ドミニカ共和国向け国別研修

「建築物耐震性診断能力強化」の実施に向けた情報収集・整理業務

業務完了報告書

2022 年 3 月

独立行政法人
国際協力機構（JICA）

株式会社 オリエンタルコンサルタンツグローバル

環境
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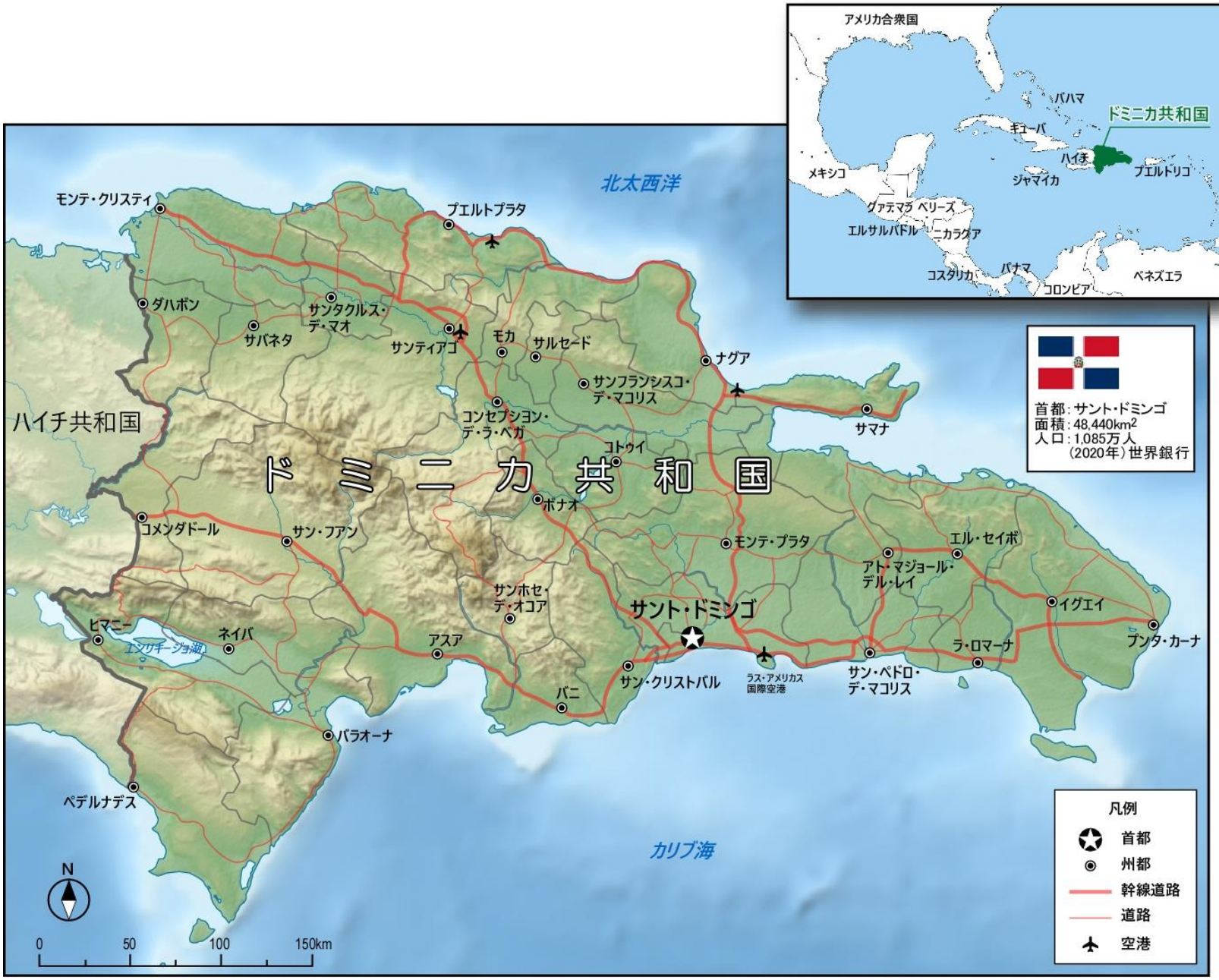
アメリカ合衆国
バハマ
ドミニカ共和国
キューバ
ハイチ
プエルトリコ
メキシコ
ジャマイカ
グアテマラ
ベリーズ
エルサルバドル
ニカラグア
コスタリカ
パナマ
コロンビア
ベネズエラ
北太西洋
モンテ・クリスティ
プエルトプラタ
ダハボン
サンタクルス・デ・マオ
サバネタ
サンティアゴ
モカ
サルセード
ナグア
サンフランシスコ・デ・マコリス
ハイチ共和国
コンセプシヨン・デ・ラ・ベガ
サマナ
コトゥイ
ドミニカ共和国
ボナオ
コメンダドール
サン・フアン
モンテ・プラタ
エル・セイボ
アト・マジョール・デル・レイ
サンホセ・デ・オコア
サント・ドミンゴ
イグエイ
ヒマニー
ネイバ
エンリキージョ湖
アスア
ラ・ロマーナ
プンタ・カーナ
サン・クリストバル
ラス・アメリカス国際空港
サン・ペドロ・デ・マコリス
バニ
バラオーナ
ペデルナデス
カリブ海
N
0
50
100
150km
首都：サント・ドミンゴ
面積：48,440km²
人口：1,085万人
（2020年）世界銀行
凡例
首都
州都
幹線道路
道路
空港

調査位置図

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【略語表】

略語	正式名称	日本語
AASHTO	American Association of State Highway and Transportation Officials	米国全州道路交通運輸行政官協会
ACI	American Concrete Institute	米国コンクリート協会
ANSI	American National Standards Institute	米国国家規格協会
APORDOM	(Autoridad Portuaria Dominicana) Dominican Port Authority	ドミニカ共和国港務局
ASCE	American Society of Civil Engineer	米国土木技師協会
ASTM	American Society for Testing and Materials	米国材料試験協会
AWS	American Welding Society	米国溶接協会
CAASD	(Corporación del Acueducto de Santo Domingo) Santo Domingo Aqueduct Corporation	サント・ドミンゴ水道管株式会社
CDEEE	(Corporación Dominicana de Empresas Eléctricas Estatales) Dominican Corporation of State Electrical Companies	ドミニカ共和国国立電力会社
CN-PMR	(Consejo Nacional de Prevención, Mitigación y Respuesta ante desastres) National Council of Disaster Prevention, Mitigation and Response	防災・減災・災害対応国民会議
CNE	(Comisión Nacional de Emergencias) National Emergency Commission	国家緊急事態委員会
CNS	(Centro Nacional de Sismologia) National Seismology Center	国立地震学センター
CODIA	(Colegio Dominicano de Ingenieros, Arquitectos y Agrimensores) Dominican College of Engineers, Architects and Surveyors	ドミニカ共和国技術者・建築家・測量士協会
COE	(Centro de Operaciones de Emergencia) Emergency Operations Center	緊急時対応センター
CRD	(Colegio República Dominicana I.E.D.) Dominican Republic School District	ドミニカ共和国学校協会
CTN	National technical committee for risk prevention and mitigation	災害リスク抑止・軽減のための国家技術委員会
DGM	(Dirección General de Migración) General Directorate of Migration	移民局
DGRS	(Dirección General de Reglamentos y Sistemas) General Directorate of Regulations and Systems	規制・制度局
DGECHO	Directorate-General for European Civil Protection and Humanitarian Aid Operations	欧州委員会人道援助・市民保護総局
DIGENOR	(Dirección General de Normas y Sistemas de Calidad) General Directorate of Standards and Quality Systems	規準・品質管理局
FEMA	Federal Emergency Management Agency	アメリカ合衆国連邦緊急事態管理庁
IBC	International Building Code	インターナショナル・ビルディング・コード
ICM	(Instituto Cartografía Militar) Military Cartographic Institute	軍事地図研究所
IDB	Inter-American Development Bank	米州開発銀行
IFRC	International Federation of Red Cross and Red Crescent Societies	国際赤十字赤新月社連盟
INAPA	(Instituto Nacional De Aguas Potables Y Alcantarillados) National Institute of Drinking Water and Sewerage	国家上下水道機関
INDOCAL	(Instituto Dominicano para la Calidad) Dominican Institute for Quality	ドミニカ共和国品質協会

INDOTEL	(Instituto Dominicano de las Telecomunicaciones) Dominican Institute of Telecommunications	ドミニカ共和国電気通信機関
INDRHI	(Instituto Nacional de Recursos Hidráulicos) National Institute of Water Resources	国立水資機関
INTEC	(Instituto Tecnológico de Santo Domingo) Santo Domingo Institute of Technology	サントドミンゴ工科大学
INVI	(Instituto Nacional de la Vivienda) National Housing Institute	国立住宅機関
MEPyD	(Ministerio de Economía, Planificación y Desarrollo) Ministry of Economy, Planning and Development	経済・企画・開発省
MINERD	(Ministerio de Educación de la República Dominicana) Ministry of Education of the Dominican Republic	教育省
MIVHED	(Ministerio de la Vivienda, Hábitat y Edificaciones) Ministry of Housing, Habitat, and Buildings	住宅・居住・建物省
MOPC	(Ministerio de Obras Publicas y Comunincaciones) Ministry of Public Works and Communications	公共事業・コミュニケーション省
MSP	(Ministerio de Salud Pública)　Ministry of Public Heatlh	保健省
NGI	(Instituto Geográfico Nacional) National Geographic Institute	国立地理機関
OCD	(Oficina de la Defensa Civil) Office of Civil Defense	市民防衛局
OISOE	(Oficina de Ingenieros Supervisores de Obras del Estado) Office of Supervising Engineers of State Works	公共事業技術監理事務所
ONAMET	(Oficina Nacional de Meteorología) National Meteorological Office	国立気象局
ONAPLAN	(Oficina Nacional de Planificación) National Planning Office	国家計画局
ONESVIE	Oficina Nacional de Evaluación Sísmica y Vulnerabilidad de Infraestructuras y Edificaciones	国立地質・インフラ・建造物耐久調査局
OSPL	Observatorio Sismológico Politécnico Loyola	ロヨラ工科大学精密地震観測室
PAHO	Pan American Health Organization	汎米保健機構
SEAOC	Structural Engineers Association of California	カリフォルニア州土木技師協会
SEOPC	(Secretaria de Estado de Obras Publics Cuciones) Secretary of State for Public Works	公共事業担当大臣
SESPAS	(Secretaria de Estado de Salud Pública y Asistencia Social) Secretary of State for Public Health and Social Assistance	保健福祉省長官
SGN	Servicio Geologico Nacional	国家地質サービス
SN-PMR	(Sistema Nacional de Prevención, Mitigación y Respuesta) National System of Prevention, Mitigation and Response	国家防災・減災・災害対応システム
SNS	(Servicio Nacional de Salud) National Health Service	国民保健サービス
SODOGEO	Sociedad Dominicana de Geológia	ドミニカ共和国地質学会
SODOSISMICA	Sociedad Dominicana de Sismología e Ingeniería Sísmica	ドミニカ共和国地震学・地震工学協会
TCDPM	(Comité Técnico Nacional de Prevención y Mitigación de Riesgos) National Technical Committee	防災・減災・災害対応専門委員会
UASD	(Universidad Autónoma de Santo Domingo) Autonomous University of Santo Domingo	サント・ドミンゴ自治大学
UNISDR	United Nations International Strategy for Disaster	国連国際防災戦略事務局

	Reduction	
UNDAC	United Nations Disaster Assessment and Coordination	国連災害評価調整チーム
WHO	World Health Organization	世界保健機関

第 1 章　業務の概要

1.1　業務の背景

ドミニカ共和国は、中南米・カリブ地域の中で、複数の自然災害に対して最も脆弱な国の一つである。1978 年から 2018 年の間に、同国では 62 の大規模災害が記録されており（EM-DAT, 2019）、死者 2,897 人、被災者 720 万人、経済損失総額 28 億 8200 万米ドルに上る。世界銀行（2015 年）は、災害に伴う平均的な年間被害額は約 4 億 2000 万米ドル（GDP の 0.69%）に上ると推定している。

ドミニカ共和国とハイチがあるヒスパニオラ島は、14 の活断層が存在し、地震発生確率の高い場所に位置しており、地震リスクは同国で取り組むべき優先課題の 1 つとなっている。歴史的にも、1842 年、1911 年、1946 年など、何度も激しい地震災害が発生しており、1946 年の地震では津波が発生し、1,970 人の命が奪われた。これらの地震は 40～50 年に 1 度の頻度で発生している。また、2003 年に発生した地震のように規模が小さく、国の一部に影響を与えた地震も発生している。

このような地震災害リスクに対処すべく、同国は仙台防災枠組の批准国として、長期開発目標「国家開発戦略 2030」でも、災害対策の強化を重要項目と掲げている。カウンターパート機関である国立地質・インフラ・建造物耐久調査局（National Office of Seismic Assessment and Vulnerability of Infrastructure and Buildings (ONESVIE)）は、既存の建築物の耐震性診断や補強事業の実施、耐震性設計基準の更新・普及、地震発生時の各関係機関との連絡調整等を担っており、過去の課題別研修やフォローアップの成果等を生かしながら、耐震診断教育や、公的機関の耐震強度インベントリー作成等を実施してきている。

