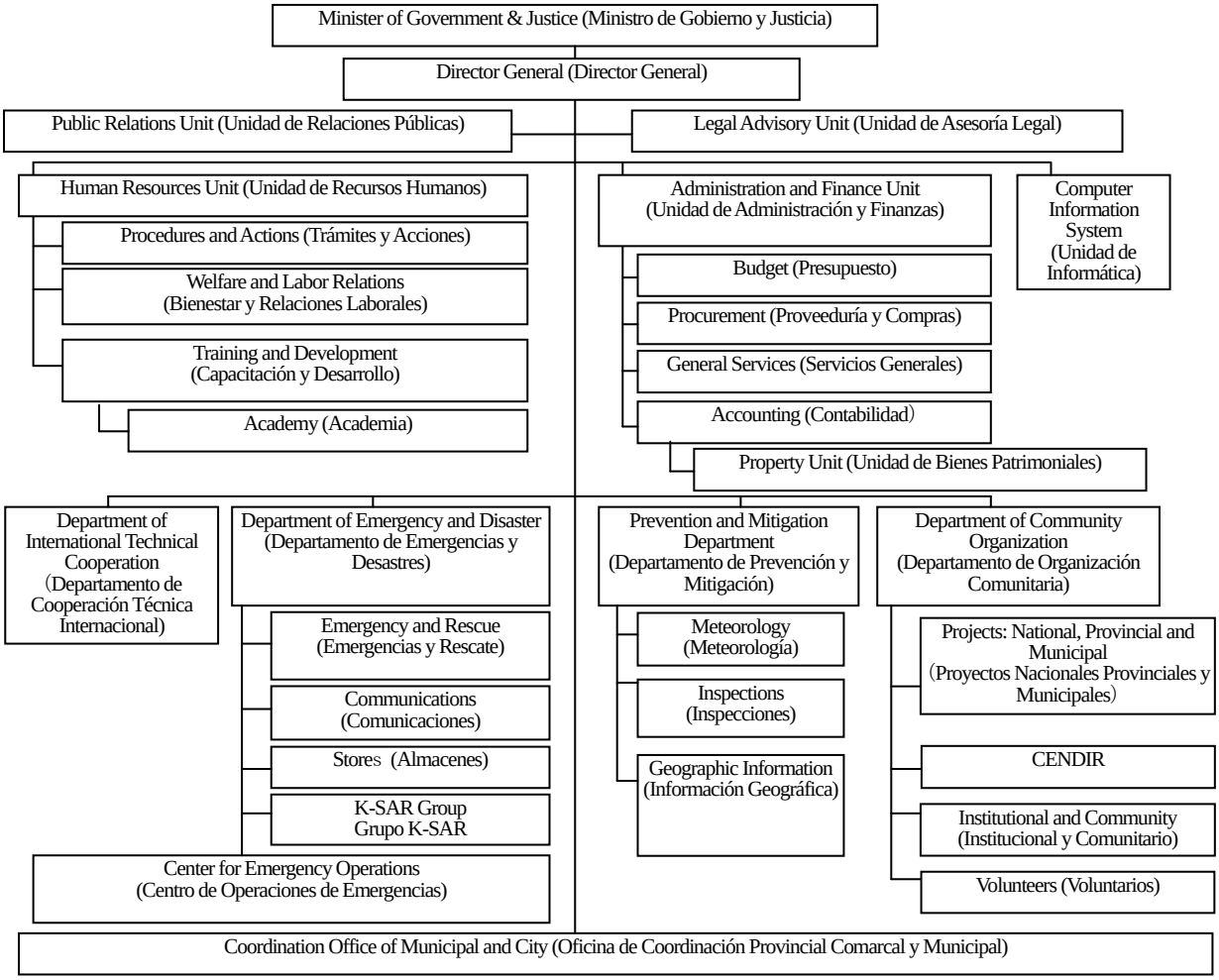


Figure 20 Organization chart of SE-SINAPROC [110]

(2) Environmental Education Department, Ministry of Education (Ministerio de Educación, Departamento de Educación Ambiental)

There are 8 staff in total (6 for engineering, and 2 for office work) at the Environmental Education Department, Ministry of Education. Personnel of environmental education and risk mitigation are allocated in 15 locations across Panama, and activities related to disaster prevention are carried out through these personnel.

Below are the approaches towards disaster prevention.

- Safe schools activity: An activity to ensure safety of the school in the event of disaster. This is also a part of the public education system, where school workers and the families of the students take part in. The financial assistance is by United Nations International Children/s Fund (UNICEF: Fondo de las Naciones Unidas para la Niñez y la Infancia). For 10 schools rated in Panama as high-risk, assessment is planned by using the "safe school

[110] Data provided by SINAPROC

index".

- Disaster prevention drill: Under the initiative of the Environmental Education Department, disaster prevention drills are held every July in schools. SE-SINAPROC, police department, Red Cross, fire department, and traffic police are also participating.

Regarding the collaboration between organizations, provision of equipment and financial aid for an early-warning system for floods, earthquakes, and tsunami granted by United Nations Educational, Scientific and Cultural Organization (UNESCO: Organización de las Naciones Unidades para la Educación, Ciencias y Cultura). The fields jointly implemented with other organizations are technology, education, and implementation, and the Environmental Education Department is in charge of disaster prevention education. Additionally, training is held jointly by the Red Cross, USAID/OFDA, etc.

(3) Institute for Geosciences, University of Panama (UP/IGC: Universidad de Panamá, IGC Instituto de Geociencias)

There are 5 staff in total in UP/IGC, consisting of specialists for seismology (2), volcanology (2), GIS for disaster prevention (1), tsunami (1), and landslide (1). UP/IGC operates the national real time earthquake/volcano observation network (around 10 observation stations), and provides data to SE-SINAPROC.

Regarding the collaboration between organizations for disaster prevention; research with USGS (creation of hazard maps, research on landslide, volcano, tsunami), participating to CAPRA of the World Bank, acquisition of observation data from the university of Costa Rica and Columbia, sharing of information and technology with architects association, and holding workshops and inviting researchers from overseas.

(4) Panama University of Technology (UTP: Universidad Tecnológica de Panamá)

Most of the activities are not related to disaster prevention, and has no course related to disaster prevention. However, UTP has created a hazard map, assessed vulnerability to earthquake, and researched soil property in the past.

The Hydrology/hydraulic Engineering Research Center of UTP is the counterpart of JICA's dispatch of science and technology researchers for "Influence of Climate Changes on the Hydrological Cycle in the Panama Canal Watershed".

2.7.3 Japan's cooperation achievements

Japan's cooperation achievements in Panama are shown in the following table. [111] [112]

Table 34 Japan's cooperation achievement in Panama

Scheme	Project Name	Period
Technical Cooperation	Project on Capacity Development for Disaster Risk Management in Central America "BOSAI"	2006-2012
Grant Aid	Improvement of Equipment for the Recovery of Hurricane Disaster in Four Countries of Central America	2006
Emergency Assistance	Emergency Assistance for the Heavy Rain Damage	2006

2.7.4 Key donor engagements

Key donor engagements in Panama are shown in following table. [113]

Most of the assistance is related to governance of the HFA activity area, such as development of legal system or establishment of plans relevant to disaster prevention. It is obvious that the assistance for strengthening of preparation for emergency response such as disaster prevention drills or human resources development are insufficient.

Table 35 Key donor engagements in Panama

Project Name	Funding Agency	Budget (USD)	Period	HFA Activity Area(s)*
Support for the development of a Risk Assessment Platform (CAPRA) for Panama	SE-SINAPROC,Universities, Ministry of Finance	500,000	2009-2011	1, 2, 3
Support capacity building and integrate risk reduction into national planning systems to mitigate urban risk	SE-SINAPROC, Municipality of Panama, Other Municipalities, UNDP	2.2 million	2009-2012	1, 2, 4
Technical assistance to mainstream disaster risk management in the water and transport sectors	Ministry of Health,Ministry of Transport, SE-SINAPROC	600,000	2009-2011	1, 2, 4
Support to mainstream disaster risk management in other priority sectors	Ministry of Finance, SE-SINAPROC	980,000	2009-2012	1, 2, 3, 4, 5
Technical assistance to raise public awareness and proactively engage the private sector in disaster risk reduction activities	SE-SINAPROC, Private Sector Entities	500,000	2009-2011	1, 3, 4

HFA Activity Area(s)
(1) Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation (Governance)
(2) Identify, assess and monitor disaster risks and enhance early warning (Identification of disaster risk)
(3) Use knowledge, innovation and education to build a culture of safety and resilience at all levels (Education for DRM)
(4) Reduce the underlying risk factors
(5) Strengthen disaster preparedness for effective response at all levels

[111] JICA Knowledge Site (http://gwweb.jica.go.jp/)
[112] "Japan's ODA", website of the Ministry of Foreign Affairs of Japan (http://www3.mofa.go.jp/mofaj/gaiko/oda/search.php)
[113] World Bank, Global Facility for Disaster Reduction and Recovery: Country Notes

2.8 Characteristics of natural disasters and disaster preparedness in Central America

This section describes the risks of natural disasters in Central America from a global viewpoint, as well as the characteristics of the preparation for natural disasters or disasters in Central America, based on existing studies. There are various organizations studying the hazard of disaster or risks at a global level. Below are examples of such assessments made by Germanwatch, World Bank, UN-ISDR and UN.

Below Figure is cited from "Global climate risk index 2012"[114], which shows the distribution of the index of climate change risk by country. This Climate Risk Index is evaluated by number of deaths by country, number of deaths by population of 100,000 and economic loss, due to storm, flood, heat wave, and cold wave. According to the Climate Risk Index, Honduras and Nicaragua ranked 3rd and 4th in the world respectively, for the countries most affected by extreme weather events from 1991 to 2010.

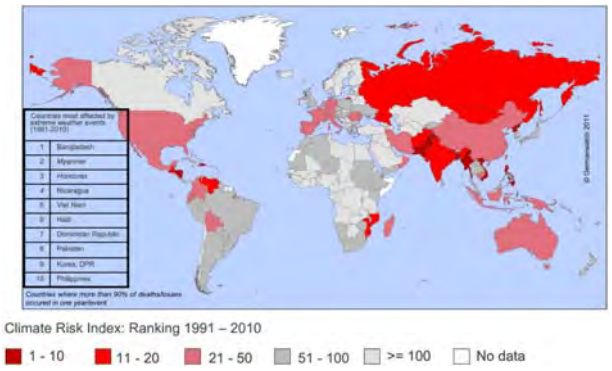


Figure 21 World Map of the Global Climate Risk Index [115]

Below Figure shows the number of disasters by region as well as type and percentage of disaster, from 1970 to 2010. The chart shows that from a global perspective, Central America is a region with a high occurrence of disasters. With regard to the type of disasters, flood is the most frequent, followed by intense rainfall/storm, and earthquake. These could all trigger a slope disaster, therefore it is considered that the risks of landslide and debris flow is high.