一方で、これらの基準に基づく防災事前投資事業の実施にまでは結びついていないのが現状である。技術面では、建物の耐震設計に関する規則は設定されているものの、同基準に応じた耐震設計・工法や、施工段階で同基準の順守がなされていなかったり、耐震診断は実施されている一方で、耐震補強に関する基準・ガイドラインがなかったりという課題がある。道路・橋梁などのインフラに関しては、新規建設にあたっての耐震設計に関する基準は存在していない。加えて、地震ハザード・リスク評価については、再現期間が 50 年、475 年、2475 年の加速度マップや、地震シナリオに基づくリスク評価が行われているが、同結果を都市計画や土地利用・規制、防災事業に活用はできていないのが現状である。制度・人材面では、耐震・防災分野の専門知識を保有する人材不足、ONESVIE と関係機関内での耐震・防災に関する意識や基準が統一されていないといった問題があり、多岐に亘って課題が存在する。

このような中、ドミニカ共和国から、地震・耐震分野の技術・能力向上に関して、3 年度に渡る国別研修の要望が接到し、これを実施することとなった。他方現状では上記のように課題が山積し、これら全てにおいて国別研修を通じて取り組みたいという要望があるが、貴機構として同国においては過去に同分野における技術協力に係る大きな投入がなく、効果的な研修計画・立案を実施するだけの情報が蓄積されていない。ついては、まずは同国において、地震・耐震分野における情報収集、ならびに課題を洗い出し、事前防災投資の促進に向け、時系列で対応策の優先

順位を整理したロードマップを整理することが期待されている。なお、我が国の対ドミニカ共和国国別開発協力方針は、「持続的な経済開発」を重点分野とし、日本の技術を活用した同国の防災能力向上への支援を定めており、同研修はこの方針に一致している。

1.2 業務の目的

本業務において、オンラインによるドミニカ共和国関係者との協議を通じ、国別研修「建築物耐震性診断能力強化」の実施を見据えた、同国における地震防災に関する課題の分析・整理を行い、整理された課題の解決に向けて、伝えるべき日本の知見を検討する。

なお、本業務において検討を行う研修の目的、成果及び活動は、以下が想定されている。従って当業務では、以下の項目を念頭に、地震・耐震分野の情報収集を行う。

1) 上位目標：
ドミニカ共和国の地震災害リスクが低減する。
2) 研修目標：
ドミニカ共和国の地震災害リスク軽減事業の促進に向けた準備が整う。
3) 成果
成果１：建物およびインフラの耐震を中心とする地震防災の全体像及びその中での自国の課題の位置づけを理解し、長期的なロードマップ案が作成される。
成果２：ロードマップ案をベースに、耐震化を中心とした事業促進に向けた知識や技術を習得し、短期的な取組に関する具体的な行動計画が策定される。
4) 活動
活動１－１：建物およびインフラの耐震を中心として日本の地震防災事業の実施体制について学ぶ。
活動１－２：自国の耐震分野の現状と課題を整理する。
活動１－３：自国の耐震化を促進するための長期的なロードマップ案を作成する。
活動２－１：日本の耐震設計基準、耐震診断、耐震補強に関連する技術を学ぶ。
活動２－２：日本の耐震設計基準、耐震診断、耐震補強に関連する法制度及び普及のための取り組みを学ぶ。
活動２－３：活動２－１、２－２の学びをもとに、自国の耐震化事業を推進するための具体的な計画を策定する。

1.3 業務の期間

本業務の実施期間は、2021 年 11 月 19 日～2022 年 3 月 31 日である。

1.4 要員の構成

本業務の要員構成は、表 1.4.1 のとおりである。作業工程は図 1.4.1 のとおりである。

表 1.4.1　要員構成

担当分野	氏名	所属
全体総括／都市地震防災	高橋　亮司	OCG
耐震建築・耐震補強（建築）	林　亜紀夫	OCG（補強）
耐震建設・耐震補強（インフラ）	福島　誠一郎	OCG（補強）

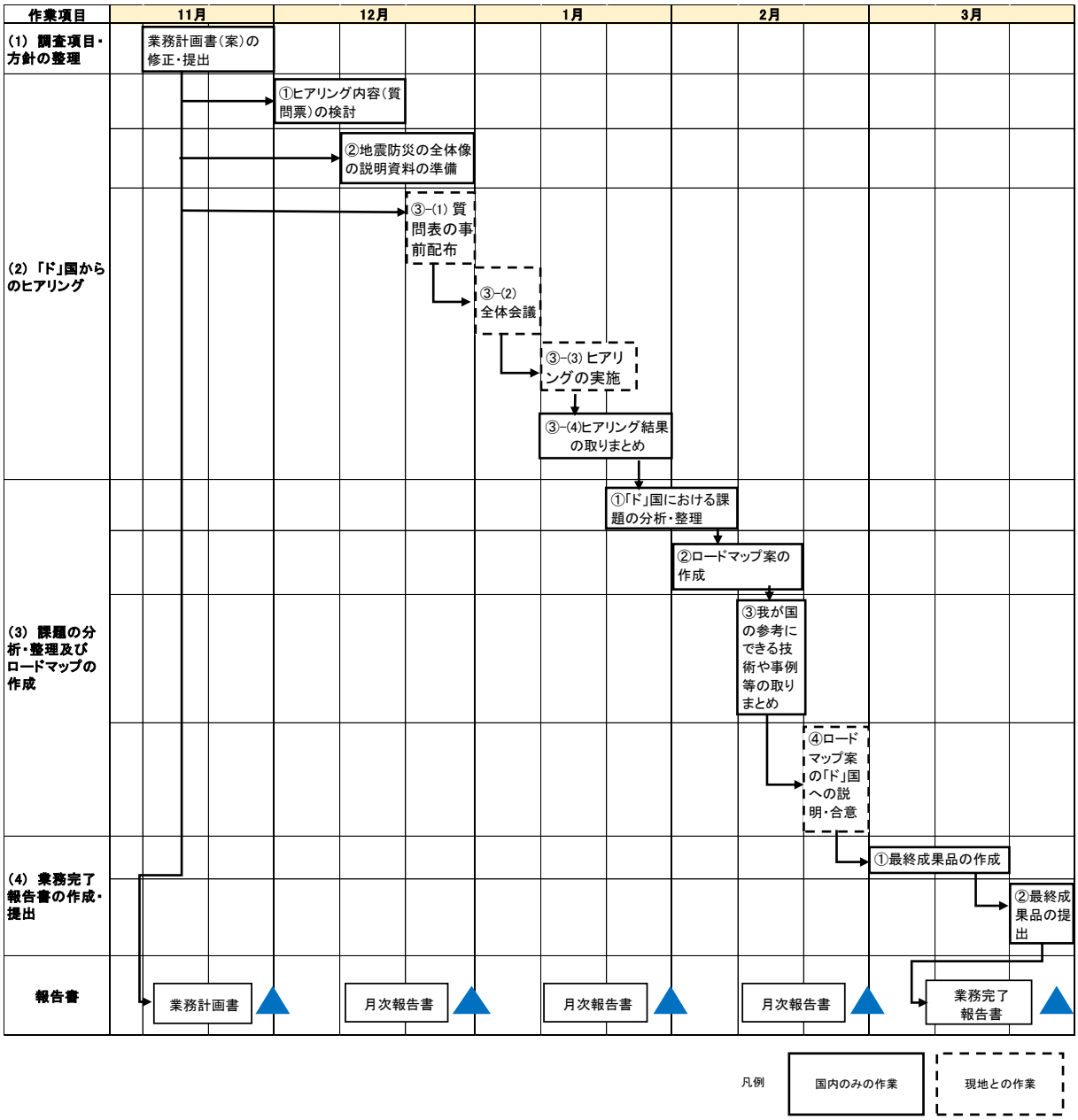


図 1.4.1　作業工程表

1.5 質問票送付及びヒアリング先機関

【行政機関】

(1) 国立地質・インフラ・建造物耐久調査局（ONESVIE）

Mr. Leonardo Reyes Madera	局長（Director General）
Ms. Camila Gutier	Head of Planning and Development Department
Mr. Pedro Ivan Marquez	Head of Scientific Engineering for Earthquake Department
Mr. Cesar David Mendez	Head of Research and Development Department
Mr. José Cordero	n/a
Ms. Zoraida Disla	n/a

(2) 公共事業・コミュニケーション省（MOPC）

Mr. Nestor Julio Matos Ureña	Director General of Directorate Regulations and Systems
Ms. Martha A. Souffront G.	Director of Environmental Risk Management Directorate

(3) 住宅・居住・建物省（MIVHED）

Ms. Vivian Reyes	Vice-minister of Permits and Regulations
Ms. Illiana Gallardo	n/a
Ms. Giselle Mahfoud	n/a

(4) 経済企画開発省（MEPyD）

Ms. Mercedes Feliciano	Director of Disaster Risk Management Directorate
Mr. Peter M. Sanchez	n/a
Mr. Dionys De la Cruz	n/a
Ms. Maria Betania Roque Quezada	n/a

(5) 教育省（MINERD）

Mr. Diego Bautista	局長（Director General）
Mr. Abraham Perez	n/a

(6) 保健省（MSP）

Ms. Gina Estrella	Director of Disaster Risk Management Directorate
Ms. Johanna Thomas Oreste	n/a

(7) 市民防衛局（OCD）

Mr. Juan Manuel Méndez	局長（Director General）

【学会・研究機関】

(8) 国家地質サービス（SGN）

Mr. Edwin García Cocco	局長（Director General）
Ms. Yesica H. Perez Alejandro	Head of the Seismic Studies Dynamics Department

(9) 国立地震学センター（CNS）

Mr. Ramón Delanoy	局長（Director General）

(10) ドミニカ国地質学会（SODOGEO）

Mr. Eduardo Verdeja	局長（Director General）
Mr. Julio Ernesto Espaillat Lamarche	Chairman

(11) ドミニカ国地震学・地震工学協会（SODOSISMICA）

Mr. Hector O'Reilly	Chairman

【教育機関】

(12) ロヨラ工科大学精密地震観測室（OSPL）

Dr. Javier Rodriguez	局長（Director General）

【その他】

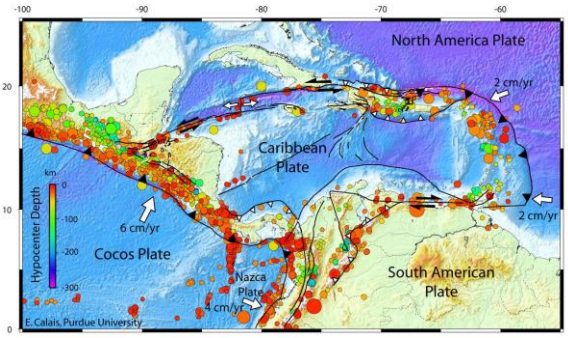
(13) 2021 年度課題別研修「南米建築物耐震技術の向上・普及」参加研修員（2 名）

Mr. Felix Noel Amparo	Architect
Mr. Uri Rolando Rodriguez	Civil Engineer I

第 2 章　ドミニカ共和国における地震・耐震対策の取組状況と課題

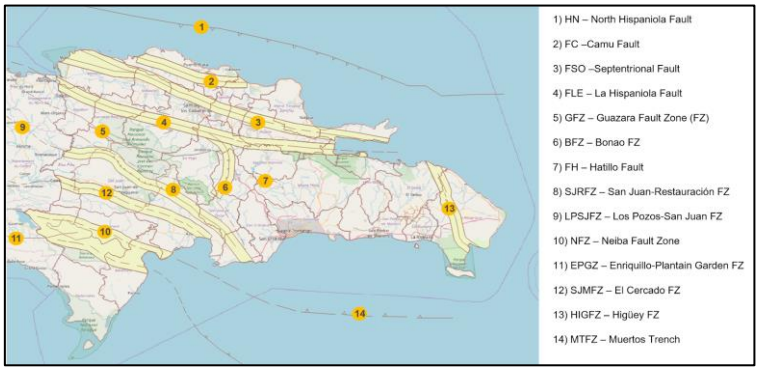
2.1　ドミニカ共和国における地震災害リスクと主な地震災害履歴

ドミニカ共和国があるヒスパニオラ島は、北米プレートとカリブ海プレートの境界に位置し、地震活動が活発な領域である（図 2.1.1）。また、国内及びその周辺には、大規模な地震を発生させる可能性のある断層がいくつかあり、主な断層として、Septentrional 断層、Camú 断層、Enriquillo 断層、San Juan-Ocoa 断層、Hispaniola 断層などが挙げられる（図 2.1.2）。Septentrional 断層は、北米-カリブ海プレート境界にある左横ずれ断層で、国内第二の経済都市であるサンティアゴ（Santiago）を含む Cibao 渓谷という人口が密集しかつ脆弱な建築物が集積する地域に位置しており、北部地域にとって大きな脅威とされる。また、北ヒスパニオラ断層（北米プレートとカリブ海プレートの境界）は逆断層であり、この断層による Cibao 渓谷を含む地域への地震の被害リスクも懸念される[1]。



出典：National Science Foundation/ Eric Calais, Purdue University[2]

図 2.1.1　カリブ地域における地殻変動とプレート位置



出典：MOPC, 2011 に加筆[3]

図 2.1.2　主な断層位置と名称

[1] OSPL 質問票及びヒアリング
[2] Morales-Cartagena, A., Tectonic setting of the Caribbean (Courtesy: National Science Foundation/ Eric Calais, Purdue university (https://ymc.eeri.org/500-years-of-earthquake-history-how-academia-and-government-are-collaborating-to-reduce-earthquake-risk-in-the-dominican-republic/fig1/)
[3] Morales-Cartagena, A., Tectonic setting of the Caribbean (Courtesy: National Science Foundation/ Eric Calais, Purdue university (https://ymc.eeri.org/500-years-of-earthquake-history-how-academia-and-government-are-collaborating-to-reduce-earthquake-risk-in-the-dominican-republic/fig1/)