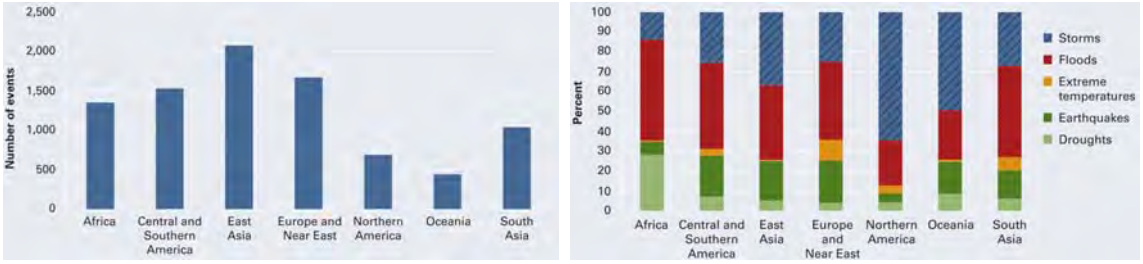


Figure 22 The number of disasters 1970-2010 (left) and percentage of disaster type (right) (Classification by region) [116]

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[114] Global climate risk index 2012, Germanwatch
[115] Global climate risk index 2012, Germanwatch
[116] Natural hazards, unnatural disasters : the economics of effective prevention, 2010, The World Bank and The United Nations

Below chart shows the hazard ranking by World Bank's Natural Disaster Hotspot Study.[117]The ranks are rated by the ratio of the total land area subject to hazards, ratio of the population to the total population subject to hazards, and the number of hazards. In the top 15 are Costa Rica (2nd), Guatemala (5th), El Salvador (12th), Panama (14th), and Nicaragua (15th). This indicates that most of the countries in Central America are subject to multiple hazards.[118]

Table 36 Top 15 of hazard ranking by World Bank's Natural Disaster Hotspot Study [119]

No.	Country	Percent of Total Area Exposed	Percent of Population Exposed	Max. Number of Hazards
1	Taiwan	73.1%	73.1%	4
2	Costa Rica	36.8%	41.1%	4
3	Vanuatu	28.8%	20.5%	3
4	Philippines	22.3%	36.4%	5
5	Guatemala	21.3%	40.8%	5
6	Ecuador	13.9%	23.9%	5
7	Chile	12.9%	54.0%	4
8	Japan	10.5%	15.3%	4
9	Viet Nam	8.2%	5.1%	3
10	Solomon Islands	7.0%	4.9%	3
11	Nepal	5.3%	2.6%	3
12	El Salvador	5.1%	5.2%	3
13	Tajikistan	5.0%	1.0%	3
14	Panama	4.4%	2.9%	3
15	Nicaragua	3.0%	22.2%	3

Below Figure shows the evaluation of the risk mitigation index based on 38 indicators (DARA, 2011).[120] This indicates how the countries of Central America are approaching risk mitigation, as well as how appropriate or effective the policy is. In this chart, Costa Rica was the highest and Nicaragua was last for the capacity for risk mitigation out of the countries of Central America, although for Costa Rica, the ratio of area to the total land area subject to hazard was ranked 2nd. This means that the ratio of hazardous area of Costa Rica is high, but has an adequate risk management policy.

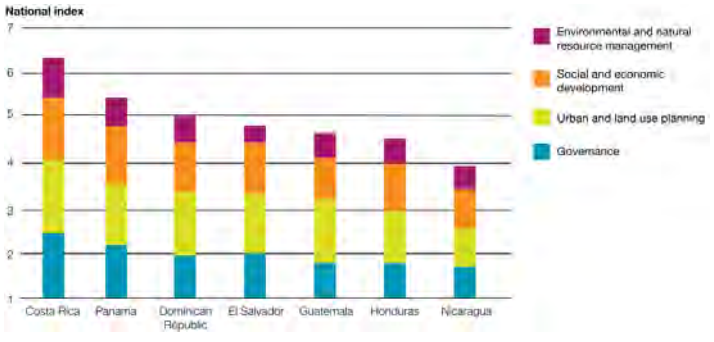

Figure 23 Risk governance capacities across Central America and the Caribbean [121]

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[117] Natural Disaster Hotspot study, 2005, World Bank
[118] Honduras was not included in the hazard ranking by World Bank's Natural Disaster Hotspot Study
[119] Natural Disaster Hotspot study, 2005, World Bank
[120] Global Report on Reducing Disaster Risk, 2011, UN-ISDR
[121] Global Report on Reducing Disaster Risk, 2011, UN/ISDR: The higher number means that a country is advancing DRM

Below chart shows the result of mortality risk of Central American countries according to "2009 Global Assessment Report on Disaster Risk Reduction"[122] by the World Bank. The multiple mortality risk due to disaster are affected by the mortality risk of earthquake, therefore Guatemala has the highest value. Moreover, the multiple mortality risk of all the countries are rated 5 or higher, indicating the high-risk in Central America.

Table 37 Mortality risk of Central Americans countries [123]

	Multiple Mortality Risk class	Cyclones Mortality Risk class	Earthquakes Mortality Risk class	Floods Mortality Risk class	Landslides Mortality Risk class
Guatemala	8	2	8	4	6
El Salvador	7	-	7	3	5
Honduras	6	3	5	4	5
Nicaragua	6	4	4	4	5
Costa Rica	7	2	7	3	5
Panama	5	-	4	3	5
Japan	7	5	6	4	4

(Risk class: from 0 to 10, higher number means high mortality risk)

Below Figure shows the mortality risk distribution from weather-related hazards (cyclone, flood, and landslide due to rainfall) in Central/South America, and the Caribbean. All countries of Central America are evaluated as medium to high risk.

Figure 24 Mortality risk distribution from weather-related hazards [124]

countermeasure by government. This study's target area was only CA countries, therefore, there is nothing of comparison with other area of the world.

[122] Risk and poverty in a changing climate (Global Assessment Report on Disaster Risk Reduction), 2009, UN

[123] Risk and poverty in a changing climate (Global Assessment Report on Disaster Risk Reduction), 2009, UN

Below Figure shows the occurrence of disasters in Central American region. Various disasters occurred from 1998 to 2008 in Central America, however particularly, floods occurred most frequently. Especially in Panama and Costa Rica, most of the disasters were floods. As for the other four countries, various disasters including tornados and landslides occurred.

Figure 25 Disasters in Central American Region (1998-2008) [125]

[124] Global Risk Assessment Report, UN, 2011
[125] Ten years after Hurricane Mitch: a survey of trends in disaster risk management in Central America (http://www.eird.org/cd/redlac/introduccion/agradecimientos.html)

3 Examination for JICA's Cooperation Direction of Disaster Risk Management Sector in the Six CA Countries and Mexico

3.1 Need s of Central American countries

3.1.1 Overall trend

The following summarizes the needs for disaster risk reduction in the Central American countries according to the Hyogo Framework for Action 2005–2015 (HFA).

(1) HFA1 : Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation (Governance)

All the countries take up disaster risk reduction as a priority issue based on the Central American Policy for Comprehensive Disaster Risk Management (PCGIR: Política Centroamericana de Gestión Integral de Riesgo de Desastres) and establish the national disaster risk reduction plan as a mid-term plan to update it approximately every five years. In particular, the central disaster risk reduction organizations that the Study Team visited to conduct interview survey in this study have coordination opportunities in the form of national disaster risk reduction meetings, establishing a platform that includes both government agencies and many other organizations in pursuit of centralization of the disaster risk reduction system. However, the organization control, personnel, budget scale, owned facilities and equipment, etc. are at the levels of mid-sized cities in Japan. Against such a backdrop, the central disaster risk reduction organizations have a high need for assistance in organizational enhancement (particularly provision of equipment).

The disaster risk reduction coordinating agencies in these countries that serve as the liaison and implementing organizations for disaster risk reduction projects tend to admit as much assistance as possible from the donors and therefore sometimes cannot control the numerous projects appropriately. SE-CEPREDENAC is not fulfilling the expected roles due to limited full-time staff and ordinary budget. SE-CEPREDENAC uses the membership fees from the member countries as the financial source and, since the increase in the amount of this revenue cannot be expected at present, has no choice but to depend on the external sources for organizational enhancement.

On the other hand, the specialized agencies that conduct public works and observations understand the importance/necessity of disaster risk reduction projects. With the necessity well-defined, the projects tend to become able to develop spontaneously.

(2) HFA2:Identify, assess and monitor disaster risks and enhance early warning (Identification of disaster risk)

Since disaster risks must be identified to establish appropriate disaster risk reduction

measures, all the countries are striving to identify hazards, assess risks, and create hazard maps to deal with such hazards as earthquakes, floods, and landslides in their capitals and major cities.

Early warning is essential in a wide range of levels from the government to community, and the accuracy and promptness of warning are required to be improved constantly. Specifically, for example, it is mandatory to establish a workflow of observing earthquakes, tsunamis, and volcanic activities with a network that covers the entire Central American region, sharing the observation data among the relevant agencies, and promptly communicating it.

According to the information acquired in this study, the observation system using weather radars in El Salvador, the tsunami monitoring system in Nicaragua, and the earthquake observation system in Costa Rica are advanced and sophisticated. On the other hand, the systems for hydrological observations and flood forecast based on them are underdeveloped and have not accumulated much data yet, resulting in high need for enhancement of the observation and forecast systems in all the countries. As to landslides, warnings issued are mainly based on rainfall gauging and, as such, it is difficult to issue accurate warnings. It is necessary to elucidate more detailed landslide mechanisms and construct a warning system based on comprehensive consideration of monitoring of landslide activities and other factors. It is considered imperative to implement such a system starting with hazardous regions by giving higher priority to them.

(3) HFA3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels (Education for DRM)

In the Central American region, earthquakes, tsunamis, landslides, floods, volcanic disasters, and droughts are the disaster types common to the region. Efficient and effective countermeasures for them through collaboration of the South American countries and region are required. The important point in disaster risk reduction education is conveyance of correct knowledge and technique to the residents. In this sense, the community disaster risk reduction projects being implemented by the donors and NGOs are important. However, it is difficult to cover all the communities because the number of communities is huge. Therefore, there must be a mechanism of horizontal deployment from an implementing community to surrounding communities. Furthermore, it is also important to establish the culture of disaster risk reduction. In this sense, the effect of BOSAI is highly evaluated by the Central American countries. CODEM in Tegucigalpa, Honduras, one of the implementing agencies of community disaster risk reduction, seemed to be able to interact with many communities and participants meticulously. Most of the other donors know about BOSAI and indicate a willingness to collaborate and share information with it. There was also an NGO that wanted to participate in the BOSAI project.

Many sectors including the government agencies, local administrative organs, donors, and international agencies are hoping for continuation and next-phase projects of BOSAI.

(4) HFA4：Reduce the underlying risk factors

The Central American countries have different risk levels and, even within one country, the risk levels and factors vary. It is important to define potential risks and take countermeasures against them. The earthquake resistance project[126] is contributing to the improvement of earthquake resistance of buildings in the Central American region. Risks of buildings against earthquakes can be alleviated if the proposed earthquake resistance technology is adopted in construction standards and applied to actual construction cases. In reality, however, the incorporation of the technology into the national legal system and the popularization and implementation of the technology are big issues to be confronted.

Furthermore, living in regions with high disaster risks constitutes a potential risk factor. The common problem for the Central American countries is that many poor people live in lowland along rivers with high flood risks and on slopes with high landslide risks. In particular, urban planning and land use policies not based on the viewpoint of disaster risk reduction in large cities pose big problems and, unless they are solved, no substantial risk reduction can be achieved. The incorporation of the viewpoint of disaster risk reduction in the urban planning and land use policies needs long-term efforts for several years to several tens of years until the actual disaster mitigation effects are achieved. However, this is an inevitable task in order to reduce disaster risks from a long-term viewpoint.

(5) HFA5：Strengthen disaster preparedness for effective response at all levels

According to the recent experience of disasters, the techniques and systems for emergency responses are improving. The disaster risk reduction agencies and the Red Cross societies in the South American countries are preparing for emergency responses. Some donors are setting up storage bases for emergency equipment, food, etc. When the Haiti earthquake struck, international agencies and donors provided emergency responses on a prompt and long-term basis. Although the required amounts of equipment and food significantly vary according to the disaster scale, the trend of advance preparation is progressing steadily.

[126]Project for Enhancement of Technology for the Construction of Earthquake-Resistant Popular Housing in El Salvador (2003 – 2008), "Project for Improvement of the Earthquake-Resistant Housing Construction Technology" in Nicaragua (2010 – 2013)

3.1.2 Needs trend of each country

(1) Guatemala

Whereas SE-CONRED lists numerous projects, equipment, facilities that it hopes to be implemented, supplied, and constructed, it is important that SE-CONRED itself verifies the effects of them and determines the order of priority for them.

Even about ten years after the completion of the hazard mapping project[127] of JICA, INSIVUMEH publicizes and utilizes the information whenever an opportunity arises. However, the information is becoming out-of-date so it is requesting to have the hazard maps revised.

In the urban areas, integrated land use and centralization of real estate have progressed, making the area vulnerable to disaster risks. Thus further assessment of the hazard and improvement of hazard maps and consequent risk analysis and mapping are expected. The disasters caused by the tropical storm 12E and Agatha in Guatemala revealed that many occur in the areas of volcanic sediments and it indicates disasters are closed related to volcanoes. In this sense, SE-CONRED is expected to work together with INSIVUMEH to cope with volcanic disasters in the areas of volcanic sediments. It should include in addition to the volcanic eruption, volcanic debris flows caused by heavy rain, and slope failures on plateaus of volcanic sediments such as in Guatemala city. Establishment of early detection and warning system and subsequent evacuation system, and restriction of land use in risky areas will be necessary. Furthermore, the earthquake observation equipment is obsolete, then it is requesting to have a more accurate analysis system with which a seismic focus can be determined on a real-time basis.

Furthermore, INSIVUMEH and MICIVI General Road Directorate are requesting for a continued project regarding highway slope disasters examined in the "Preparatory Survey for Disaster Prevention Program in Guatemala (2009)" by JICA.

(2) El Salvador

MOP/DACGER, a counterpart in the "Technique Assistance Project for the Department of Adaptation for the Climate Change and Strategic Risk Management for Strengthening of Public Infrastructure" by JICA, seemed to understand the positions of projects by JICA and showed a strong sense of responsibility for the projects related to disaster risk reduction. According to the information acquired in the hearing survey, the government agencies and universities in El Salvador is the most promising in the Central American countries in terms of technical sustainability.

El Salvador regards the measures against climatic change very important, and thus, the needs

[127] The Study for Establishment of Base Maps and Hazard Maps for GIS in the Republic of Guatemala (2000 - 2003)

for improvement of capacity of urban drainage channels and measures against land slides are high. In order to satisfy the needs for measures against climatic change and establishment of safe road network, the following comprehensive measures will be required: safer bridge structure, measures against erosion of road shoulders by rivers, measures to stabilize cut-soil slopes, and traffic restriction system according to the rainfall intensity.

In coping with TSUNAMI disaster, it is necessary to collaborate with Nicaragua to establish a warning system. If the source area of the TSUNAMI waves is in Nicaragua, it is necessary to receiver the information immediately from Nicaragua where the detection and warning system is relatively sophisticated. Also, it will be necessary, from the viewpoint of realizing the TSUNAMI monitoring system along the entire Pacific coast, to establish the warning system for the whole Central America.

An earthquake resistance project [128] should contribute significantly to improving the earthquake resistance of popular houses for low-income earners and become a base for collaboration in the Central American region for the sake of popularization of earthquake-resistant construction in the future. Both UCA and UES which will play central roles in the project are hoping for continued support from Japan.

(3) Honduras

The risk of large earthquakes and volcanic eruptions in Honduras is relatively lower than the other five countries in the Central America. Meanwhile, the floods and land slides occur more frequently than in those countries. The steep landscape and unstable geology coupled with development of natural slopes and intensive deforestation cause floods and land slides whenever there is heavy rain. In flood mitigation, promotion of measures such as improvement of river banks and upgrading of flood warning system is required. In measures against damage to infrastructure by land slides, recognition of hazard of various infrastructure, mainly roads (land slide hazard survey), should be done first and then, a comprehensive risk of land slides should be evaluated, and finally the implementation of the hardware measures should start from those with higher priority. Also, as part of measures against land slides in regional and city levels, proper land use planning and land use regulations that will help reduce land slide damage will be needed.

COPECO did not necessarily play a role in the BOSAI project on its own initiative. COPECO rarely took part in the projects related to disaster risk reduction and even subcontracted the

[128] Project for Enhancement of Technology for the Construction of Earthquake-Resistant Popular Housing in El Salvador (2003 - 2008)

operations to the Tegucigalpa city CODEM at times. On the other hand, CODEM and CODEL show a high need for community disaster risk reduction and their expectations are high for the continuation and next-phase projects of BOSAI. Actually ,several projects in disaster prevention sponsored by other donors and NGOs were confirmed. In this regard, they are interested in the problems of droughts, salinization of farmland, etc. which were not addressed previously.

Also, the government agencies in Honduras are now interested in taking measures against drought and salinization of farmlands that they have not been dealing with. SOPTRAVI is seeking to add the river flood control on the southern Pacific-coast rivers and the northern Atlantic-coast rivers to the measures so far taken by the government and thus change the mechanism of disaster prevention on rivers by changing the viewpoint to utilize the capacity, technology, and funding of the private sector and amending the law. In research and education on disaster prevention, continuation of JICA's education and technical cooperation concerning landslides in UPI is hoped for.

(4) Nicaragua

Nicaragua has established a tsunami monitoring and early warning center, having an early warning system for tsunamis in operation. Thus, Nicaragua has experience and high interest in disaster monitoring and early warning as well as needs for sophistication of tsunami observation and early warning, construction of an earthquake and volcano observation system, etc.

INETER is seeking to improve the equipment and capacity in order to upgrade the existing tsunami monitoring and early warning system currently in operation. The future issue for INETER is to foster human resources (educational institute, research center, etc.) regarding earthquakes, tsunamis, river floods, volcanic disasters, and landslides. It is seeking personnel who have master or doctor-level knowledge and technical capability and can deal with these types of disasters.

SE-SINAPRED is pursuing as priority issues the disaster risk management in Managua city, a densely populated area, and promotion of efforts for tsunami disaster risk reduction in the major cities on the Pacific coast.

In this country, JICA had an NGO implement a project where community level disaster management was integrated into agricultural development in rural areas. One of the lessons obtained from this project is that it is effective to conduct a disaster management project along with measures to improve income levels and sanitary situation of target communities. This finding indicates potential need for promoting “disaster prevention” to the main issues in development.

International aid organizations and other donors mainly provide assistance in the area of

identification of disaster risks. (information system, database establishment, risk assessment) and this indicates a high needs in this area. However, also important is the assistance to strengthening preparation for future disaster, which has not been implemented in big scale.

(5) Costa Rica

Costa Rica has research and observation organizations such as OVISICORI that can undertake initiatives in the Central America region with a world level seismic and volcanic observation network. It is expected that by effectively combining these resources, the knowledge, experience, and know how in seismic and volcano observation can be spread to other countries to improve their capabilities.

Costa Rica has formulated and developed the legal system and plans associated with urban planning and land use policy in connection with disaster prevention. Also, a strategic action in "Social Sector and Poverty Support Measures", which is an important issue in the "National Development Plan 2006-2010", is to formulate and implement national, regional, and local land use plans and urban development plans. In addition, there are organizations and budgets[129] that are capable of contributing to the promotion of disaster risk reduction urban development. There are trainees that have returned from the third country training "Urban Planning System and Land Management Instruments" held by JICA in Columbia that belong to MIVAH. Also, MIVAH are using these returned trainees in JICA's follow-up cooperation (dispatch of third country specialists from Colombia's National Department of Planning), who are engaged in formulating and spreading national development plans, land-use policies, and urban plans that incorporate the viewpoint of disaster risk reduction. Therefore the needs and implementing capacity for disaster risk reduction planning in Costa Rica is high. In addition, personnel changes in government staff due to changes of government in Costa Rica are comparatively small, so it is considered that they can undertake disaster risk reduction urban planning which requires undertaking initiatives from a long-term point of view.

Japan has experience in community-level disaster prevention and in emergency support at the time of disaster and is expected to provide continued assistance in community-level disaster prevention measures. The record of the projects by international organizations and other donors indicates that there is also high need for capacity development for early warning system and vulnerability assessment.

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[129] Examples of organizations that can contribute to the promotion of disaster risk reduction urban planning: UNGL, IFAM, and DINADECO. DINADECO provides funding assistance for various activities including community disaster risk reduction.

(6) Panama

In Panama a tsunami and flooding early warning system has been constructed, and they are aiming to improve it further.

SE-SINAPROC is focused on a disaster risk reduction academy for the education and development of personnel associated with disaster risk reduction, and they want to strengthen their capabilities. The facilities of the disaster risk reduction academy are old, and specialists from the BOSAI project have pointed out its problems as a training facility. However its role is important, therefore a facility for training is required.

In Panama the activities carried out to date have been in connection with disaster response, but currently they are starting to recognize the importance of initiatives for preparation prior to a disaster. The needs for disaster risk reduction urban planning in Panama City are also increasing, where the fragility with respect to disasters is increasing with the rapid economic development and increase in population.

Japan has experience in community-level disaster prevention and emergency assistance at the time of disaster and is expected to continue the assistance in community-level disaster prevention. International organizations and other donors conducted many aid projects in establishing legal system concerning disaster management, indicating a high need in this field. On the other hand, there have not been many project in strengthening preparation (various training and human resources development concerning disaster prevention) for emergency measures. It is, thus, considered worthwhile to study possible assistance in this field.

3.1.3 Summary of needs trend in each country

The needs of each country are diverse, but the main needs from Japan as identified in this study are a continuation of community disaster risk reduction projects, guidance on advanced disaster risk reduction technology, and support for strengthening infrastructure such as roads and rivers, etc. The following is a summary of the needs of each country. The countries put focus on climatic change and the needs for improvement of drainage capacity of urban drainage channels and improvement of capacity of measures against land slides are high. In order to satisfy the needs for measures against climatic changes and establishment of safe road network will require a comprehensive disaster prevention approach including safer bridge construction, prevention of erosion of road shoulders by rivers, stabilization of cut soil slope, and regulation of traffic depending on the rainfall intensity.