ドミニカ共和国では、歴史的にも、1842 年、1911 年、1946 年等、甚大な地震災害が発生している。1946 年 4 月に発生した地震（マグニチュード 8.1）では、津波が発生し、1,900 人以上の死者を記録したが、その後は、同国において大規模な被害をもたらす地震は発生していない。主な地震と影響区域は、表 2.1.1 のとおりである。

表 2.1.1　ドミニカ共和国における近年の主な地震とその影響区域

発生年月	マグニチュード	主な地震影響区域
1946 年 8 月	8.1	Nagua Province, Matancitas
1962 年 1 月	6.5	San José de Ocoa, Azua, Baní, San Cristóbal, Santo Domingo
1984 年 6 月	4.8	Monte Plata Province, Bayaguana Community
2003 年 9 月	6.5	Puerto Plata, San Francisco de Macorís, Santiago

出典：*PLAN NACIONAL PARA LA REDUCCIÓN DEL RIESGO SÍSMICO*、USGS[4]

2.2　地震防災対策の取組状況

2.2.1　関連法令及び規則

ドミニカ共和国では、多くの災害予防・抑止・対応に関する法律や細則が、数十年の間に整備されてきた。ここでは、特に、防災政策の基本となる防災法について、その内容を整理する。

(1)　防災法（Ley No. 147-02 Sobre Gestion de Riesgos, 2002）

ドミニカ共和国では、UNDP の支援の元[5]、2002 年に災害予防・減災対策を含む総合的な防災対策関連法である「災害リスク軽減関連法（第 147-02 号）」が成立した。同法で特に重点的に定義づけられているのが、災害リスクマネジメントの実現を可能とするための取組や組織を体系化した「国家防災・減災・災害対応システム（SN-PMR)」である。当システムの機能の中で、特に地震防災（Prevention and mitigation）に関連する内容は、表 2.2.1 の通りである。

表 2.2.1　「国家防災・減災・災害対応システム（SN-PMR)」の機能（地震・耐震化関連）

「国家防災・減災・災害対応システム（SN-PMR)」の地震対策・耐震化に係る主な機能
4. 想定される災害ハザードと居住地の脆弱性を考慮した災害リスク評価・研究の実施 7. 土地利用計画や経済・社会開発計画に災害予防対策を盛り込むなど、計画へのリスク管理基準の取り込み 8. 災害リスクのある区域に位置する居住地域の特定と予防のための管理及び処置の実施 12. 災害時における公共・民間インフラの安全性と即座の運用を保証するためのインフラ保護・緊急時対策の確立

出典：*Ley No.147-02 Sobre Gestion de Riesgos (Disaster Risk Management Act),* 2002

同法には、当システムの調整組織として災害予防・対応国家委員会の設置や組織構成、国家緊急事態委員会の設置、災害予防のための国家技術委員会の設置などについても示されているほか、地方行政機関の役割や住民の参画についても言及されている。また、国家災害リスク軽減計画の主軸の取組や所管機関、災害後の国家緊急計画の策定・実施について定義づけされている。一方で、災害マネジメントサイクルの各段階で求められている各取組に関する方針や役割についての

[4] https://earthquake.usgs.gov/earthquakes/eventpage/iscgem874001/executive
[5] UNDP. 2013. https://www1.undp.org/content/dam/undp/library/crisis%20prevention/disaster/UNDP-CPR-HyogoFramework-ExecutiveSummary_JP.pdf

記載はみられず、地震対策や耐震化の促進に向けた具体的な取組方針は定義されていない。実際、ONESVIE からの質問票においても、現状、耐震設計や耐震施工について、同法では考慮されていないとの回答を得ている。なお、同法は現在、IDB の資金的な支援のもと、仙台防災枠組に沿った内容となるよう MEPyD を中心に改訂作業中[6]であり、2022 年中での改訂版の公表が予定されている。

2.2.2 地震防災に関する国家関連計画・戦略

(1) 国家開発戦略（Ley 1-12Estrategia Nacional de Desaprollo 2030）

ドミニカ共和国では、法令として国家開発戦略が策定されており、同戦略は、国の方向性を示す重要な目標を定め、国家予算検討のひとつの基本[7]となっている。同戦略で説明されている長期ビジョンでは、安全性の確保や強靭化など、防災・減災に関わる表現はないものの、「気候変動に適応した環境配慮型の持続可能な生産と消費社会」が国家の重要な柱の一つに位置付けられており、そのための目標の一つに「4.2 人的、経済的、環境的な損失を最小化するための効果的なリスクマネジメント」が設定されている。具体的な取り組み内容の内、耐震補強や耐震化に関わる施策は、表 2.2.2 のとおりである。ここでは、災害リスク軽減に向けた社会インフラの整備に関する明確な記述がみられるほか、国家の方針として、地震防災対策推進に向けた関連規則の整備が重視されていることが確認できる。

表 2.2.2 国家開発戦略での防災（耐震化関連）の施策内容

特定の目的	取り組み内容
4.2.1 被害を最小限に抑え、被災地と被災住民の迅速かつ持続可能な復興を可能とするため、コミュニティと地方政府の積極的な参加を得て、効果的な国家総合リスク管理システムを構築する。	4.2.1.3 災害時における適切で責任あるリスク管理に必要な規則や規制の承認と実施の促進 4.2.1.6 セクターや地域の計画プロセスや公共投資への、不可欠な要素としての災害リスク管理の取り込み 4.2.1.7 気候変動による脆弱性や影響を軽減するため、**ダムや橋梁、道路等の保護など、リスク軽減のための優先的な工事**の実施 4.2.1.11 家族、コミュニティ、地域、国のあらゆるレベルにおいて、**地震のリスク軽減**を促進するための関連規則の採用と、それを尊重する意識啓発

出典：*Ley 1-12Estrategia Nacional de Desaprollo 2030*

(2) 国家災害リスク軽減計画（Plan Nacional de gestion de riesgos, 2001）

国家災害リスク軽減計画（PLAN NACIONAL DE GESTIÓN DE RIESGOS）は、IDB の資金援助のもと[8]、「国家防災・減災・災害対応システム（SN-PMR)」の施策を導く国家戦略として 2001 年に策定された。同計画には、災害予防・抑制や安全性の確保、経済・社会・環境・文化財の保護のための政策のガイドラインと基本原則が示されているほか、国レベルの各組織の所掌事務についても明文化されている。当計画に記載されている 5 つのプログラムの柱の内、特に地震の災害予防・抑制と耐震化促進（Disaster mitigation and prevention）に係るプログラムは、主に、次の表 2.2.3 の通りである。

[6] ONESVIE 質問票及びヒアリング
[7] MOPC 質問票
[8] Plan Nacional de Gestión Integral del Riesgo de Desastres en la República Dominicana, p4

表 2.2.3　地震予防・抑制及び耐震化促進に係る主な計画内容

プログラムの柱	プログラム	プログラム内容	組織
１．知識の発展とリスク評価の普及・促進	２．リスクアセスメント	• 災害予防・抑制に資するハザード・脆弱性・リスク評価のための調査 • 都市中心部、重要建築物及びライフラインの脆弱性分析とリスク評価 • リスクシナリオとマルチハザードマップの作成	ONAMET, INDRHI, DGM, ICM, ONAPLAN-.DGT, INVI, ISU de la UASD, Secretaria de Estado de Medio Ambiente, INAPA, CDE, Universidades, Oficina Nacional de Gestion de Riesgos, SEOPC, Liga Municipal Dominicana, Ayuntamientos Descentralizados, SEIP, Corporaciones de Acueductos y Alcantarillados, Cuerpos de Bomberos, ONPM-C, SET, Fuerzas Armadas, OR, SESPAS
２．リスク要因の低減と予防の強化	２．災害リスク区域に位置する住民、居住地及びインフラの管理と処置	• 建築物やライフラインの設計・施工のための安全基準と規制の策定 • 都市中心部、重要建築物、既存ライフラインの脆弱性への介入と提言 • 個人及び集団の財とサービスの保護のための保険適用に関する研究と促進	ONAPLAN, INVI, CONAU Secretaria de Estado de Medio Ambiente, Oficina Nacional de Gestion de Riesgos, Secretaria de Estado de Obras Publicas y Comunicaciones DGRS, INAPA, ODE, SODOSISMICA, Universidad, CODIA, DIGENOR, Oficina Nacional de Defensa Civil, SEIP, Liga Municipal Dominicana, Ayuntamientos Descentralizados, Superintendencia de Seguros, Cuerpos de Bomberos, CRD, OMPM-C, Procomunidad, INDRHI.

出典：Plan Nacional de gestion de riesgos, 2001, Matriz de programas, subprogramas y responsabilidades

一方で、MIVHED からは、同計画には、計画実行に必要な要素である法的枠組み、制度的枠組み、予算的枠組み、モニタリングと評価の仕組みを備えていなかったために、計画が実行されなかったとの指摘があった。当計画の ANNEXX Ⅲには、一般的な計画モニタリング・評価手法に関する提案がされているものの、各関係組織とのヒアリングや質問票結果では計画のモニタリングは実施されていないとの回答であった。また、プログラムのタイムスパンや具体的な年次についての記載がなく、組織名も羅列されている状況であり、責任の所在が曖昧となっている。建物の耐震補強や耐震化に関する具体的な取り組みについての方針や施策に関する記述も見られず、一般的な防災対策が並べられているのみである。

(3) 国家総合災害リスク管理計画（Plan Nacional de Gestión Integral del Riesgo de Desastres en la República Dominicana, 2011）

国家総合災害リスク管理計画は、UNDP の支援のもと[9]、国家災害リスク軽減計画に代わるものとして 2011 年に策定された。また、2010 年に国連国際防災戦略事務局（UNISDR）のアメリカ地域事務所が主導した「リスクの予防と軽減のための国家技術委員会」及び「自然災害に対する省庁間の脆弱性評価」が当計画の大きな支えになったとされる[10]。同計画は、5 年間の災害リスク管理施策の実施を定義するものとなっており、ドミニカ共和国で作成されてきた計画や法令の内容や解釈、自国の防災対策の実態に関する分析結果が示されるとともに、プログラムや実施に向けた指標が示されている。特に、同計画のプログラムライン２「災害リスク要因の軽減と予

[9] ONESVIE 質問票
[10] UNDRR. https://www.undrr.org/news/dominican-republic-approves-disaster-risk-plan

測の強化」の内、プログラム 2.2 では、災害リスク軽減指標及び予防的な保全プログラムの強化を、重要インフラに導入することが提案されている[11]。

(4) 国家災害リスク軽減計画 2017-2030（Plan Nacional de Reducción del Riesgo de Desastres 2017 - 2030 de la República Dominicana）

当計画は、仙台防災枠組（2015-2030）の内容を踏襲した計画で、2017 年に、国家総合災害リスク管理計画に代わる計画として作成され、2022 年に公表される予定となっている[12]。

現行案では、下表のとおり、優先的に実施すべき事項として、災害リスク軽減を考慮した、建築許可やインフラ建設・再建に関する規制・基準の見直しや、新規・既存の重要インフラの防災強靭化の推進などが挙げられている。また、計画の運用に向けた具体的な取り組み内容として、災害時や災害後も重要インフラが機能するよう整備することなどが明記され、実施プロセスや指標、責任組織も明確化された。数値的な目標や指標の設定は課題と考えられるが、前計画と比べて、地震防災に関わる取り組みはより具体的に示されている。

表 2.2.4　国家防災政策目標（耐震化関連）

国家防災政策目標
d. 2030 年までに、防災力を高めることなどにより、国内の重要インフラへの災害被害と保健・教育施設などの基本的なサービスの途絶を大幅に抑制する。

表 2.2.5　国家戦略、政策及び防災計画における優先事項（耐震化関連）

項目	優先事項
C. 防災力強化のための災害リスク軽減への投資	f.　建築環境とあらゆるレベルでのリスクアセスメントの推進 g. リスク評価、作図、人口統計学的分析、その他ツールの、地域分析、都市計画、土地利用への取り入れの推進 h. 災害リスク軽減の基準での、建築許可やインフラ建設・再建に関する規制・基準（code）の見直しの実施
D. 効果的な災害対応への備えと復旧・復興・再建分野における「より良い復興」の実現	c.災害時に安全で効果的に機能し、災害後も必要不可欠なサービスの提供が可能となるよう、新規および既存の重要インフラ（水供給、交通、通信、教育施設、病院、その他の医療施設等を含む）の防災力向上の推進

表 2.2.6　地震防災分野（主に耐震化）に関わる主な取組み内容、目標及び指標等

No.	プログラム	目標	指標	責任組織（省庁名）
活動ライン 3：防災力向上のための災害リスク軽減への投資				
3.c.	特に以下を通じて、災害に強い社会を実現するための公共・民間投資を強化する。 ●学校や病院などの重要施設やインフラにおける災害リスク予防と軽減のための構造的・非構造的・機能的な対策の実施 ●ユニバーサルデザインの原則や建築資材の標準化などの適切な設計・施工	2019 年に、公共及び民間インフラ（学校、病院、優先的に取り組むべき重要インフラ）における災害リスク軽減	●2018 年に、諮問チームを創設 ●2019 年までに、重要インフラの標準化された物理的な脆弱性評価ツールの、関	ONESVIE, MOPC