Table 38 Needs of each country

Country	Needs of each country
CA Region	・ DRM capacity development of central government ・ Capacity development of DRM in community level ・ Human resource development in the field of DRM ・ Regional development planning with consideration to DRM ・ Road Improvement project by maintenance manual of road and bridge (SIECA)
Guatemala	・ Community activities for DRM ・ Capacity development for DRM, improvement of early warning system, risk reduction by DIPECHO project in local government ・ Master plan for Samara river basin management ・ Project for slope disaster mitigation of national highway ・ Revision of the hazard map ・ Capacity development in coping with disasters in volcanic areas(warning, evacuation, instruction of appropriate land use etc.). ・ Risk mapping and risk management based on the risk assessment ・ Update of seismic-observation equipments and analysis system
El Salvador	・ Improvement of drainage of urban channels and land slide measures as part of measures againt climatic change ・ Community activities for DRM ・ Continuation of the earthquake resistance project (introduction of seismic resistance standards and dissemination of quake-resistant technology) ・ Capacity development and support for Secretariat of Vulnerability Affairs ・ Collaboration with Nicaragua in TUNAMI warning system and establishmen of cross-boarder warning system in Central Ameria.
Honduras	・ Community activities for DRM (Flood, Landslide, Drought, damage of farmland from salt water, early warning system, capacity development of CODEL/CODEM) ・ Measures against land slides in urban areas (assessment of land slide hazard, monitoring, measures against land slides) ・ Countermeasure for erosion, reinforcement of riverbanks, improvement of bridges, countermeasure of rising riverbed) in Choluteca river basin. ・ Assessment and countermeasures for production activity by climate change ・ Countermeasure of flood in area of the northern Atlantic coast ・ Landslide technical transfer and education to UPI (Continuation)
Nicaragua	・ Community activities for DRM ・ Support for facilities/equipments of tsunami monitoring and early warning system ・ Human resource development for earthquakes, tsunamis, floods, volcanic disaster and landslide (Support for education facilities/ training center) ・ Human resource development for INETER's capacity development (masters and doctoral level professionals) ・ Mainstreaming of disaster prevention (not just directly applied technology but inclusion of measures to improve income and sanitation of communities) ・ Identification of disaster risks (information system, database installation, risk assessment etc.) ・ Strengthening of preparation for emergency measres against disaster
Costa Rica	・ Community activities for DRM ・ The national development plan, land use policies and urban planning incorporating viewpoints of DRM ・ Coordination and capacity development for seismic/volcano observation institutions ・ Capacity development in early warning system and assessment of disaster risks and vulnerability.
Panama	・ Community activities for DRM by upcoming project of BOSAI ・ Capacity development of SE-SINAPROC's academy (problem of aging facilities) ・ Improvement of land use policy for vulnerability reduction in urban area which is continuing rapid economic development and population growth ・ Revision of leagal framework to put high priorities to disaster prevetion issues in national and district level. ・ Strengthening of preparation for emergency measres against disaster (training and human resouces development concerning disaster preventikon)

In the Central America region non-structural measures (soft measures) are required in addition to structural measures (hard measures). One soft measure is community disaster risk reduction. In Central America community disaster risk reduction activities are at the stage of

becoming established as result of the activities of donors, in particular JICA, and their results are steadily increasing. The BOSAI project has been highly evaluated in the Central America region, and the needs of government organizations, local administrative organizations, NGOs, etc., are high. However, in order to obtain a large impact and effect from a limited investment, it is necessary to summarize the results from the community disaster risk reduction carried out to date and their needs (target communities, implementation system, details of activities, etc.), and reflect them in future national plans for disaster prevention.

Also, for organizations responsible for infrastructure and research and observation organizations, there is a need for projects and equipment to expand their work in their respective fields.

3.2 Cooperation with Mexico

Mexico is situated in a similar tectonic and climatic setting as those of the Central American countries and has high risks of earthquake, TSUNAMI, volcanic eruption, land slides, and floods. Also the countries use the same language and has similar cultural backgrounds. From this context, Mexico has played a leading role in Stouth-South cooperation in this area under JICA's assistance.

After the earthquake that occurred on September 19, 1985, the Mexican Government requested technical cooperation for the development of an earthquake monitoring network and the establishment of a disaster prevention center. Based on this, CENAPRED was established in 1988, which carried out south-south cooperation as a base of technical support for earthquake disasters and volcanic disasters not only within Mexico, but also within the Central America and Caribbean region.

In this survey, in order to obtain fundamental information on the present status of CENAPRED and universities, and to study the possibilities for future south-south cooperation with Central America as the target, the relevant organizations were surveyed.

3.2.1 Current situation of each institution based on the interview survey result

(1) Ministry of Foreign Affairs

The disaster risk reduction organization of the Mexican Central Government is the National Civil Protection System of the Secretariat of the Interior, which carries out disaster risk reduction activities and emergency response within the country. National disaster risk reduction plans, state disaster risk reduction plans, and municipal disaster risk reduction plans have been

established, but in many cases they are not linked. On the other hand, during a disaster there is a consistent chain of command (the country determines the emergency response, and the state carries out the activities locally in accordance with that response).

The region of Central America that connects with Mexico has a similar disaster environment, and belongs to the same Spanish language area, so it is considered that the knowledge of Mexico can be easily used in the countries of Central America. The Mexican government places importance on Central American disaster risk reduction support, and wishes to continue it, but the problem is that there are no funds.

When a disaster occurs in the Central America or Caribbean region, support is provided via a special emergency fund. The emergency response to the Haiti earthquake was on an exceptionally large scale. Sixty hours after occurrence of the earthquake the Mexican government provided emergency goods and personnel support in a so-called shuttle manner via an air bridge (30 flights), and a sea bridge (5 vessels). Thereafter 1,300 personnel were sent over a period of six months, and even thereafter support continued.

The Mexican Government has financial problems, and it is difficult to continue even with personnel support. Support for other countries with limited disaster risk reduction is limited, and tending to reduce.

(2) National Center for Disaster Prevention （CENAPRED : Centro Nacional de Prevención de Desastres)

CENAPRED belongs to the Secretary of the Interior, and is one of the national disaster risk reduction organizations. They are engaged in a wide range of activities such as surveying, monitoring, research and testing, risk management, and education. CENAPRED is an organization that is a symbol of the cooperative relationship between Japan and Mexico that carries out advanced scientific research on earthquake observation, volcano monitoring, climate, etc. The scope of their work activities is focused on scientific research, education, and dissemination activities.

There is a total of 108 staff members at the CENAPRED headquarters, of whom 50 are technical, and remaining 58 are responsible for management, planning, training, dissemination, and services. As a result of a reorganization in 2009, the present organization consists of a Management Department (management, technical service), and a Technical Department (surveying, equipment installation and IT, risk analysis and management, capability strengthening, and dissemination activities).

Escuela Nacional de Protección Civil has three bases within Mexico. Ten teachers are deployed at each base (total 30), who provide guidance to instructors in each area. Escuela Nacional de

Protección Civil has been established with national disaster risk reduction funds, and CENAPRED is responsible for education. Specialists in earthquakes, floods, wildfires, and chemical risks are deployed at Escuela Nacional de Protección Civil.

CENAPRED cooperates in research and dissemination of seismic analysis and seismic resistant structures. Regarding Mexican south-south cooperation (the Japan-El Salvador-Mexico TAISHIN (seismic resistance) project), relationships with El Salvador are good (support for UCA and UES, etc.), and they are scheduled to continue. They are said to have succeeded in the technical aspects and dissemination aspects of projects for the dissemination of new construction technology, and low cost seismic resistant housing.[130] Other examples of south-south cooperation include surveys, research, and disaster risk reduction support for volcanic eruptions in Ecuador, landslides in Bolivia, and tsunamis in Costa Rica, etc.

CENAPRED recognizes the difficulties of south-south cooperation, and does not acknowledge that Mexico is in a position of leadership in Central America even on the technical level, and they are unable to respond to all the requests for international assistance from the Central America region.

(3) National Autonomous University of Mexico （UNAM ：Universidad Nacional Autónoma de México)

The Geophysics Department and the Engineering Department of UNAM are members of the scientific advisory committee organization of CENAPRED.

About 1/4 of the graduate students in the research laboratory of the Engineering Department of UNAM come from other countries in Central and South America. There are Central and South American students carrying out surveys and research at the Graduate School of Geophysics in order to obtain master's degrees and doctorate degrees. The number of students from the Central America region is small (most of the students are from Columbia, Peru, Ecuador, and Venezuela, and some of the teachers are also South Americans). There are not many academic links with universities of the Central America region.

In November 2012, a conference on geophysics is scheduled to be held in Puerto Vallarta, Jalisco Province (the main topics will be oceanography, seismology, volcanology). Researchers from the countries of Central and South America have been invited to this. Organización de los Estados Americanos (OEA) provides scholarships for Central and South American students aiming to acquire master's degrees and doctorate degrees in geophysics at UNAM.

The Geophysics Department of UNAM supports each country of Central and South America through the Ministry of Foreign Affairs. The Volcano physics group has supported the preparation

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[130] http://www.jica.go.jp/activities/issues/ssc/case/04.html

of a volcano hazard map in Nicaragua, and in addition they have experience of carrying out assistance projects for earthquake disaster risk reduction in El Salvador and Guatemala.

If an international project (research, study groups, training camps, student and teacher exchange system) can be carried out under the cooperation and auspices of JICA and UNAM, all the countries of Central and South America will benefit, and this would be an opportunity for link ups.

3.2.2 Cooperation with Mexico and the Six Central American Countries

(1) Areas of potential cooperation

1. Support for an emergency fund when a disaster occurs in Central America
2. Curso Internacional Multidisciplinario de Programas de Protección Civil y Prevención de Desastres[131] is being implemented as a 5-year program from 2007, which is expected to result in link ups in fields related to community disaster risk reduction such as landslides and floods, that are related to multiple fields such as geology, hydrology, seismology, geomorphology, social economics, etc.
3. Continuation of BOSAI, limited participation in next proposal
4. Cooperation to the extent possible in seismic analysis and seismic resistant structures
5. Support for research organizations and universities such as UCA and UES in connection with seismic resistance
6. Support for surveys and research on tsunamis in Central America
7. International project (research, study groups, training camps, student and teacher exchange system) under the cooperation and auspices of JICA and UNAM
8. Preparation of volcano hazard maps in Guatemala, and earthquake disaster risk reduction support projects in El Salvador and Guatemala by the Geophysics Department of UNAM
9. Geophysics meeting in Puerto Vallarta, Jalisco State (main topics oceanography, seismology, volcanology)
10. OEA's scholarship system for students from Central and South America

(2) Difficulty of coorperation

With the financial difficulties of the Mexican Government and the frequent occurrence of disasters within the country, assistance to other countries is on a downward trend. CENAPRED is limited in the assistance they can provide to other countries, due to the amount of their work within Mexico and a shortage of staff. Also, they do not acknowledge that Mexico is the leader in Central America on the technical level.

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[131] JICA third country group training "International Multidisciplinary Course on Civil Protection and Disaster Prevention Programs"

On the Central American side there are merits from the point of view of similarity of disasters and belonging to the same language area. However other countries with different technology and culture have an attraction, and the interest in the United States, Europe, and Japan among students and researchers of Central America is high. Also, it has been pointed out that there is overlap in the research fields for interchange at the researcher level, so new knowledge or reference information cannot be obtained.

It is considered that as long as the financial situation continues as at present, it is difficult for JICA to expect south-south cooperation from Mexico, and in particular from CENAPRED.

3.3 Possibility of cooperation with other donors

The following is a summary of the potential for JICA to tie up with other donors, based on information obtained from a survey of donors planning and implementing disaster related projects in the 6 Central American countries.

Donors can be broadly divided into multi-donors (international organizations, Central and South American and Caribbean organizations, etc.) and bilateral donors. Each donor has their own strategy and preferred fields, and it is desirable to construct a cooperative relationship with them after determining these.

IDB is said to be strong in risk evaluation and analysis, and USAID is said to be strong in disaster response. DIPECHO has excellent achievements in community disaster risk reduction, and is scheduled to continue these in the future. Regarding nonstructural disaster risk reduction measures (soft measures), these other donors provide funds and support for legal system development, and JICA provides technical support locally.

JICA signed a partnership agreement for the sustainable economic growth and environmental improvement in Central America and the Caribbean region with IDB March 2009. [132] Based on the agreement, the memorandum of understanding for establishing a co-financing framework on recycling/energy saving in Central America and the Caribbean region was signed in January 2011. [133] The statement of mutual agreement of the "CORE Sheme" (Co-financing for Renewable Energy and Energy Efficiency Scheme) was signed in March 2012. Moreover, this co-financing project was confirmed to promote the mitigation of climate change. [134]

BCIE and IDB provide funds for infrastructure development projects (in particular roads and bridges). A link up is conceivable with these organizations being responsible for funding aspects, and JICA being responsible for technical aspects, such as formation of infrastructure projects that

[132] http://www.jica.go.jp/press/2009/20090401_01.html
[133] http://www.jica.go.jp/press/2010/20110114_01.html
[134] http://www.jica.go.jp/topics/2012/20120406_02_02.html

incorporate a disaster risk reduction point of view, or strengthening of technical capability or organization capability in order to strengthen disaster risk reduction.

To date AECID has responded over a wide range from the government level to community level. However the cooperation plans of AECID for the future do not emphasize disaster risk reduction, so a link up is considered to be difficult.

To strengthen infrastructure disaster risk reduction, it is important to incorporate a disaster risk reduction point of view in normal infrastructure development projects. A link up in which BCIE and IDB supply funds for infrastructure development projects, and JICA supports the technical aspects is conceivable.

The following is a description of the profile of the organizations with which there is high possibility of a link up with JICA on disaster risk reduction programs.

Table 39 Potential for JICA to tie up with other donors[135]

Name	Strategic/strong area	Point of cooperation
USAID/ OFDA	Training for disaster risk reduction and emergency response. Support for capacity development of fire brigades. Hazard map making with USGS	Same stance with JICA's cooperation (Focus on CEPREDENAC) Cooperation is required in the area of capacity development, DRM education, evacuation site improvement, risk reduction, earthquake-resistant construction technology.
DIPECHO	Community activities for DRM (DIPECHO5, 6 and 7), small basin management, drought countermeasure, humanitarian assistance, infrastructure reconstruction, disaster risk reduction.	Cooperation is required for upcoming project BOSAI. DIPECHO Honduras has experiences of reconstruction, small business assistance, provision of seeds. JICA and DIPECHO have the areas that can be cooperated with each other, such as community DRM project in south area of Honduras. DIPECHO has information about the capacity of organizations which have DRM activities. This information is important for JICA's future projects.
AECID	Capacity development of government agencies, cooperation with CA regional organizations such as CEPREDENAC and SIECA	AECID cooperation plan (2010-2014) does not include the important item of DRM. But, cooperation with NGO and achievements of past cooperation would be helpful. Manuals for DRM of road by AECID, CEPREDENAC and SIECA should be utilized/shared.
GIZ	Project for climate change, risk management and disaster mitigation in Guatemala, Honduras, Nicaragua.[136]	Information exchange is required for tsunami early warning system, land use planning considering with DRM and climate change issue.
COSUDE	Community activities for DRM, disaster risk reduction, emergency assistance. COSUDE has a plan of project for disaster risk reduction and climate change in Nicaragua and Honduras 2013-2016.	Information exchange is required for community activities of DRM in Nicaragua.
NORAD	Implementation of project of DRM for infrastructure（information by CEPREDENAC）. There was no response about request of interview survey and questionnaire sheet	Information collection survey is required regarding to the DRM of infrastructure.
Italy	Provision of equipment and training for utilization the equipment in community of Guatemala	Information exchange is required for upcoming project BOSAI.
Taiwan	Advanced technology, such as information technology, database creation	Provision of related information. Cooperation with JICA and Taiwan as same East Asian countries
UNDP	Development and poverty reduction in local governments and community.	Information exchange is required for upcoming JICA's project because of many similar projects with JICA.
ECLAC	Capacity assessment of government agencies and training	Funds are few but positive for capacity development of government agencies

[135] Study Team (2012)
[136] http://www.giz.de/en/SID-F68A5E0B-99A51C6E/worldwide/north_and_central_america.html

PAHO	Health, medical. Capacity assessment of hospital for disaster.	Cooperation with NGO related with health and medical sector. Cooperation with JICA is expected.
World Bank	Funding, hazard mapping, risk assessment, capacity development of government agencies.	Japan Social Development Fund (JSDF) and Policy and Human Resources Development Fund (PHDF) of the World Bank have asked for JICA's comments with respect to the viability of new projects. The possibility of cooperation among these organizations should be considered after appropriate information has been collected
IDB	Funding, policy support, risk assessment, risk reduction, DRM capacity development of community, support infrastructure development	The memorandum of understanding on cooperating on promoting climate change countermeasures and co-financing schemes is signed. It is also hoped that cooperation in the disaster prevention sector related to the 2011 Great East Japan Earthquake can further strengthen such cooperative ties. Japan Special Fund (JSF) and Japan Special Fund Poverty Reduction Program (JPO) by IDB have cooperation experiences with JICA's projects (such as Technical Cooperation, training, etc.). There is a possibility of the cooperation which may increase the impact of project by IDB and JICA in the future.
BCIE	Funding and disaster risk reduction through infrastructure construction. Capacity development of government agencies.	Possibility of coordination BCIE's financial assistance and JICA's technical assistance

The following diagram maps the range of activities of the main donors and JICA, based on the survey results to date. JICA is engaged in government level activities to strengthen the capabilities of the disaster risk reduction coordination organizations of the central governments of each of the countries and community level disaster risk reduction activities. JICA's range of activities is broad, ranging from non-structural measures (soft measures) such as raising awareness and disaster risk reduction education, to structural measures (hard measures) such as landslides, floods, and earthquake resistance. There are areas of overlap with the range of activities of other donors, and activities have been carried out to date through cooperation, but in the future it is expected that activities will be undertaken to increase the output effect of the investment, while supplementing mutual strengths and weaknesses.

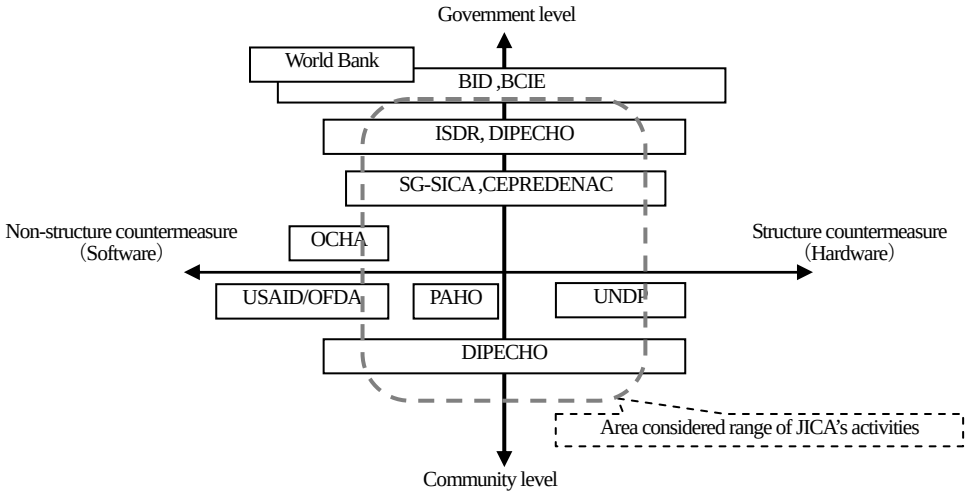

Figure 26 Mapping image of activity area of donors[137]

[137] Study Team (2012)

3.4 Possibility of cooperation with universities, NGOs, and the private sector

3.4.1 Possibility of cooperation with universities

In many cases in the Central America region public servants are changed whenever there is a change of government. On the other hand researchers at universities tend to remain for a comparatively long period of time at the same institution compared with public servants, and continue the same research. It is considered that nurturing these continuous resources is important for personnel development. For survey research into disaster risk reduction which requires specialized knowledge and techniques, it is essential to link up with universities. In addition, graduates become public servants or work in private companies, which have advantages for link ups from the dispatch point of view. Also, it is desirable to positively investigate the use of students, in particular internees, to participate in disaster risk reduction projects.

Overseas training in Japan or dispatch of researchers or advisors from Japan is expected from the academic point of view and technical point of view. Landslide specialists have been dispatched by JICA to UPI, and continued support is expected by UPI. Also, there are landslide specialists and researchers at UNAM-CIGEO, and in addition they have excavation machinery and soil test apparatus and equipment. It is expected that there should be link ups between these universities and Japan in connection with landslides.

In this way link ups with universities are possible in a broad range of disaster risk reduction fields, viewed from the technical, knowledge, accumulation level and continuity perspectives.

The following table shows the activities, fields of excellence, and content of link up with universities with which a link up is possible.