[11] MOPC 質問票及びヒアリング
[12] ONESVIE 質問票及びヒアリング

No.	プログラム	目標	指標	責任組織（省庁名）
	技術、建築補強と再建を通じた災害に耐えられる建築への改善 ●メンテナンスの文化の醸成 ●経済的、社会的、構造的、技術的、また環境的な影響評価の考慮	ロードマップの実施	係機関による承認・検証 ●2020 年に建設規制が承認される	
3.h	災害に強い構造を促進する観点を持ち、インフォーマルな居住地や限界集落などの地域の状況に応じた適用を容易にすることを目的とし、既存の建築基準や規格、復旧・復興実務の改訂、又は、適切な場合は、国または地方レベルでの新たな規範・基準・慣行の策定を奨励する。また、適切なアプローチを通じて、これらの規定を実施・監視・執行する能力を強化する。	公共・民間インフラにおける災害リスク軽減諮問チーム（DRR Advisory Team）への当施策の取り入れ	●インフラの災害リスク軽減諮問チーム（DRR Advisory Team）への取り入れ ●基準や規制に関する周知と意識向上のためのワークショップの実施	**ONESVIE, MOPC**
活動ライン 4: 効果的な災害対応への備えと復旧・復興・再建分野における「より良い復興」の実現				
4.c.	災害時に安全で効果的に機能し、災害後も必要不可欠なサービスの提供が可能となるよう、新規および既存の重要インフラ（水供給、交通、通信、教育施設、病院、その他の医療施設等を含む）の防災力向上を推進する。	公共・民間インフラにおける災害リスク軽減諮問チーム（DRR Advisory Team）への当施策の取り入れ	●公共・民間インフラにおける災害リスク軽減諮問チーム（DRR Advisory Team）への当施策の取り入れ	**ONESVIE, MOPC**

出典：*Plan Nacional de Reducción del Riesgo de Desastres 2017 - 2030 de la República Dominicana*

(5) 国家地震リスク軽減計画（PLAN NACIONAL PARA LA REDUCCIÓN DEL RIESGO SÍSMICO, 2011）

ドミニカ共和国では、2010 年のハイチ地震以降、地震への警戒を強め、2011 年に UNDP の技術支援の下、地震被害リスクの軽減に向けた戦略として、国家地震リスク軽減計画が策定された。同計画では、短期（１～２年）、中期（２～５年）、長期（５～10 年）の戦略・プログラム・プロジェクトが示され、2 年ごとに計画の評価を行うとされている。同計画は、地震災害時の脆弱性要因を軽減し、災害対応・復旧能力を向上させ、地震災害の影響を受ける可能性のある地域の防災力を高めるため、異なる行政レベルや一般市民社会に戦略的な方向性を示す、政策的で技術的なガイドラインの作成が目標とされている。

地震災害予防・抑制及び耐震化に関する内容としては、同計画の戦略的な柱として位置づけられている「知識開発、リスク評価と啓発」、「災害リスク要因の軽減と予測の強化」が挙げられる[13]。プログラムと主な内容は、表 2.2.7 に示すとおりである。地震災害アセスメント調査による、地震災害リスクの分析や、災害リスクを考慮した土地利用計画・規制の設定、地震災害予防・抑制のための取組が、体系的に整理されており、そのための人材育成や予算についても、その確保の必要性について示されていることが確認できる。

[13] PLAN NACIONAL PARA LA REDUCCIÓN DEL RIESGO SÍSMICO, P42

表 2.2.7　地震災害予防・抑制及び耐震化に関する主なプログラム内容

プログラムの柱	プログラム	主な内容
知識開発、リスク評価と啓発	リスク評価	• 防災、減災、災害対応を目的としたハザード、脆弱性、地震リスクの構成要素の分析 • ハザードのモニタリング、地震情報管理システムの改善、及び関連するデータ処理の促進
災害リスク要因の低減と予防の強化	リスクマネジメントの是正措置	• 過去の開発過程で生み出された災害脆弱性を軽減するための取組の実施 • 建物の補強、住民の移転、他の土地利用形態への適応が必要な地域の改修・再調整のための条件整備

出典：*PLAN NACIONAL PARA LA REDUCCIÓN DEL RIESGO SÍSMICO*

また、同計画に記載されている具体的なプログラムのうち、建築物及びインフラの耐震化に関わる内容は、主に、表 2.2.8 のとおりである。重要建築物やインフラの脆弱性評価や構造的な補強についてのプロジェクトが明記されている。しかしながら、ONESVIE によると、実際には、建築物及びインフラの耐震補強の取り組みは実施されておらず、実行の面での課題が確認できる。また、MEPyD からは、同計画に記載された課題や手法は非常に一般的な内容であり、明確なガイドラインや実施すべき行動を特定できていないとの指摘もみられた。

表 2.2.8　国地震災害予防・抑制及び耐震化に関する主なプロジェクト内容と責任組織

プログラム	サブプログラム	プロジェクト	指標	目標	時期	責任組織
知識開発、リスク評価と啓発						
リスク評価	地震に対する脆弱性の評価と知見	基幹構造物の地震に対する物理的な脆弱性の評価	重要インフラに関する脆弱性評価報告書	重要インフラやライフラインの数年以内の脆弱性評価	短期	ONESVIE MOPC
		ライフラインの物理的・機能的な脆弱性の評価	ライフラインの脆弱性評価報告書		短期	ONESVIE INAPA CAASD INDRHI CDEEE
リスク要因の軽減及び予測の強化						
是正的リスク管理	重要建築物の補強の優先的な実施	病院/学校/公共施設/住民へのサービス提供事業者	病院や学校、公共施設、その他重要インフラの構造的な補強	3～7 年の間に、2 つの主要都市において、重要インフラの補強と脆弱性への介入を実施		MOPC
	ライフラインにおける物理的・機能的脆弱性への介入	脆弱性低減対策：飲料水供給システム、電気システム、通信システム、道路網及び重要インフラ.	地震発生時への適切な対応のための構造的な介入手段を備えたライフライン			CAASD/INAPA:水 CDEEE: 電気 INDOTEL: 通信 MOPC :道路ネットワーク、港湾 INDRHI: ダム
	地震リスクの課題をもつ地域の都市再生、住宅改善及び復興	住宅改善と耐震対策の導入	地震リスク軽減のための緩和策を実施した住宅	5～10 年の間に、2 つの主要都市において、少なくとも 3 つの都市再生と住宅改善事業を実施		市町村 INVI
将来を見据えたリスク管理	規則・規制の実装と執行	コンクリートや石造、木造、鉄骨の耐震構造基準の適用、監視、管理のための仕組みとプ	耐震性と、コンクリート・石造・木造・鉄骨の建築基準を管理するための法的メカニズムの開発と実	1年以内に、耐震性と、コンクリート・石造・木造・鉄骨の建築基準を管理するための法的	短期	MOPC

		ロトコルの確立	施手順の検証	メカニズム（の開発）と実施手順（の検証）		
		地震リスクの高い地域における建設制限の仕組みの構築	安全ではない場所での建設管理のための法的・運用的な仕組み	1年以内に安全ではない場所での建設管理の仕組み	短期	市町村
リスク移転	構造物やインフラの保証	地震時に構造物やインフラを保護するための保険の適用	重要な構造物やインフラの確保	4年以内に、重要インフラの確保と住宅保険への刺激策を講じる	中期	国営の損害保険会社

出典：*PLAN NACIONAL PARA LA REDUCCIÓN DEL RIESGO SÍSMICO*

(6) 国家地震リスク軽減計画改訂案（PLAN NACIONAL PARA LA REDUCCIÓN DEL RIESGO SÍSMICO）

現在、UNDP の支援を受け、ONESVIE が中心となって、国家災害リスク軽減計画及び仙台防災枠組に沿った内容となるよう、国家地震リスク軽減計画の改訂が進められており、2022 年に公表される予定である[14]。ONESVIE によると、これまでは耐震設計・施工の促進に関する情報はなかったが、当計画にそれらが組み込まれるよう提案がされているとのことである。同改訂案では、国家災害リスク軽減計画 2017-2030 の内容との整合が図られており、優先的な取り組み事項の一つに、「防災力強化のための災害リスク軽減への投資」が挙げられている。具体的なプログラム内容を見ると、重要建築物やインフラ、ライフラインの耐震補強について、達成目標や責任機関が明確化されている。

表 2.2.9　国家地震リスク軽減計画改定案 プログラム内容（耐震関連）

プログラム[15]	サブプログラム（地震）	プロジェクト	目標	指標	責任機関
1.1 災害リスク軽減のための情報管理	地震リスクに関する知識・評価	重要インフラやライフラインの地震脆弱性評価	国内の100% の国土における重要インフラとライフラインの地震脆弱性を評価	2022年までに、30%の領土の重要インフラとライフラインの地震脆弱性調査を実施 2027年まで、70%の領土で、重要インフラとライフラインの地震脆弱性調査を実施	MOPC ONESVIE その他公共サービスを提供する機関
		建築物やインフラの地震脆弱性評価（分野別アプローチ：保健、教育、住宅、道路・交通、産業、観光等）	国土の100% において、建築物やインフラの地震脆弱性を分野別で評価	2025年まで、30%の領土の建築物やインフラの地震脆弱性を、分野別に調査 2030年までに70%の領土で、建築物とインフラの部門別の地震脆弱性を調査	MINERD MSP MOPC INVI Ministry of Tourism
3.1 災害リスク軽減の	地震リスク軽減のための投資	重要建築物及びインフラの優先的な補強	重要建築物とインフラの耐震補強	2025年には、10%の建築物と重要インフラが耐震補強される	MEPyD MOPC ONESVIE

[14] ONESVIE 質問票
[15] プログラムは、国家災害リスク軽減計画 2017-2030 と関連性をもたせており、それ以外は地震に特化した内容が記載されている。

ための投資能力の開発		ライフラインにおける物理的、機能的な脆弱性に対する強化	ライフラインの耐震補強	2025年に、30%のライフラインが耐震補強される	MOPC ONESVIE その他公共サービスを提供する機関
3.4 災害リスク軽減のための規制の更新	公共及び民間建築物の強靭化	安全な建築基準への更新	安全な建築基準法及び規格の更新	2022年までに、安全な建設のための規格と建築基準法を更新	MOPC

出典：*PLAN NACIONAL PARA LA REDUCCIÓN DEL RIESGO SÍSMICO*（改定案）

(7) 地方防災計画

ドミニカ共和国では、全ての地方行政機関が、国家計画に沿った、その管轄区域内の防災計画（Local disaster risk management plan）と緊急計画（Emergency plan）を国家計画に沿って作成する責任があるとされている[16]。これまで、いくつかの地方防災計画が、外部支援の元、作成されてきたが、現行法の元で求められている計画について地方レベルではかなりの混乱が見られる状況である[17]。実際、ONESVIE 及び MEPyD からの質問票回答結果及びヒアリングによると、いくつかの地方自治体では既に地方防災計画が作成されており、防災対策を実施する組織が設置されている事例も見られるが、技術的な能力向上及び施策実施の予算が必要とされる[18]。また、地方防災計画をモニタリングする仕組みが、中央政府に存在しない[19]ことも、課題として考えられる。一方、計画策定が済んでいない自治体に対しては、作成に向けた技術的な支援も必要である。

(8) 学校防災計画策定

MINERD からの質問票回答結果及びヒアリングによると、学校総合リスク管理計画（The school plan on comprehensive risk management）が学校関係者によって作成されており、当計画を作成済みの学校は、全体の 25%であり、16%が更新中とのことであった。計画の構成としては、4 つのユニットに分かれた 13 のステップが記載されている（ユニット１：組織体制（ステップ１、２）／ユニット２：リスク診断（ステップ３～７）／ユニット３：計画の作成・構築（ステップ８～11）／ユニット４：計画の実施（ステップ 12、13））[20]。

2.2.3 地震災害リスクアセスメント

災害リスクアセスメントは、上記で整理した各種計画にも記載されているとおり、実施すべき取組と認識されている。関係機関への質問票やインタビュー調査結果によると、これまで、いくつかの地震災害リスクアセスメントが実施されている。例えば、Santo Domingo, Salcedo、Santiago de los Caballeros などにおいて、災害の脅威レベルや、脆弱性の程度などを基準とした、

[16] IFRC. 2011. Analysis of Legislation Related to Disaster Risk Reduction in the Dominican Republic. p27, ONESVIE 質問票
[17] IFRC. 2011. Analysis of Legislation Related to Disaster Risk Reduction in the Dominican Republic. p27
[18] MEPyD 質問票及びヒアリング
[19] ONESVIE 質問票及びヒアリング
[20] MINERD 質問票及びヒアリング

地震震度分布図（Seismic microzonation map）が作成されている[21]。また、これら結果は、地震防災対策を実施する優先対象地域の特定や、耐震化の推進、土地利用規制、地震防災意識啓発などで使われているとの回答を得ている[22]。MOPC によると、2012 年には、同国において、CAPRA プラットフォームを用いた災害リスク分析が実施され､そのハザード評価においては、災害の発生頻度や程度が分析された。同様に、2021 年 10 月には、Santiago 市を震源とする地震のシミュレーションが実施されている[23]など、一部の地域を対象に、リスクアセスメントが実施されていることが伺える。一方で、全国規模での実施の仕組みや取組は確認できない。