Table 40 University/research institutions related to DRM[138]

Name	Achievements, activities, potential cooperation
USAC (Guatemala)	The undergraduate students of USAC must choose either the writing of a thesis or participation in seminars as a requirement for graduation. One of the seminar assignments is community DRM activity. Effects such as smooth communication with residents can be expected by cooperation with upcoming BOSAI project and USAC student's DRM activity. Landslide researchers belong to the engineering geology department (Ingenieria Geotécnica).
UCA (El Salvador)	UCA is a private university and the counterpart to JICA's TAISHIN project. In Phase 1 of the project, 48 people participated in the training. Approximately half of them are working as teachers and the rest have found places of work in the private sector, etc. In Phase 2, 40 people participated in the training. UCA has potential to be the center of human resource development in the area of seismic engineering in Central America. As a model of further development of the South-South Cooperation, the counterpart in TAISHIN project is providing assistance to JICA's Earthquake-Resistant Housing project in Nicaragua. While UCA has a researcher studying earthquakes, it does not have an expert or a department studying geology or landslides.
UES (El Salvador)	UES has departments involved in research in DRM, such as the Departments of Volcanology, Seismology, Geology, Geo-thermal Dynamics and Mathematics in the Faculty of Science where basic research is conducted. The Department of Geotechnics in the Faculty of Engineering is engaged in comprehensive research on disasters. Dr. Edgar Armando Peña Figueroa, who received a doctorate degree from Yokohama National University, was appointed as the Director of the School of Civil Engineering. The School of Engineering takes a favorable view of participation of its students in BOSAI project during the one-year internship period before graduation. There is

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	no researcher and department of landslide.
UPI (Honduras)	UPI is a new private university founded in 2007 with strength in engineering, particularly civil engineering. It aims to foster engineers for new national land development. At UPI, overseas senior volunteers and experts delegated by JICA in "Hazard Geology Focusing on the Landslides in Tegucigalpa" are giving lectures and teaching students. UPI is enthusiastic in learning and hopes for continued assistance by Japanese experts.
UNAH/IHCIT (Honduras)	UNAH, founded in 1847, provides high-level education and performs academic-level coordination of master's and doctor's degrees. As to disaster risk reduction study, UNAH founded IHCIT after Hurricane Mitch, based on the recognition of the importance of geological study and education in terms of disaster risk reduction. This institute studies the formation of disaster risk reduction culture, mechanisms of disasters, and prediction and warning systems for disasters. There is no researcher of landslide, but there are experts of applied field and risk management.
UNAM-CIGEO (Nicaragua)	At UNAM-CIGEO, geology, geophysics, and disaster prevention (landslide, earthquake, and volcano) are researched. The subject being focused by UNAM-CIGEO is the update of the hazard map based on the detailed fault investigation in Managua, as well as the tectonic survey, modeling of the crustal structure, and landslide survey.
UNI (Nicaragua)	UNI is the operating body of the aid of JICA, "Improvement of the Earthquake-Resistant Housing Construction Technology". A course for the master's degree for disaster prevention is available at the Innovation Center of UNI. The subjects taught in this course include i) land use plan for disaster prevention, ii) risk management (risk assessment, hazards of an earthquake, and identification of hazardous areas), and, iii) climate change, etc. UNI is advising the central government on how to minimize the risk of disasters.
OVSICORI (Costa Rica)	OVSICORI is a research institute where seismic activities are monitored, and the risk of earthquake is announced to the citizens through the media. OVSICORI consists of the following three groups; i) seismology (including monitoring), ii) volcanology, and, iii) application research (such as research on the seismic activity of Nicoya Peninsula). There is around 25 staff. OVSICORI is a member of a worldwide seismic observation network consortium (see footnote for details), and has 20 fixed points of seismological network (online and real-time observation). OVSICORI has played a lead role in seismic observation in CA.
PREVENTEC (Costa Rica)	PREVENTEC was established in 2007 as one of the programs of the University of Costa Rica. It consists of 10 staff who are teachers or researchers of the 26 departments of the University of Costa Rica (specialized in economy, seismology, sociology, geology, engineering, psychology, programming, statistics, remote sensing, and GIS, etc.).
UP/IGC (Panama)	There are 5 staff in total in UP/IGC, consisting of specialists for seismology (2), volcanology (2), GIS for disaster prevention (1), tsunami (1), and landslide (1). IP/IGC operates the national real time earthquake/volcano observation network (around 10 observation stations), and provides data to SINAPROC.

3.4.2 Possibility of cooperation with NGOs

There are many NGOs carrying out activities in community disaster risk reduction. Many of these NGOs have characteristics based on the aims of establishment of the respective NGOs, the objectives of the projects, the staff specialization, etc. It is necessary to investigate the possibility of a link up after determining the achievements and fields of excellence of the NGO, etc. The following table summarizes their fields of excellence, past achievements, sources of funds, etc.

Table 41 NGO related DRM activities[139]

NGO name	Achievements, activities, potential cooperation
CARE International	CARE International is an NGO working in four countries, Guatemala, Honduras, El Salvador, and Nicaragua. The El Salvador office has a role as the headquarters in the Central American region. The office of each country is located in its capital city and there are site offices at the places of activities. In the disaster risk reduction project in Usulután city, it is entrusted by DIPECHO to perform disaster risk management (DRM) mainly consisting of preparation for disasters and disaster risk reduction education.
International Federation of Red Cross	The Red Cross societies in various countries are working under the International Red Cross or the International Red Crescent Organization. Each of the countries in CA has a

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Societies	Red Cross headquarters, which is working in the framework of legislative systems and disaster risk reduction organizations. The organization consists of full-time employees and registered volunteers. The Red Cross society of each country helps disaster victims by securing and distributing food, water, medicines, daily commodities, etc.; helps the sick and wounded by providing care as an emergency hospital, supply of food and water, and pediatric health maintenance; helps disaster victims and evacuees by providing dwelling, epidemic control, health maintenance, production assets, and vocational training; and provides humanitarian support by protecting family bonds.
Plan International	Plan International is an international NGO, which works on the theme of protecting the rights of children. With regard to disaster risk reduction, disaster risk management and mitigation are considered from the standpoint and viewpoint of children. Taking into consideration that children tend to be ignored or subject to violence or abuse, Plan International examines such disaster-time problems in advance and provides support by protecting children from neglect or abuse, ensuring health and sanitation of them, securing safe food and water for them, and helping them attend schools
ASODEL	ASODEL is implementing project for vulnerability reduction of climate change and natural disasters in Chinandega of Nicaragua. The training for DRM in community has been held with JICA
CRS (Catholic Relief Services)	CRS is an international humanitarian organization of the Catholic community. CRS has been active in 17 countries (El Salvador, Guatemala, Honduras, Nicaragua, Mexico, Haiti, etc.) in Central America and the Caribbean region. CRS's project sector is following;; agriculture, water, sanitation, health, education, emergency response, hunger, malnutrition, peace, human rights, public policy, such as microfinance.

3.4.3 Possibility of cooperation with private sector

In order to promote disaster risk reduction countermeasures, it is important that they become rooted in ordinary society, through cooperation with the private sector, not just with public research organizations or administrative organizations. Therefore it is necessary that, for example, private consultants or contractors engaged in building construction become familiar with the knowledge and techniques of disaster risk reduction. Also, the accumulation of technology in the private sector is not affected by changes of government so its continuity can be ensured. A survey was carried out of private organizations related to disaster risk reduction, in particular building, civil engineering, and geology, from the point of view of implanting and spreading this type of disaster risk reduction technology within society. The following table shows the private organizations, the achievements of their activities, their fields of excellence, and content of link ups. Almost all the groups that participated in the interviews had experience of projects with government organizations of each of the countries and other donors, and in most cases had existing materials for reference.

Table 42 Private organizations related to DRM[140]

Organization name	Achievements, activities, potential cooperation
CESEM (Guatemala)	Consists of 50 experts and researchers in the DRR geology field including on earthquakes, earthquake resistance, landslides, and volcanoes. Members are from various organizations. It does not, nor is it expected to in future, undertake its own projects, but members are involved in projects in their respective organizations.
CIG (Guatemala)	Its activities are still in their infant stages and have not produced results as yet. CIG has several committees, including on infrastructure, land use, earthquakes, and a subcommittee on house design standards. Networks with DRR experts (incl. geology, landslide and flood experts).

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ASIA (El Salvador)	Approx. 2,000 members, which is 10% of all engineers in El Salvador (approx. 20,000), majority of whom are civil engineers. It aims to i) development and conservation, ii) acquire skills and knowledge, and iii) provide services (particularly in an emergency). Although it has many members, it does not have many with expertise in earthquakes, floods, landslides or disaster emergency response. It is actively holding technical training for government agencies.
World Geologists (El Salvador)	Headquarters are in Spain. Local staffs are: Head of office (engineering geology), seismology, risk management, engineering geology, hydrology and geology. In DRR field conducts landslide, flood and volcanic hazard evaluation projects. Mostly funded by AECID. Has limited staff and capacity, however it produces results of a high standard.
IGH (Honduras)	IGH has a close relationship with UPI. Completely voluntary basis and is not very active. Has a lot of experience in landslide surveys and countermeasures in Honduras, and collaboration with JICA on landslide and ground analysis is a possibility; or alternatively, it can introduce relevant engineers or experts.
CIN (Nicaragua)	Members, 150 in total, come from construction, building materials and consulting companies, independent consultants and architects etc. Supports the development of building standards. In event of a disaster, works with SE-SINAPRED to provide heavy machinery, equipment and building materials from member companies and individuals. Possible to collaborate on drafting architectural/construction laws, or projects in the DRR field.
CFIA (Costa Rica)	CFIA has 24,000 member engineers: civil, technical, mechanical, topographic and architects. Plays major role in developing laws on earthquake resistance, foundation works and electrical fields. Dispatches experts to disaster zones to survey building damage etc. Conducts disaster vulnerability assessments at request of CNE and MIVAH etc., as well as advice and inspection of building quality for government agencies. Also conducts DRR activities; and develops architectural and construction laws.

3.5 Constraining factors and issues for cooperation with related organizations and human resources

3.5.1 Constraining factors for cooperation of related organizations and human resources

The following is a summary of the problem points associated with organizations and personnel in the Central America region, from the results of this survey.

(1) Coordination capacity shortage of government agencies

Most of the donors, including JICA, implement projects with government organizations, in particular disaster risk reduction coordination organizations, as counterparts. However, there is a problem that donors and counterparts often do not sufficiently share the objectives. Also, the counterpart organizations do not have personnel of sufficient quality and quantity, and because the number of projects is large they are busy, and projects are not appropriately managed. In the case of community disaster risk reduction, the disaster risk reduction coordination organization must have a link up with the local government organization, but these link ups are not sufficient for the above reasons.

(2) Problem at the time of emergency response

When a disaster emergency occurs, important staffs are deployed on emergency response, and they must leave their planned projects. In this case implementation and continuation of projects is difficult. In the case of a mega disaster the implementation of projects can be stalled for periods of several years.

(3) Shortage of budget

Each country has financial difficulties so the budgets for disaster risk reduction are small, and individually they are unable to implement special projects. They must rely on donors for the funds to implement special projects. It is necessary that there be a mechanism for securing budgets so that each country can implement important projects (special budgets for disasters or funds for disaster risk reduction, etc.).

(4) Shortage of experts

The number of specialists and technical personnel in disaster risk reduction organizations of each central government is small. There are almost no specialists in local governments. In many cases, activities are carried out by employing consultants, or jointly with NGOs.

(5) Problem of personnel changes and retirement

Most of the countries in Central America have frequent changes of government, and on those occasions the policies and structures of government ministries are changed, and public servants are transferred. As a result it is difficult for disaster risk reduction organizations to accumulate knowledge and experience (there are cases where the employees of the previous government have taken results). There are also cases where the new government negates the results of the previous government. However, transfers are comparatively few in universities or research organizations,

or even within highly specialized technical departments within administrations, so it is considered that the effect of the support can be easily obtained.

(6) Difficulty of cooperation with neighboring countries

It is important that neighboring countries cooperate in cases such as pollution of international rivers or eruption of volcanoes near national boundaries. Also, it is desirable that there should be consultation in advance regarding the disaster risk reduction system and the allocation of roles, etc. However, there are areas where coordination between countries is difficult, such as allocation of budget, implementation system, scope of responsibilities, utilization of results, etc. If it is possible to share radar rainfall observation data with neighboring countries, it could be utilized in response to floods and landslides disasters, but this kind of coordination is difficult, and cooperative link up systems have not been constructed.

3.5.2 Issues for cooperation with related organizations and human resources

The following are the issues associated with organization and personnel, based on the problem points as described above.

(1) Utilization of people who have experience

In most cases engineers continue and are active in their respective specialist fields. In the survey, the state of cooperation with private consultants and engineers was determined. These groups have experience of being commissioned on projects by other donors and government organizations in the past, and have relevant materials and information regarding the country. It is considered that using this kind of information is beneficial for the implementation of disaster risk reduction related projects. Former employees of government organizations frequently transfer to private consultants when there is a change of government, etc., and the use of these persons with administrative experience should also be considered.

(2) Utilization of universty students

There are universities with disaster risk reduction related departments and subjects, with community disaster risk reduction activities as a unit (elective) to meet the graduation requirements. Also, there are examples of students from the medical department of a certain university working as assistants on medical treatment activities at the sites of disasters. Most universities are favorable towards participation in community disaster risk reduction activities, disaster risk reduction training and education. However, in any actual link up it would be necessary to clarify the allocation of roles and scope of responsibilities, etc., so these points must also be investigated.

(3) Utilization of NGOs

There are examples of NGOs who carry out community disaster risk reduction activities

without link ups to other organizations. The national Red Cross of each country, CARE International, Plan International, and so on, have much project experience, have accumulated technology, and have very experienced trainers, etc. There are NGOs with excellent staff in a high position that have been engaged in similar work for 10 years or more. However, in most cases staff are employed for a project, or temporarily, so replacement of staff is frequent, so it is always necessary to determine the current status of staff.

Most NGOs are favorable towards link ups with JICA on disaster risk reduction activities, and are favorable towards link ups on aspects such as securing funds for activities. NGOs have prepared training programs and educational materials, and if these are utilized, it is considered that JICA can effectively implement disaster risk reduction related projects.

(4) Cooperation with private sector

If private industry groups themselves, such as building and civil engineering industry associations or technical associations, geological industry associations, etc., undertake commissions for projects, then the members of those groups will implement the project. There are also cases of direct contracts with private groups. The number of members is large, so it is possible that it would take time to find suitable technical staff, but it is considered that this can be dealt with by using the list of members for each group (the specialist field can also be known).

(5) List of related organizations and human resources

There is a considerable number of organizations and people engaged in activities associated with disaster risk reduction in Central America, but link ups with organizations and promotion of utilization of personnel is not effectively carried out. One reason is because an overview and details of the organizations and personnel have not been determined. Therefore, it is proposed that information be collected by JICA on those associated with disaster risk reduction related projects in Central America, and that JICA should prepare a database of disaster risk reduction personnel in Central America.

3.6 Advantages of Japanese ODA

Based on its experience to date in the Central America region, its disaster risk reduction support projects in various countries throughout the world and its technology, Japan is in an advantageous position.

(1) Wide experience of disaster recovery, risk management, improvement of infrastructure and community disaster mitigation activity in CA

The project to establish CENAPRED commenced in the early 1990s, and disaster risk reduction projects were carried out in Central America and Mexico. Thereafter, through the Hurricane Mitch disaster of 1998, many projects were implemented such as a hurricane recovery project, a risk reduction project, an infrastructure strengthening project, etc. The awareness of BOSAI and seismic resistance projects in the Central America region is high, and their results have started to propagate. These achievements of JICA provide an advantageous foundation for assistance in the Central America region.

(2) Effective support using high technology as a advanced country of DRM

Examples of Japan's support for advanced disaster risk reduction technology include the establishment of CENAPRED and technology transfer, the use of the seismic resistance testing building of UCA, etc.

Fields such as the project to identify disaster risk in Guatemala and Nicaragua by JICA, and support in the IT field by Taiwan, etc., are fields where Japan can make the most of its advantages.

Also, it is considered that Japan is in a favorable position regarding individual technical support for disaster risk reduction, such as equipment for monitoring earthquakes, tsunamis, volcanoes, etc., and information transmission equipment used in early warning, disaster prediction, prediction of damage from soft measures and hard measures, etc. There are many examples of the introduction and operation by Japanese local government bodies of archives of disaster related information using GIS, hazard maps, monitoring, and internet infrastructure disaster information sharing systems, and it is considered that Japan is in an advantageous position in these fields also.

One of the HFA priority actions "reductions of latent risk factors" includes "land-use planning and other technical measures (urban planning, incorporation of a disaster risk reduction viewpoint in the process of development project planning)". In this respect the importance of urban planning and land-use measures that incorporate the disaster risk reduction viewpoint has been recognized in the BOSAI project. Japan has been engaged in constructing the legal system and procedures for disaster risk reduction since the 1940s, during which the City Planning Act,

the Building Standards Act, and the Land Readjustment Act have been produced, and projects have been developed based on them. In these fields also it is considered that the experience and successful examples of Japan can be used (example: regulations and guidance for land-use in order to manage disaster risks).

(3) Support by the combination of various measures

In order for governments to improve the disaster risk reduction capabilities of communities over a broad level, the combination of structural measures (hard measures: facility development, countermeasure construction, etc.) and non-structural measures (soft measures: survey research, community disaster risk reduction, etc.) is important. JICA has a broad support menu that includes technical cooperation, grant aid cooperation, ODA loan, etc., and combinations of these are also possible. This can also be considered to be in Japan's favor.

(4) Many experienced human resource/experts and support form Japan and overseas

In Japan there is a certain number of specialists from the BOSAI project, specialists on natural disasters, and consultants with experience in Central America. There are also many persons associated with disaster risk reduction in Central America in administrative organizations, research organizations, and universities within Japan, so it is considered that there would be few problems setting up an acceptance system. On the other hand communication is a major problem (in particular the language: Spanish). It is possible to deal with this by interpretation for short consultations, etc., but for long-term activities the Spanish language would be an obstacle (long-term training or community disaster risk reduction activities, etc.).

(5) Follow-up system

Even when results are obtained to a certain extent from disaster risk reduction projects, if the subsequent status of use is not determined and continued support is not provided where necessary, the results become unusable. In order to establish and sustainably develop community disaster risk reduction, a long-term span ranging from several years to several tens of years is necessary, and for this reason follow-up is necessary. Also, maintenance is important for equipment and structures. JICA carries out follow-up after completion of projects, and in this respect also it is considered that Japan is in an advantageous position.

3.7 Proposal for the Direction of Assistance

The following five points are pointed out by JICA as the direction of the assistance of disaster prevention in Central America.

1. Strengthening of adaptation measures against climate change (landslide, flood, or drought[141])
2. Exchange of technology, and accelerate sharing of resources within the region
3. Involve research institutes, private sector, NGO, as well as to accumulate human resource
4. Effective introduction of legal system of the countries based on grasping the condition of resources, and linkage with the donor countries
5. Utilization of assets such as human resource or equipment, for the assistance to be in the citizens' reach

1. Strengthening of adaptation measures against climate change (landslide, flood, or drought: For the future disaster prevention related projects of JICA in Central America, areas with high risk of disaster must be taken into consideration. Implementation of projects targeting communities with high risk of landslide or flood are considered, either as the continuation of BOSAI Project or as the following project. In addition, if the government of the recipient country considers that drought or other disasters in JICA's project area due to climate change are major issues, then such disaster must be reviewed as to whether the disaster should be added to the subject of the project or not. However, if drought is the theme, other fields such as agricultural engineering (development of irrigation) or agriculture (crops that are resistant to drought) need to be planned.

2. Exchange of technology, and accelerate sharing of resources within the region: If the JICA personnel attends SE-CEPREDENAC or other meetings or seminars held by disaster prevention organizations of the recipient countries, and introduce the technology of Japan, it will be an opportunity to show the presence of Japan. It would be ideal to invite as many international organizations, other donor countries, and NGOs as possible, to the activity report presented in the disaster prevention related projects.

3. Involve research institutes, private sector, NGO, as well as to accumulate human resource: Through this study, information was gathered to a certain extent from resources such as universities, private groups, NGOs that were confirmed. However, it is required to create a database of organizations/persons in Central America that are involved in disaster prevention, as well as to form a network.

4. Effective introduction of legal system of the countries based on grasping the condition of resources and linkage with the donor countries: In order to review the direction of future

[141] In general, flood, landslide, earthquake, tsunami, and volcanic eruption were the main disasters the institute/organizations were aware of. However, some did pay attention to ground subsidence and drought, therefore is described here.

assistance, the legal system related to disaster prevention in the countries of Central America, and the resources need to be utilized. Efficient collaboration between disaster prevention related organizations of the countries, or pioneering approaches could not be observed in this project. Regarding the collaboration between JICA and other donors, many of the fields have space for cooperation or coordination, since other donors desire collaboration with JICA.

5. Utilization of assets such as human resources or equipment of the assistance to be in the citizens' reach: This subject concerns assets (human resources and equipment) of Japan, as well as assets of recipient countries. As for the human resources of Japan, civil service workers, teaching staff of universities, volunteers, or private consultants are active in Central America. In the BOSAI Project, community activities were carried out with the local residents, and the assets are surely in reach of the citizens.

Based on the above summary, direction of the future disaster prevention related assistance is proposed as follows.

(1) Subject of disaster prevention related assistance in Central America

For a long period, disaster prevention related assistances have been provided by international organizations or donors for many times across Central America or the countries within. The achievements are in the form of policy documents such as PCGIR (Política Centroamericana de Gestión Integral de Riesgo de Desastres) or PRRD (Plan Regional de Reducción de Desastres), and in the form or legal systems of each country or plans concerning disaster prevention.

In the past, actions taken after the disaster such as disaster response or recovery/restoration were focused from the disaster management cycle (preparation for disaster – disaster response – recovery/restoration). This part was assisted by USAID or other donors, and also has a structure for funding such as CAT DDO, therefore JICA must focus on assistances on strengthening the preparation for the disaster, which is still behind compared to the others.

The organizations that are subject to JICA's assistance should be organizations that are capable to positively handle the project of JICA, rather than organizations that are busy with a lot of work.