2.2.4 地震・耐震対策の実施体制

(1) 防災対策の組織体制

1) 災害予防・減災・対応国家委員会及び技術委員会

防災法（Law No. 147-02）によると、ドミニカ共和国における防災全体の方向性や計画、調整役は、OCD の局長を常任理事とする「災害予防・減災・対応の国家委員会（National council for disaster prevention, mitigation and response ：CN-PMR）」とされている。National System for Disaster Prevention, Mitigation and Response (Sistema Nacional de Prevención, Mitigación y Respuesta ante Desastres：SN-PMR)は、防災法に基づき、公共及び民間のインフラにおける緊急事態や安全対策を確立する責任を負っている。学校や病院、道路、橋梁、エネルギー、交通、通信などの重要なインフラに対する災害の影響を抑制するため、国家基金から融資が検討されている[24]。当委員会は、政府機関や Santo Domingo 国家地方委員会、ドミニカ赤十字、民間団体など、22 名で構成されており、少なくとも年に 2 度、会議を開催し、防災政策の承認や、防災関連機関の行動枠組みの確立などを行っている[25]。

一方、国家災害リスク管理計画案の起草や改訂は、2008 年に設置された「災害予防・減災・対応の国家技術委員会（National technical committee for risk prevention and mitigation: CTN）」が担当しており[26]、これまで、外部パートナーの支援を受け、計画案の検討が行われてきた[27]。同時に、災害リスク軽減活動におけるアドバイザーとして、また、調整役としての機能を有している[28]。組織体制としては、SN-PMR に参画している機関の技術長で構成されており、委員会は毎月開催されている。但し、同委員会では、人的・財政的な資源が不足していることが指摘されており、各計画の策定や更新を含め、各取組への外部協力が不可欠とされる[29]。

また、IFRC(2011)によると、関係機関は、学校や病院の構造的な改善を含む主要な災害軽減の取組は主に、被災後の対応として、外部機関からの支援を得て実施されてきており、災害リスク軽減に必要となる長期的かつ総合的なアプローチとは対照的であると認識している[30]。

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[21] ONESVIE 質問票及びヒアリング
[22] ONESVIE 質問票及びヒアリング
[23] MEPyD 質問票及びヒアリング
[24] Law No. 147-02, art. 12 and Decree No. 874-09, art. 20, paragraph 1-B. cited by IFRC(2011) p39
[25] Law No. 147-02, art. 9, and Decree No. 874-09, art.s 6-9. Cited by IFRC(2011), p34
[26] Law No. 147-02, art 15
[27] IFRC. 2011. Analysis of Legislation Related to Disaster Risk Reduction in the Dominican Republic. p19-, 26
[28] PLAN NACIONAL PARA LA REDUCCIÓN DEL RIESGO SÍSMICO, 2011, p55
[29] Law No. 147-02, art. 11, paragraph II. Cited by IFRC (2011),p35
[30] IFRC. 2011. Analysis of Legislation Related to Disaster Risk Reduction in the Dominican Republic. p39

2) 防災セクターテーブル（Seismic table）

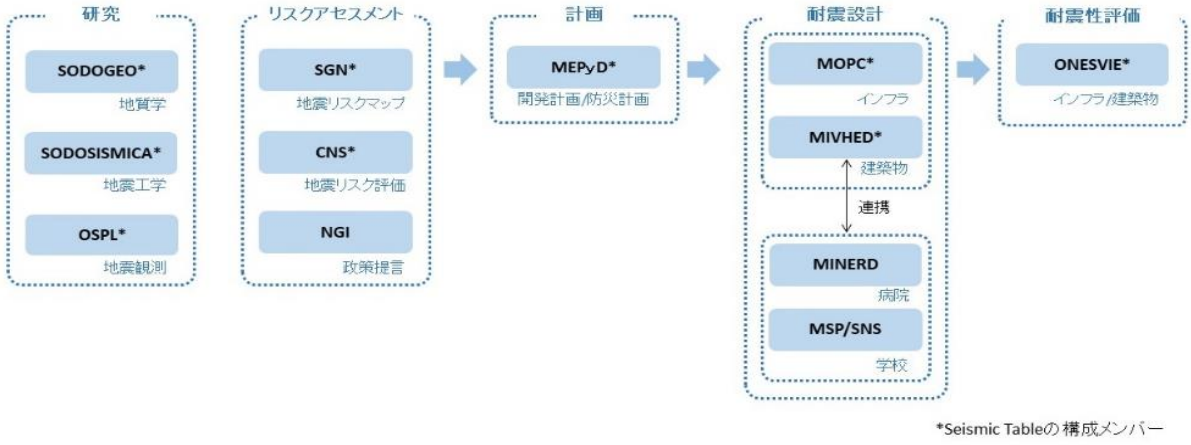
ONESVIE とのヒアリング結果によると、防災セクターテーブルは、ONESVIE の前局長のイニシアティブによって設置された。法律などによって取り決められている組織ではないが、現在協定の準備がされている。同組織は、防災や耐震に関する機関で構成されており、ONESVIE は、当組織のリーダー組織となっている。参画機関は、以下のとおりである。

- 国立地質・インフラ・建造物耐久調査局（ONESVIE）
- 国家地質サービス（SGN）
- 国立地震学センター（CNS）
- 公共事業・コミュニケーション省（MOPC）
- 経済企画開発省（MEPyD）
- ドミニカ共和国地質学会（SODOGEO）
- ドミニカ共和国地震学・地震工学協会（SODOSISMICA）
- ロヨラ工科大学精密地震観測室（OSPL）
- 災害リスク管理、地質学、鉱業の問題にかかる 2 名の大統領顧問
- 教育省（MINERD）

このように、ドミニカ共和国では、防災対策を実施する組織や委員会が複数存在しており、MEPyD からは、同じ目標を持つ省庁や機関が複数あるものの、目標達成に向けた連携がなされず、機関や組織の機能や権限、範囲の重複が、主要な課題の一つであるとの指摘があった[31]。

(2) 各地震防災・耐震対策関連組織の役割

ドミニカ共和国の地震防災・耐震対策の体制を図 2.2.1 で、関連組織の役割を表 2.2.3 でまとめた。



出典：JICA Expert Team

図 2.2.1 地震防災・耐震対策の体制

[31] MEPyD 質問票及びヒアリング

表 2.2.3　各機関の地震防災に係る役割と取り組み

機関	役割/主な取り組み
ONESVIE （国立地質・インフラ・建造物耐久調査局）	既存の建築物およびインフラの耐震診断の実施、耐震性能評価に基づく耐震補強または取り壊しの提案と監督、公共及び民間セクターの建設プロジェクトでの耐震設計の指導、地震発生時の各関係機関との連絡調整を担う機関[32]。そのほかに、リスク軽減に資する公共投資の必要な分野の特定[33]、耐震診断教育や、公的機関の耐震強度インベントリー作成等を実施しも行ってきた[34]。従業員数は 126 名。[35]
MOPC (公共事業・コミュニケーション省)	国土の公共インフラの建設と管理に係る機関[36]。主な役割に、建築物およびインフラの建設に係る基準・規則を制定と改訂やインフラの設計と施工の監督がある[37]。従業者数は 6,117 名[38]。
MIVHED （住宅・居住・建物省）	2021 年に新設された、居住環境、建築物の建設に係る政策、原則、プログラム、計画、戦略を立案し推進する機関[39]。主な役割に、あらゆる建築物の設計、監督、施工の管理がある[40]。
MEPyD (経済企画開発省)	国の開発計画の制定、監理、モニタリング、評価を行う機関。これまで、国家地震リスク軽減計画等の計画を策定してきた[41]。また、各機関が地震リスクを含めたリスク軽減策を開発計画に含めることを推進している。[42]
MINERD （教育省）	初等教育及び中等教育レベルにおいて、学校における災害予防・対応計画を作成し、その計画に沿って取組を実施することとなっている[43]。防災に関連する部局としては、Directorate of Environmental and Risk Management と Directorate of Risk Assessment, Vulnerability Reduction, and Training がある。前者は校舎の脆弱性の評価、後者は職員と生徒の訓練を担当している。[44]
MSP（保健省）/ SNS（国民保健サービス）	MSP 内の Risk Management and Disaster Management Directorate がすべての防災に関する規則を作成して推進し、病院との調整も行う[45]。SNS は MSP に付随する機関であり、保健サービスの技術的、行政的、財政的な有効性を確保することを目的に 2015 年に設立された[46]。SNS 内の、Department of Infrastructure and Maintenance は建築物の基準への準拠を確認する。PAHO の支援で実施した Safe Hospital Program において、80 の病院の安全性（継続可能性）を評価した。
SGN（国家地質サービス）	ハザード評価を主な役割とする機関であり、地質学的リスクマップを作成してきた[47]。

[32] http://www.grvglobal.com/RIF18/Roundtables
[33] https://eeri.org/ymc/articles/11538-500-years-of-earthquake-history-how-academia-and-government-are-collaborating-to-reduce-earthquake-risk-in-the-dominican-republic
[34] http://www.onesvie.gob.do/
[35] ONESVIE からの回答
[36] https://www.mopc.gob.do/nosotros/qui%C3%A9nes-somos/
[37] *Law 687*
[38] https://eeri.org/ymc/articles/11538-500-years-of-earthquake-history-how-academia-and-government-are-collaborating-to-reduce-earthquake-risk-in-the-dominican-republic
[39] *Law No. 160-21* Title II, Chapter 1, Article 5
[40] MIVHED ヒアリング
[41] MOPC 質問票
[42] MEPyD 質問票
[43] 3.3.3. Funciones y responsabilidades institucionales, *Plan Nacional de gestion de riesgos, 2001*
[44] MINERD 質問票及びヒアリング
[45] MSP ヒアリング結果
[46] https://sns.gob.do/sobre-nosotros/quienes-somos/
[47] SGN 質問票

NGI（国立地理機関）	地理学に関連した政策や活動を提言するとともに、国の地図作成や地理データアーカイブの作成を実施する機関[48]。
CNS（国立地震学センター）	地震観測ネットワークの構築と地震リスク評価を実施する機関である。30 以上の地震観測所（うち８つを所有）を有している。[49]
SODOGEO （ドミニカ共和国地質学会）	地質学者をはじめとする専門家を組織する公共団体。地震をはじめとした地球科学に関連した研究・調査と情報発信をする。
SODOSISMICA （ドミニカ共和国地震学・地震工学協会）	主な役割は、1)地震リスクの状況を把握するための研究の促進、2)地震工学に関するコンサルティング、3)知識・知見の普及活動である。[50]
OSPL (ロヨラ工科大学精密地震観測室)	地震活動および地震災害の記録、分析し公表している。27 の地震計(うち 15 台を所有)を有し、得られた情報はリアルタイムで専用ポータルサイトに公開されている[51]。

インフラ・建築物の耐震化に係る役割を表 2.2.4 で整理する。耐震設計制度の運用は、建築物の場合は MIVHED が実施し、道路・橋梁等のインフラの場合は MOPC が実施する。公共建築物の耐震設計制度の運用はこれまで MOPC と OISOE によって実施されてきたが、2021 年以降は新設された MIVHED にこの役割は移行された[52]。建築物の耐震診断は設立以来、ONESVIE が実施しており、これまで 6000 件以上の建物（主に公立学校や病院）を評価し、100 件以上の耐震改修を設計してきた[53]。学校の脆弱性評価や病院の安全性評価はそれぞれ、MINERD と MSP によって一部実施されているが、これらは外部ドナーの支援による。

表 2.2.4　インフラ・建築物の耐震化に係る役割

対象		耐震設計	評価・診断	耐震補強
民間建築物		MIVHED	ONESVIE	n/a
公共建築物	学校	MIVHED/MINERD	ONESVIE(/MINERD)	MIVHED/MINERD
	病院	MIVHED/MSP	ONESVIE(/MSP)	MIVHED/SNS
	避難所	MIVHED	ONESVIE	MOPC/MIVHED
	政府庁舎	MIVHED	ONESVIE	MOPC/MIVHED
インフラ	道路・高速道路・橋梁	MOPC	ONESVIE	n/a
	港湾	MOPC	n/a	n/a
	空港	MOPC/APORDOM	n/a	n/a
ライフライン	上下水道	民間事業者	n/a	民間事業者
	電気	MOPC/国営会社	n/a	MOPC/国営会社
	ガス	民間事業者	n/a	民間事業者
	通信	民間事業者	n/a	民間事業者

出典：ONESVIE, MOPC 質問票を元に作成

[48] https://www.sismap.gob.do/Municipal/Directorio/Dir/Details/24869
[49] CNS 質問票
[50] SODOSISMICA 質問票
[51] OSPL 質問票
[52] Decree 715-01
[53] Morales-Cartagena. 500 years of earthquake history

地震リスクアセスメントについては、リスクマップを作成する SGN、地震に関する報告書を作成する CNS、政策提言を行う NGI、国家リスク軽減計画などを策定している MEPyD が実施している。また、地震防災にかかわる調査・研究は SODOGEO、SODOSISMICA、OSPL が行っている。