(2) Assistance for approaches to disaster prevention in Central America

In Central America, SE-CEPREDENAC is making the approaches, therefore the promotion of PCGIR (Política Centroamericana de Gestión Integral de Riesgo de Desastres) and PRRD (Plan Regional de Reducción de Desastres) are the issues in the region. Regional meetings on climate change adaptation measures or promotion of disaster risk management for the ministries such as

Ministry of Public Works or Ministry of Environment have been held in the past, therefore a foundation is built for the promotion in the region. It is essential to support the regional policies and plans, while taking approaches that correspond to the policy for achieving the target of developing the disaster prevention field. Likewise HFA, the target year of PCGIR etc. is 2015, thus renewal of disaster prevention policy/plan shall be necessary in Central America. Under such circumstances, it is predicted that proposal or participation of JICA will be requested in the future, for JICA's experience in disaster prevention related projects around the world, as well as in Central America.

(3) Assistance that supply the demand of the recipient countries

While approaches as shown above are taken in the region, it is also necessary to develop assistances that correspond to the characteristics of the recipient countries as shown below.

- Disparity of economy – Costa Rica and Panama being at high economic level compared to other countries of Central America
- Countries where the approaches are taken through centralized authority and countries that promote decentralization
- Difference in types of disaster with particularly high risk
- Difference in the ability of national disaster prevention organizations

Although it is important to hold a hearing for the needs from the counterpart organization, Japan being a leading disaster prevention country, it is also possible to propose effective ideas from Japan and extract the needs of the counterpart organization, if they are interested.

(4) Ensuring Sustainability of Human Resource Development

The countries in Central America are generally small, therefore lack of human resource is a serious issue. There are only few researchers for the academic disciplines that underpin disaster prevention (geotechnology or seismic technology etc.) in each country, and the level of research is not very high. In addition, the countries besides Costa Rica where bureaucracy is stable, the civil servants are considerably replaced when the administration or the head of the country changes, and as a result, not only the senior officers but also the working level officers are replaced in many of those countries. Therefore, the human resource must be enriched through human resource development, and is required for making necessary efforts for securing sustainability.

For example, there are more than 100 former participants of Central America through the trainings such as the regional training for disaster prevention in Central America which was implemented by JICA Hyogo (JICA Kansai at present) under the support of Asian Disaster Reduction Center, or the seismic technology training implemented by JICA Tsukuba under the

support of Building Research Institute. These people are a valuable resource and network. Development of human resource through such trainings are showing achievements, therefore the network of the former participants must be maintained, and the future participants must be selected in a strategic manner. Further utilization of JICA's human resource development program is required in the future.

The subjects of the human resource development in Costa Rica may be civil servants, however for the other countries, human resource development must be promoted for research institutes, universities, or private sector etc., since they are less likely to replace the employees. In this study, in each country, universities with department or courses related to disaster prevention were found, and the organizations managing the observation/monitoring have revealed that their abilities are high, therefore is important to keep a close relationship with these organizations, and creating a cooperative relationship through projects will be effective.

(5) Promotion of "mainstreaming of disaster prevention"

Although the countries of Central America are vulnerable to disasters, at the government level, the awareness to disaster prevention is high. However until recently, measures after the disaster such as emergency response or recovery were focused on, therefore they are still inexperienced in preparation for the disaster. Additionally, many of the countries are small and their governments have insufficient budget, resulting in insufficient investment in disaster prevention. Therefore, it is not easy to expect large amount of resources to be shared specifically for disaster prevention. Under such circumstances, introducing the principle of "mainstreaming of disaster prevention" through improving disaster prevention function upon development of infrastructure, additional perspective of disaster prevention upon development of rural areas or regions, or introduction of disaster prevention education to school education, is essential.

JICA has taken pioneering approaches in the "Rural Community Development Project for Vulnerability Reduction Against Natural Disasters at Municipality of Villa Nueva" in Nicaragua, and also focuses on preparation for disaster in many other infrastructure development projects. Additionally, other approaches to disaster prevention education are introduced to the BOSAI Project or activities of Japan Overseas Cooperation Volunteers. It is considered effective to consolidate the above acquired knowledge to the "mainstreaming of disaster prevention" and disseminate this in the region.

(6) Promotion of collaboration with other development partners

In Central America, disaster prevention is one of the important tasks, therefore many of the donors and NGOs are providing assistance. However, the coordination of the development partners is not necessarily active, which led to the newly established (2011) meeting for the disaster prevention and humanitarian aid in Central America, for information gathering and coordination. Additionally, for the approach to disaster prevention in the same community, BOSAI Project is basically utilizing the framework of SE-CEPREDENAC and the national disaster prevention organization, while on the other hand, other donors are using NGOs or local governments to directly contact the community. As seen in this case, the approaches are not necessarily organized. Since the volume of needs are large, participation of many development partners should be welcome, however, is required for boosting the effect of the development through further sharing of information and accelerating practical coordination. In the continuing BOSAI Project as well as the coming project, the approach to disaster prevention in the community by DIPECHO or NGOs, as well as coordination, is indispensable.

The current situation and the needs have been confirmed through hearings with organizations of each country. Below is the fields for the projects, based on the hearing result and taking the advantage of Japan into consideration.

1) Continuance of BOSAI Project, and the upcoming project

The achievements of BOSAI Project are highly appreciated in the recipient countries. Moreover, the project is recognized by most of the donor organizations outside the region such as Mexico or the U.S., and the achievements are also highly appreciated, therefore, the project is worth continuing. However, there are many limitations for the implementation in terms of time and human resources, in many of the communities in the 6 nations of Central America. Although other donors are also participating in the community disaster prevention, there are numbers of communities subject to the assistance in Central America, and time is needed to cover all the communities in need of assistance.

For reviewing the mid-to-long term project of JICA, one of the purposes of this project was to grasp the conditions of human resources and organizations. Looking at the results the hearings and NGOs' achievements, it can be judged that separating the role of the community disaster prevention activity and requesting for assistance are possible to a certain extent. When implementing a project while collaborating with NGO or private groups, it must be considered as to show the presence of Japan and JICA (for instance, specialists of Japan and JICA should attend training, workshops, or report meetings etc.).

It is difficult in reality for the specialists to accompany the community disaster prevention full-time and provide detailed support. For this matter, members of Japan Overseas Cooperation Volunteers, Senior Volunteers, or other former participants may be able to contribute.

2) Introduction of landslide monitoring technology

In general, landslide disasters are severe in Central America. Using real-time monitoring equipment such as extensometer, borehole inclinometer, groundwater level gauge, and rain gauge etc. is effective for slow landslides enables effective transfer of landslide monitoring technology. For instance this technology can be used for securing the safety of the residents of Mexico, where landslide activity is becoming obvious. The past projects related to landslide implemented by Japan in Central America have proven the advantage of Japan's assistance for landslide.

3) Humanitarian assistance, capacity building

Japan's technology for observation of earthquake, volcano, or weather is leading the world, and the effectiveness of the warning system, bulletin system (early earthquake warning system etc.) were proven in the Great East Japan Earthquake. These technologies are transferred by JICA specialists in Mexico and El Salvador (seismology and seismic technology), as well as Honduras (landslide), at research institutes and universities. The needs for Japan's assistance from the specialized institutions in the countries of Central America are high. In response to such needs, approaches can be taken by sending Japanese researchers for a short period, while the specialized consultant can assist in a broad range and for a long period.

Additionally, for a sustainable human resource development, one idea is to assist the acquisition of master's degree in disaster prevention related field in a Japanese university. A good example from the past is the chief of civil engineering department of the University of El Salvador (UES) who acquired the doctor's degree at Yokohama National University, and returned to his country to teach disaster prevention at university, and spread the technology of Japan. However, the details need to be reviewed for an essential capacity building as well as acquisition of knowledge and technology while training for a short period in Japan.

4) Urban planning considering with DRM

In the cities of Central America, many people are living in areas under high risk of disaster, such as on slopes or along the riverside. Implementing policies on urban planning / land use is one of the approaches to reduce such potential risk.

In Japan, regulations or guidelines are given for a safe and secure urban environment development through the Urban Planning Act, Building Standards Act, Land Readjustment Act, as well as various legal systems, plans, and projects related to disaster prevention. Japan is

experienced in this flow from legal system establishment to the implementation of projects. In the recent years, Japan has learned through various studies, pioneering examples, or good practices on the basis of consensus building with the residents.

5) Direct assistance to CEPREDENAC (example: establishment of department for disaster prevention information management)

Assistance to CEPREDENAC is a significant theme for JICA, and until present, the assistance was mainly on these activities. As mentioned above, sharing of information is one of the issues concerning disaster prevention in Central America. Hence as a part of capacity building of CEPREDENAC, it is advised that CEPREDENAC establish a department that functions as gathering/transmission/sharing/renewal of information on disaster prevention in Central America. When this is realized, below items may be feasible.

- Effective allocation of personnel by creating a database for organizations and human resource related to disaster prevention
- Retaining risk analysis/ assessment results and hazard maps (or renew to the latest version)
- Sharing of disaster observation data (example: provide radar rainfall data of MARN/DOA (Ministerio de Medio Abiente y Recursos Naturales / Dirección de Observatorio Ambiental) to neighboring countries
- Transmission of disaster information to mobile terminals (mobile phones or smart phones)

Fund for a continuous operation shall be necessary, since follow up such as system update is necessary. Above are proposed by the study team, and are not confirmed whether CEPREDENAC is aware of the significance, effect, or impact, therefore a survey is required in the future.

6) GIS for disaster prevention

Information system on disaster based on GIS (Geographic Information Systems) is being undertaken by each country or by donor countries, international organizations, or NGOs individually. If these systems could be integrated for gathering, storing, transmitting, and sharing information, the disaster prevention activities in Central America could become much smoother.

In Japan, there are many systems including integrated GIS that can store and share information on disasters such as earthquake, climate, tsunami, volcano, flood, and landslide etc. are established, and are in operation by governments and municipalities. In this field, Japan can show its advantage. Introducing integrated GIS to CEPREDENAC can be suggested.

7) Introduction of advanced observation and information transmission technology (introduction of equipment from Japan)

In order to prepare for and evacuate promptly in the occurrence of a disaster, it is necessary to

install weather observation radar, flood forecasting system, seismological network, GPS observation network, tsunami monitoring system, and observation network for volcanic action for predicting volcanic eruption. Additionally, it is advised to form a disaster prevention system with advanced observation and information transmission technology, such as information transmission / information analysis, monitoring equipment, monitoring facility, and a system to transmit information to disaster prevention organizations. The introduction of advanced observation and information transmission technology of Japan is effective, also for supporting the electric and communication industry of Japan facing a hard time.

8) Development of climate change mitigation

The concerns for climate change are high in Central America and people believe that they are affected by climate change. However, CA countries have very low CO2 emissions. Apparently, drought, food shortage, forest fire, decrease of mangrove, impact to shrimp farm etc. are increasing. This indicates that rather than a single project on climate change mitigation, a complex type project including poverty measures, reduction of vulnerability in the urban area, and improvement of agricultural facilities etc. must be considered.

9) Measures against mega disaster

Hurricanes cause considerable damage, regardless of scale. When disasters as large as Hurricane Mitch or the Haiti Earthquake strike, the damage inflicted on small countries of Central America (those affected by disaster, number of deaths, or economic loss etc.) can be tremendous, leading to a national crisis. Japan's experience through the Great East Japan Earthquake can be utilized; for example, assistance for establishing a national disaster prevention plan against mega disaster can be provided.