(3) 地方自治体の役割

国家災害リスク軽減計画では、災害アセスメント及や脆弱性評価、ハザードマップの作成は、各レベルの適切な意思決定を行うために実施されるべきとされており、地方自治体が地域の詳細なリスク診断を実施するための分析方法論や技術・指標の設定・促進を中央政府が行い、各地方自治体がその管轄区域の詳細なリスクアセスメントを実施するとされている[54]。しかしながら、MOPC の質問票回答及びヒアリング結果によると、実態としては、ドミニカ共和国では市長室の中に、災害リスク管理や都市計画室などが設置されるものの、市長室は災害リスク評価を行うための技術的、資金的、物理的な資源が限られることから、災害リスクの特定と分類は、中央政府の支援によって実施されている[55]。地方自治体レベルでは、地震防災施策が導入されているとは言い難い状況[56]であり、地方自治体の防災力向上に向けた組織体制の構築と予算確保、施策の実施に向けた支援が必要と考えられる。

2.2.5 地震防災・耐震化促進に係る予算状況

(1) 防災予算の仕組みと現状

ドミニカ共和国において、中央政府の一般予算は、国家開発戦略（National Development Strategy）や国家複数年公共セクター計画（the National Multi-year Public Sector Plan）、各機関別の戦略計画（the Institutional Strategic Plans）に基づいて策定される[57]。また、地方行政予算については、地方の開発計画に基づき決定されることとなっている[58]。国家開発戦略では地震リスク軽減に向けた基準の設定についての記述がみられ、重要な施設やインフラに対する災害リスク軽減のための工事の実施についても施策の一つとして記載されているが、耐震補強・耐震化との記載はなく、従って、耐震化施策の実施機関（各施設の所管省庁）は、耐震化に向けた予算の確保が困難であると考えられる。

現行防災法（Ley No. 147-02 Sobre Gestion de Riesgos, 2002）では、CNE と CTN は、防災対策業務を実施するための年間予算を確保できることとなっている[59]。また、国家地震災害リスク軽減計画では、計画の基本原則への遵守に必要不可欠な事項として、資金の確保が挙げられており 、計画実施に向けた資金確保のため、各担当省庁の公共投資資金の投入や、災害予防・軽減・対応のための国家基金（National fund）からの資金調達などが挙げられている 。しかしながら、実態としては、基本的な組織運営費用は確保されているものの、各防災関連組織がその役割を果たす

[54] Plan Nacional de gestion de riesgos, 2001
[55] MOPC 質問票
[56] MEPyD ヒアリング及び質問票
[57] MOPC 質問票
[58] MOPC 質問票
[59] Law No. 147-02, art. 22. Cited by IFRC(2011)

ための十分な財源は得られていないとの評価を受けている[60]。

本調査においても、ONESVIE については、2021 年の年間予算として RD$ 130,137,102.00（約 2.56 億円）が承認されている[61]ものの、当省庁の職員から[62]は、現在の省庁予算は職員の人件費（employees and services）に充てられており、国家災害リスク管理計画に記載されている地震防災・耐震促進対策（計画、設計、開発）を実施するための年間予算は確保できておらず、大統領に対し再調整を要求しているとの回答であった。また、他に耐震補強や耐震設計のための予算を有している省庁も存在せず、公共施設の耐震補強を実施している組織も存在しないとのことだった。ONESVIE からは、一要因として、当組織は設置依頼、技術的な対策ではなくサービスの提供を重視してきたためと考察しており、現在、技術者を中心に組織再編を行い、能力を向上させ、耐震設計や耐震改修のための予算の要求を試みようとしているようである。具体的には、予算は確保されていないものの、病院と学校の耐震補強に向け、優先的に耐震補強を行う学校の特定を済ませているとのことだった。また、病院についても対象施設の特定を進めている状況である。但し、耐震補強工事については、ONESVIE の管轄外であることから、そのための資金は、他省庁に委ねられるとのことで、実際の耐震補強の実施には、省庁間の連携と各省庁における予算の確保が必要と考えられる。また、ONESVIE 以外に対しても、各省庁の防災予算について確認したところ、情報やデータがないとの回答がほとんどであった。今後、地震防災対策を推進するためには、現状の地震防災分野における各省庁の予算状況の把握と現状認識も、併せて必要と考えられる。

一方、耐震補強や耐震化に向けた予算状況については、前述したとおり、非常に限られている印象を受けるものの、各省庁における防災組織の人員増加については、多数の報告が挙げられており、防災分野に対する各省庁の優先度は高まってきていると考えられる。

(2) 地方防災行政予算及び市民に対する支援の実態

MEPyD へのヒアリングの結果及び質問票の回答によると、地方行政における資金及び技術的能力が大きな課題として挙げられている。地方行政における防災予算は非常に少なく、防災対策を実施するための予算確保を可能とする政策が必要と考えられる。また、地震課題を解決するためには、民間セクター（耐震診断の実施や耐震改修等）に対する支援も必要となるが、過去の JICA 研修参加者によると、行政から民間セクターに対する資金的な支援が不足していることも指摘されている[63]。

[60] Report on the implementation of the 53 recommendations of the UNDAC 2005 evaluation mission on national disaster response capacity, UNDAC, 2010, p. 11. cited by IFRC(2011)
[61] MEPyD 質問票及びヒアリング
[62] 以降、ONESVIE ヒアリング結果
[63] 2021 年度課題別研修「南米建築物耐震技術の向上・普及」参加研修員 質問票

2.3 建築物の耐震化状況と取組内容

2.3.1 建築物の種類と耐震化状況

(1) 耐震基準に基づく建築物の種類

ドミニカ共和国における建築物は、図 2.3.1 に示すように、カテゴリー1：1979 年以前に建築された構造物、カテゴリー2：1979 年から 2011 年に建築された構造物、カテゴリー3：2011 年以降に建築された構造物の 3 つのカテゴリーに分類できる。

出典：JICA Expert Team

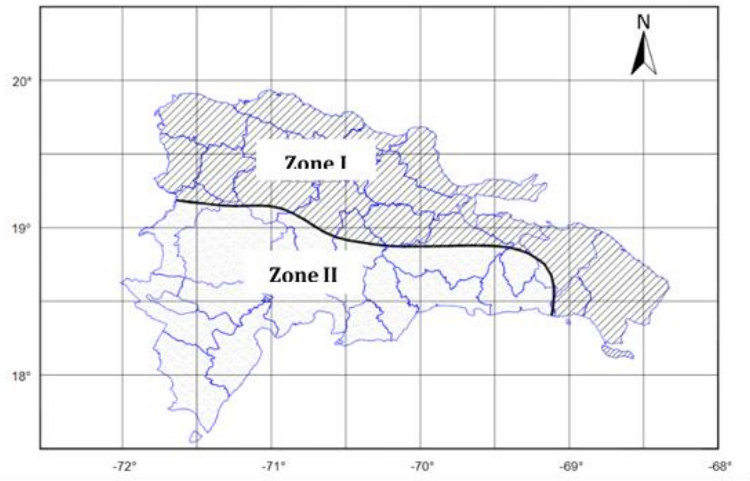
図 2.3.1 耐震基準に基づく建築物の分類

ドミニカ共和国における最初の耐震基準は、1979 年に設立された「M-001 Provisional Recommendations for the Seismic Analysis of Structures」であり、地震荷重を考慮した設計について明記されていた。しかし、同基準に法的強制力はなく、推奨にとどまった。そのため、カテゴリー1 のみならずカテゴリー2 に分類される建築物も地震に対して脆弱である可能性が高い。2011 年には、法令 201-11 に基づいて「R-001 Regulations for Seismic Analysis and Design of Structure」（後述）が MOPC より制定された。カテゴリー3 に分類される建築物は耐震設計の基準及び運用制度が導入されてから建設されているため、カテゴリー1 と 2 の建築物に比べて安全性が高いと考えられる。

(2) 耐震基準によるゾーニング

R-001 では、地震活動度の視点から国土を 2 つのゾーンに区分している（図 2.3.2）。[64]

比較的地震活動度の高い Zone Ⅰと、中程度の地震活動度である Zone Ⅱの２種類である。



出典：R-001

図 2.3.2 R-001 に規定されている Seismic Zone

(3) 耐震基準の遵守状況

前述の建築物に加えて、ドミニカ共和国には”Informal Construction”に分類される建築物が多数存在する（図 2.3.3、図 2.3.4）。これらは耐震設計制度の手続きを経ずに建てられた建築物のことを指す。ドミニカ共和国では 2013 年から 2019 年にかけて 30,342 件の民間建築物の工事があったにも関わらず、MOPC の Plan Processing Office がこの期間に交付した建築許可は 6,193 件[65]にとどまっている。すなわち、この期間に建てられた建築物の約 80%は現行の基準に従って建設されていない。Informal Construction は、低所得の住宅によく見られる点、資格を有していない職人によって設計されている点、工学的な基準を満たしていない点から、建築主および居住地の社会経済的なレベルと密接に関係していると考えられる。

図 2.3.3 informal construction の増築事例

図 2.3.4 サントドミンゴの informal construction

[64] R-001 Regulation for the Analysis and Seismic Design of Structures
[65] National Office of Statistics (ONE)

(4) ドミニカ共和国の建築物の主要構造

都市部では、鉄筋コンクリート（RC）フレーム構造、補強組積造、横荷重用の鉄筋コンクリート製せん断壁と重力荷重用のフレーム構造（コンクリートまたはスチール）の二重システムが主流である。R-001 で定義されるゾーン II では 6 階建てまで、ゾーン I では 4 階建てまでが建設可能であるが、首都サントドミンゴでは 40 階建ての建物もある。近年では、高層マンションにおいてじん性の低いせん断壁を用いた構造が普及している（図 2.3.5）。

農村部では、informal construction が多くみられる（図 2.3.6）。建築物の構成としては、ブロック壁にトタンの屋根、木材壁にトタンの屋根、ブロック壁にコンクリートの屋根が主流である。

図 2.3.5 サントドミンゴ都市部

図 2.3.6 農村部の住宅

(5) 重要建築物の耐震化状況

災害時緊急使用のために重要な建築物である学校、病院、政府庁舎の耐震化状況について整理する。また、ドミニカ共和国における災害時避難施設の考え方について整理する。

1) 学校

ドミニカ共和国には、私立と公立を合わせて 7,500 校以上の学校があり[66]、280 万人以上の生徒がこれらの施設を利用している[67]。ドミニカ共和国の公立校の施設は、他の公共建築物と同様に、1930 年代から建設されている。学校は通常、1 階建てから 3 階建てで、延床面積は 150 ㎡から 3,500 ㎡である。サントドミンゴの人口密集地では 4 階建ての学校も確認されている。

図 2.3.7 ドミニカ共和国の公立校

多くの学校は耐震基準が制定される前に建設されたため、地震荷重や耐震設計が考慮されていない可能性が高い。また、学校はこれまでにもハリケーンや地震の影響を強く受けている建物の

[66] Centros Educativos de República Dominicana, 2021. - Conjuntos de datos - Portal de Datos Abiertos de la RD
[67] https://www.statista.com/statistics/1174670/number-school-students-education-type-dominican-republic/

一つである。ドミニカ共和国では風水害の発生頻度が高く、学校が洪水や地滑りの被害を受け、

何百人もの生徒が何週間も教育を受けられない事態が頻発している。その一方、地震災害による影響も多く報告されている。2003 年の M6.5 のプエルト・プラタ地震では、多くの公立学校が深刻な被害を受け、建物の一部が損壊または倒壊した（図 2.3.8、図 2.3.9）。

図 2.3.8　José Dubeau 高校

図 2.3.9　Urbano Gilbert 校

崩壊の原因は、主に短柱及び梁と柱の接合部にある。ここで短柱とは腰壁や垂れ壁によって柱の可とう長さが短くなり、せん断破壊を起こしやすくなることで、これまでにドミニカ共和国内で行われた学校建物耐震性調査でも指摘されている。梁柱接合部の強度不足も、この調査で指摘されている。[68]

2)　病院

ドミニカ共和国の医療システムは 187 の病院（13 の専門病院、38 の専門病院、136 の総合病院）で構成されており、ナショナルディストリクトとサントドミンゴ州に集中している。建築物の主な構造は鉄筋コンクリート（RC）フレーム、せん断壁、RC 補強組積造、およびこれらの混構造である。また、これらの構造には水平方向および／または垂直方向の不規則性がみられることが多く、設計段階において構造部分と非構造部分の相互作用が考慮されていないことが指摘されている[69]。

同国では、甚大な被害をもたらした２つの暴風雨（オルガ：2007 とノエル：2008 ）をきっかけに、2009 年に WHO の「Safe Hospital Program」を採用した。このプログラムは、MSP の緊急・災害対策本部（DNED）と PAHO が主導し、実施された。同プログラムでは、対象病院を、Safe Hospital Index にもとづいて構造、非構造、機能の 3 つの要素で評価する[70]。病院はその結果、3 つのカテゴリーに分類される。カテゴリーは表 2.3.1 の通りである。

表 2.3.1　Safe hospital Index による分類[71]

分類	定義
カテゴリーA	利用者の生命を守ることができ、災害時にも機能を維持できる可能性が高いと判断された施設。

[68] Seismic risk of critical facilities in the Dominican Republic: case study of school buildings
[69] https://iris.paho.org/bitstream/handle/10665.2/4278/DOR_HospitalesSeguros2008-2013.pdf?sequence=1
[70] 評価は、Safe Hospital Program の研修を受けた政府機関関係者が実施している。
[71] https://www.paho.org/disasters/dmdocuments/SHT_HospitalSafetyIndex.pdf

カテゴリーB	災害には耐えられるが、設備や重要なサービスが危険にさらされている施設。
カテゴリーC	災害時に利用者の生命と安全が危険にさらされると判断される施設。

MSP によると、2019 年までに 80 の病院が評価され、85%以上の病院が C カテゴリー、15%が B カテゴリーで、A カテゴリーの病院がないことがわかった。これらの評価を高めるために、MSP は機能部分と非構造部分の改善を支援しているが、病院の耐震補強等の構造部分の支援は対象外となっている。耐震改修の実施を阻む主な要因は、地震リスク軽減のための国家予算が不足していることに加え、既存の構造物に耐震改修を施すには高いコストがかかることだと指摘されている。

国内初の耐震改修の事例は Hospital José Cabral y Báez 地域病院である。（図 2.3.11）。同病院が耐震改修の対象となった理由としては、1) 耐震診断の結果、重大な構造上の欠陥（短柱と軟弱な床）が明らかになった点[72]、2) 建設年度が古い（1978 年）、3) 機能しなくなった場合、多くの市民への影響が懸念される点[73]が挙げられる。この耐震補強工事の設計は Leonardo Reyes Madera Consulting 社[74]が担当し、主に炭素繊維による柱の補強、鉄骨梁の補強、新たな内部せん断壁の設置、基礎の補強（周縁部）などの工法が用いられた。また、R-001 に基づき、耐震パラメータを考慮した新棟も建設された。同工事は 2013 年に開始し、工期は 20 か月を予定していたが、結果として 7 年以上かかったことは特筆すべき点である。工事の責任機関である OISOE によると、工期の遅れの主要因は工事の複雑さを挙げている。総工費は 24 億ペソドル。[75]

Danilo Medina 政権のもと、2013 年には MISPAS-CCC-PU-2013-08 が策定され、56 病院を改修/

図 2.3.10　地域大学病院サン・ビセンテ・デ・ポール（HRUSP）の建設現場

[72] http://www.campesinodigital.com/2011/03/edificios-y-hospitales-de-santiago_19.html?m=0
[73] Solidarity Foundation によると、José Cabral y Báez 地方大学病院は、北部地域を構成する 14 の州に住む 3,403,782 人の住民にサービスを提供しなければならないことが明らかになっている。
https://conexionsalud.do/2020/07/13/cabral-y-baez-lleva-siete-anos-en-reconstruccion-y-reforzamiento/
[74] ONESVIE の現局長が代表を務める建設コンサルティング会社。
[75] 粘土質地盤のうえに、基礎が孤立して建てられていることが明らかになり、その介入が必要となった。
https://listindiario.com/la-republica/2019/12/16/596079/oisoe-dice-suelo-arcilloso-ha-retrasado-entrega-hospital-jose-maria-cabral-y-baez

図 2.3.11　ホセ・カブラル・イ・バエス地域病院　外観と耐震補強工事の様子

再建計画がはじまった。[76]現在、この計画のほとんどは停止されているが、一部の工事は進行している。建設が進められている北東部のサンフランシスコ・デ・マコリスにある地域大学病院 San Vicente de Paul (HRUSP)は国内初の免震装置を有する病院となる予定である。（図 2.3.10）同病院の建設は、OISOE に代わって、現在は MIVHED が主導している。

3)　政府庁舎

政府庁舎の建設年代は 1930 年代まで遡ることができ、現在の施設の多くはラファエル・レオニダス・トルヒーヨの独裁時代に建設されたものである。Centro de los Héroes（図 2.3.12、図 2.3.13）などは、地震荷重や耐震設計の原則を考慮せずに設計された建物の一事例である。また、1970 年代には、中央銀行、サン・ラファエル・ビル、フアン・パブロ・ドゥアルテ政府機関ビルなどの政府機関の建物が建設された。

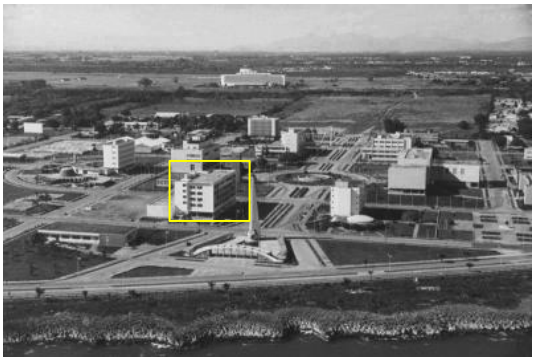


図 2.3.12　Centro de los Héroes, Santo Domingo (1955)

図 2.3.13　Centro de los Héroes, Santo Domingo (2020)

4)　避難施設の考え方

MINERD によると、ドミニカ共和国では学校はシェルターや避難所として考えられておらず、コミュニティセンター、教会、スポーツクラブなどが避難所として使われている。特に、スポーツクラブは鉄骨やスチールデッキで作られることが多く安全性が高い。また、ドミニカ共和国では学校を避難所として使用することは原則禁止されている。その理由として、水害後に校舎が住

[76] https://www.diariolibre.com/actualidad/camara-de-cuentas-encuentra-serias-irregularidades-en-proceso-de-urgencia-para-reparar-56-hospitales-en-2013-IH30157719

民に占拠され、授業の復旧に支障が生じた点が挙げられた。

2.3.2 建築物の耐震化促進に向けた取組状況

(1) 基準・規定の整備状況

1) 基準・規定の整備状況

建築物及びインフラに係る技術基準は MOPC 内の Directorate of Regulations and Systems によって運用・管理されている。当部局は、設計・施工の実施に必要な技術基準を定期的に見直し、それらを常に最新の状態に保つことを目的に 1982 年に設立された[77]。現在、MOPC が管理している基準は表 2.3.2 の通りである。基準は合計で 32 あるが、耐震基準 R-001 が制定されてから改訂された基準は５つのみである。

表 2.3.2 MOPC 発行の基準等

種類	番号	名称	根拠法令 No.	最終更新年
建築物に対する基準	R-001	Regulation for Seismic Analysis and Design of Structures	201-11	2011
	R-002	Regulation for Vehicle Parking in Buildings	284-91	1989
	R-003	Regulation for Electrical Installations in Buildings. 2nd Edition. Part I	284-91	1990
	R-004	Regulation for Supervision and General Inspection of Works	232-17	2017
	R-005	Regulation for Drawing Plans in Building Projects	N/A	1985
	R-007	Regulation for Projecting Without Architectural Barriers	284-91	1991
	R-008	Regulation for the Design and Construction of Sanitary Installations in Buildings	572-10	2010
	R-009	General Specifications for the Construction of Buildings	N/A	1982
	R-010	Provisional Recommendations for Electrical Installations in Buildings. Part II.	N/A	1982
	R-016	Provisional Recommendations for Minimum Spaces in Urban Housing	N/A	N.D.
	R-021	Application Requirements of the General Regulation of Buildings and Processing of Plans	576-06	2006
	R-022	Regulation for the Design and Construction of Medium to Low Voltage Distribution Substations	347-98	N.D.
	R-023	Regulation for the Design of School Physical Plants. (Basic and Intermediate Levels)	305-06	2006
	R-024	Regulation for Geotechnical Studies in Buildings	577-06	2006
	R-025	Regulation for the Installation of Emergency Power Plants	578-06	2006
	R-027	Regulation for Design and Construction of Buildings in Structural Masonry	280-07	2007
	R-028	Regulation for Design, Manufacturing and Assembly of Steel Structures	436-07	2007
	R-029	Regulation for the Design and Construction of Structural Wood Buildings	677-09	2009
	R-030	Regulation for the Design and Installation of Liquefied Petroleum Gas Systems	178-01	2010
	R-031	Regulation for the Design of Means of Vertical Circulation in Buildings	361-15, 84-11	2015

[77] https://www.mopc.gob.do/media/17976/cat%C3%A1logo-de-publicaciones.pdf

種類	番号	名称	根拠法令 No.	最終更新年
	R-032	Regulation for Safety and Fire Protection	364-16, 85-11	2019
	R-033	Regulation for the Design and Construction of Reinforced Concrete Structures	50-12	2012
	R-034	Regulation on Special Requirements for the Design and Construction of Works and Deep Excavations in the Ortega & Gasset-UASD Tunnel Zone	399-12	2017
インフラに対する基準	R-011	Basic Criteria for Geotechnical Studies of Highways	N/A	N.D.
	R-012	Basic Criteria for the Geometric Design of Highway	N/A	1983
	R-013	Instructions for Presentation of Proposals for Studies and Road Projects	N/A	1982
	R-014	General Specifications for Highway Construction	N/A	1985
	R-017	Provisional Recommendations for the Presentation of Road Projects	N/A	N.D.
	R-019	Provisional Recommendations for the Presentation of Road Projects	N/A	1987
	R-026	Regulation for the Execution of Excavation Works on Public Roads	61-07	2007
技術資料	R-015	P-Δ effects on nonlinear seismic response	N/A	1985
	R-018	Evaluation Manual (Flexural-Compression Design of Reinforced Concrete Walls. Rectangular, L and C Sections)	N/A	1986

上記の基準のほかに、MOPC から建築主、設計者、施工者にむけて表 2.3.3 の規程と技術資料が提供されている。

表 2.3.3　MOPC 発行の規定及び技術資料

種類	名称
規程	Requirements for Structural Evaluation in Existing or Constructed Buildings.
	Requirements for Qualification of Companies and Professionals in Structural Evaluation and Surveying
	Requirements for New Construction Systems
	Requirements for Qualification of Companies and Professionals in Geotechnical Studies
	Structural Evaluation Qualified List
	List of Qualified for Structural Evaluation and Structural Surveying
	List of Companies and Professionals qualified to perform Geotechnical Studies.
	List of Laboratories qualified to perform Tests
	Control Measures for the Installation of Mail Boxes in Buildings
	Recommendations for Wind Analysis of Structures
	Recommendations for Natural Ventilation in Buildings
	Legislative Code for the Professional Practice of Engineering, Architecture and Related Branches of the Profession
技術資料	R-015 (PT1) P-Δ Effects on Nonlinear Seismic Response.）
	R-018 (PT2) Evaluation Manual (Flexural-Compression Design of Reinforced Concrete Walls. Rectangular, L and C Sections)
	Manual of Seismic and Hurricane Evaluation of Existing Reinforced Concrete Buildings for the Dominican Republic.
	Road Signaling Manual
	(PT3) Pavement Failure Identification Pavement Failure Identification and Repair Techniques
	Environmental Manual for Design and Construction of Road Projects.
	Seismic Fault Maps - Seismic Regulation R-001

	Influence Zone Map of the Tunnel Influence Zone Avda. Ortega & Gasset-UASD Tunnel

2) 建築基準（R-001）

ドミニカ共和国の構造物耐震設計を規定する基準は基本的に R-001 (ユニット 5 、構造 タイトル 1 -B 分析と分析に関する規制 構造の耐震設計) であり、日本の建築基準法と同じく法律としての性格を持っている。ドミニカ共和国の憲法第 128 条による権限と 1982 年 7 月 27 日の法律第 687 号により制定されている。

日本において、土木施設は公共の用を担うとして構造物が保有すべき耐震性の必要条件を規定しており、一方、建築基準法では個々の建築物は個人の所有であることを鑑み、私権を制限することを避けるために“最低限の要求”を示すとされているが、ドミニカ共和国の耐震規定 R-001 は土木と建築の区別をせず、全ての構造物の耐震設計のあり方を一元的に規定している。なお、R-001 は米国の ASCE7 を出発点としていることから“最低限の要求”と言う立場にあり、この点は日本の建築基準法と共通である。

ドミニカ共和国における最初の耐震規準 R-001 は 1979 年に暫定勧告として作成され、その後 2011 年に改訂されて制式化している。新しい制式化であるために比較的率直なコンセプトで構成されている。

1979 年に暫定勧告として刊行された際に検討された地震工学的事項の概要は、第１３回世界地震工学会議に論文が提出されており、その著者は現在 ONESVIE の局長であるレオナルド氏である。

1979 年時点での地震荷重条件は 50 年（供用期間）中の超過確率が 50%に相当し、日本の許容応力度法（L1）に対応している。2011 年の改訂によって、地震荷重条件は 50 年（供用期間）中の非超過確率が 2%に相当するものが示され、日本の保有耐力法（L2）に対応することになった。

第 13 回世界地震工学会議の論文によると、ドミニカ共和国の耐震基準 R-001 は米国土木学会の ASCE7 を参考としているが、工学的な詳細としては“地震時応答の不確定性”や、“構造のねじれなどに起因する変則的な応答の増幅”など独自の考察を加えている。これらの考察の上でドミニカ共和国の中心的な耐震規定とされた。

地震動は応答スペクトルによって定義されると言う考え方に立っており、応答スペクトルの形状は ASCE7 の考え方によって、図 2.3.14 のような形状を基本としている。

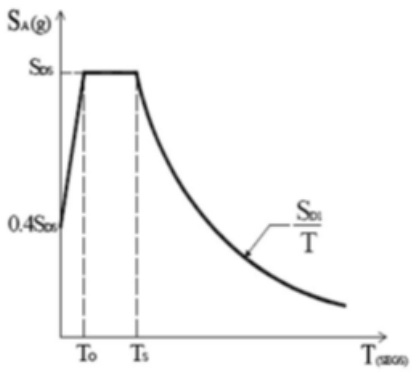


図 2.3.14　設計や解析に適用される応答スペクトル

このように地震動を応答スペクトルで規定し、モーダル法を適用することによって構造解析の入力条件（地震動の荷重規定）としている。非線形時刻歴応答解析をするには応答スペクトルに合わせる模擬波を作成して入力とすることが実行されている。

この考え方によれば、応答スペクトルは短い周期側の加速度 S_S、長い周期側の加速度 S_1、と表層地盤中での増幅 F_A,F_L の４組のパラメータで決定され、震源調査の結果となじみやすい。図の左端（固有周期ゼロ）の値は地表面最大加速度 PGA であるから、他の距離減衰推定式ともなじみやすい。

解析手法は静的載荷による解析、部材の一部の降伏を考慮するプッシュオーバー解析、部材の降伏を考慮する非線形時刻歴応答解析に言及している。

現在はさらに改訂の審議が進行中であり、次のような点が議論されているようである。

3)　改訂の審議における議論の要点[78]

地震動強度は確率論的な表現で比較的頻繁な地震から稀な地震までを下記表 2.3.4 に示す 4 段階で区分している。表中の「再来年」は目安のために調査団で追加した。

表 2.3.4　地震動強度と確率論的表現

区分	50 年内に発生する超過確率	再来年
Baja	50%	72 年
Moderada	20%	225 年
Intensidad de iseño	10%	475 年
Extrema	2%	2,475 年

出典：R-001 改訂版

設計条件とする基本の地震動強度は表-1 中の”Intensidad de iseño”、つまり 50 年（供用期間）内の超過確率が 10%(再来年 475 年)に相当する区分が選ばれるようである。応答スペクトル強度は R-001 で与えられる SS、S1、FA,FL の４組のパラメータで決定される。

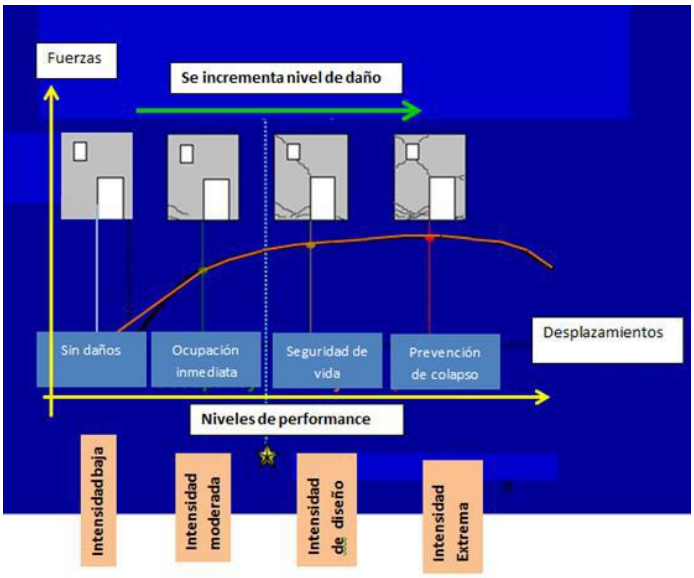
対応するべきリミットステイトは表 2.3.5 および図 2.3.15 のように示されている。[79]表中の SEAOC の相当は目安のために調査団で追加した。

表 2.3.5　対応するべきリミットステイト

[78] MOPC 提供の R-001 改訂版ドラフト(TÍTULO I R-001)
[79] 例えば SEAOC の VISION2000 による Fully Operational, Operational, Life Safe, Near Collapse に相当する

区分	SEAOCの相当
Sin Daños	Fully Operational
Ocupación Immediate	Operational
Seguridad de Vide	Life Safe
Prevención de Colapso	Near Collapse

出典：R-001 改訂版



出典：R-001 改訂版

図 2.3.15　リミットステイトを示す概念図

具体の設計において、どのリミットステイトを取るべきかは設計対象建物の重要度に対応するとされているようである。

各リミットステイトが図 2.3.15 に示されるような構造の崩壊メカニズムのどの段階に相当するのかを示す物理量は、現段階では厳密に特定されていない。世界的な趨勢である性能照査型設計に近い状態と考えられる。

上記の設計地震動を受けると構造躯体の一部分は弾性域を越えることがあるが、構造全体が崩壊することを避ける範囲に止まるべきとされている。これは SEAOC Vision2000 の性能レベルでは”Life Safe”であり、日本では２次設計、保有耐力法、L2 と呼ばれる設計方針に相当する。

構造全体を”Life Safe”の範囲に留めるには構造部材の剛度や耐力を増加させる方向、あるいは部材のエネルギー消費による減衰に注力すべきことが述べられている。（じん性に期待する設計に相当する）

それとは別に、震後直ぐにも供用が必要とされる重要構造物は弾性域内に止まることが要求されると言う意見もある。（SEAOC Vision2000 の性能レベルでは”Operational”）

”Intensidad de iseño”として設定されている強い地震動条件に対応するには免震や制震の導入が

必要とするものもあり[80]、日本の場合と同じように各種の免震や TMD、Active Control についても言及しているが、現実的な対応としては良く考察されたブレーシングに関心あるようである。[81]

ここで制震については日本の場合と同じように TMD などにも言及しているが、減衰付与を目的とするブレーシングについて述べられている。

日本の学校耐震改修に適用される「座屈を抑制するタイプのブレーシングは、この要求に応えることができる。更に鉛のダクティティを利用するタイプのダンパー等も適用の可能性がある。

4) ガイドライン・マニュアルの整備状況

MIVHED へのヒアリングの際には、実務の構造設計者を対象とする R-001 に基づいたわかりやすい耐震設計のためのガイドラインは現時点では存在せず、現時点では作成される予定もないとされた。[82]しかし一部ではその必要性が認識されており、日本の支援が有効な分野であると考えられる。現時点では米国のソフトウェア ETABS などを利用することによってドミニカ共和国の規準でカバーされない部分が補われ、設計や建設の現場で不便が感じられないようであるが、無秩序な運用は将来の混乱につながると考えられる。日本の積極的な支援が有効と考えられる分野として例えば、建築学会による「ルート」のコンセプトなどが推薦され得る。そこでは非常に強い地震動に対する構造安全性を判定する解析の方法として、精緻な手法が必要な場合とそうでない場合に分けて現実的な方針を示している。[83]

(2) ・耐震設計の運用制度・環境

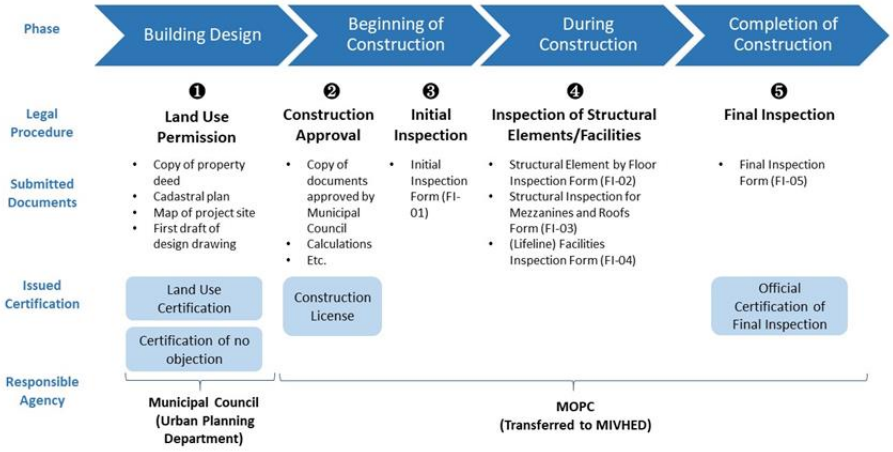
1) 建築許可手続きの法的根拠

ドミニカ共和国には日本と同様、設計と工事を審査・検査する建築物の品質保証システムが存在する。設計から着工までの手続きは、R-021 General Building and Plan Processing Regulations を、着工から工事完了までの手続きは、R-004 Regulations for General Supervision and Inspection of Works をそれぞれ法的根拠としている。

2) 手続きの状況

R-004 と R-021 で規定されている新築の手続きフローを図 2.3.16 に示す。

[80] 審議中の配布資料
[81] 例えば地震時交番荷重の圧縮による座屈を抑制するブレースや、減衰付与の効果のあるブレーシングに言及がある。
[82] 新規規定に関する計算事例は配信されているとされている。ただし日本の支援が必要。
[83] AIJ Standard for Structural Calculation of Reinforced Concrete Structures revised 2010 (ISBN978-4-8189-5005-4)



出典: JICA Expert Team

図 2.3.16　R-021 と R-004 上の手続きのフロー

建築主は、まず Land Use Permission を自治体より取得し、Construction License を MOPC（2021 年からは MIVHED）より取得しなくてはならない。両者の手続きにおいて設計図書が提出されるものの、技術基準への適合が審査されるのは後者の手続きのみである MIVHED は、Construction License の手続きが必要だということを知らずに、自治体への手続きのみで工事を開始する個人住宅の建築主も多数いるということを指摘している。[84]

3)　建築・設計状況（設計者の種類と実態）

エンジニア（建築士、土木技師、土地測量士）の資格は CODIA より交付されている。取得条件は、学位証明書及びエンジニアの監督下での 1 年間の実務経験のみであり、取得試験がないことが特徴として挙げられる。[85]

耐震設計の確認は公共建築物と民間建築物とで異なる。公共建築物の場合、MIVHED の General Directorate of Buildings が Structural Design Department を通じて、該当する基準に従って構造設計を行う。民間建築物の場合は、MIVHED の Plans Processing Office で、建築主の提出した書類に基づいて適合性が検証される。

4)　施工検査

工事の品質確認の仕組みも公共と民間で異なる。公共建築物の場合、Supervision and Oversight Department が、基準への準拠を確認するために建設プロセスを監視する。民間建築物の場合は Department of Construction Inspection がこの監視を行う。現在はどちらの部局も MIVHED に属する。民間建築物の検査は大きく 3 段階に分かれており、それぞれの検査で Inspection Form が記入され、基準への適合の可否を示す報告書が交付される。各検査の概要を表 2.3.6 でまとめた。

表 2.3.6　検査の概要

検査のタイミング	検査表番号	検査名	主な検査内容

[84] このことは建築基準の順守の上で重要な指摘であり、日本の支援でも注意すべきことである。
[85] この徒弟制度が機能している間はそれでいいが、受験人数が増加すると破綻すると考えられる

着工後	FI-01	Initial Inspection	フーチングの掘削寸法、掘削深さ、駐車スペース、敷地境界線、衛生設備（貯水槽、浄化槽など）の位置、鉄筋の配置を確認する。
工事中	FI-02	Structural Elements Inspection	構造上重要な壁、柱の材料強度、寸法、配置などを確認。
	FI-03	Structural Elements of Mezzanine Floors and Roofs Inspection	スラブ床、階段、梁、屋根の材料強度、寸法、配置などを確認。
	FI-04	Facility and Accessibility Inspection	電気、機械、プロパンガス、衛生、防火などの設備が技術仕様に沿って取り付けられた化を確認。
竣工後	FI-05	Final Inspection	承認された図面、技術仕様に沿って建築物が施工されたかを要素ごとに確認。

出典: R-004 を元に作成

今後は、すべての建築物の検査を MIVHED が実施することになっている。MOPC は膨大な工事件数に対応するための人材を雇用する予算が MOPC にはなかったことが、Informal Construction の発生につながったことを指摘している。MIVHED によると、今後は民間事業者に監督・検査の業務を委託することも検討されている。[86]

5) 建築資材の品質管理モニタリングの体制

構造物を構成する部材の強度その他の特性に関して品質検査を規定しているのは“R-004 REQUIREMENTS FOR STRUCTURAL EVALUATION OF EXISTING BUILDINGS OR BUILDINGS STARTED FOR THE PURPOSE OF PROCESSING PLANS TO OBTAIN A CONSTRUCTION LICENSE”である。

この規定は、上位の規定である “R-021 Requirements for the Application of the General Building Regulations and Processing of Plans (Decree No. 576-06)” における部材強度に関する要素をカバーしている。標題が示すように既存構造物と新設構造物の両方を対象としている。

つまり例えばコンクリートについて言えば既存構造物の場合はコア抜きしたサンプルの圧縮試験であり、新設構造物の場合はコンクリート打設の際に取り分けて養生したサンプルの圧縮試験である。

既存構造物の場合、全数を破壊試験によって強度を調べるのではなく、一部を非破壊試験によるとするケースも示されている。この場合、各階ごとに構造要素の 15%に対して追加の非破壊試験[87]を実行し、最も重要なものを選択する必要があるとしている。

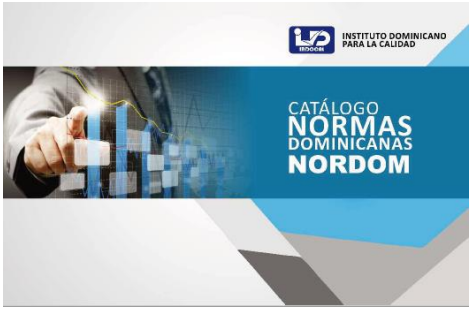
新設の構造物を対象とする場合にはコンクリート打設の際に取り分けたサンプルの破壊試験が行われる。（構造評価者が記録から信頼できる情報を取得する場合打設中に採取された試験の代表数(7m3 あたり 3 つ)のサンプリング)サンプリングの詳細については ASTM C 42/C 42M およ

[86] 官による監督システムだけでは今後の建築確認制度の実施に問題があることは明らかである。
[87] 非破壊試験としてはコンクリート中の超音波の伝搬速度測定が想定されているが、シュミットハンマーテストなど既往の技術も参照されるべきである

び ASTM C 82388[88]で確立された手順に従うとされている。MOPC はこれらの記録を分析して、情報の真実性と問題の建物との対応を検証するとされている。

RC 造以外の場合は、FEMA 351 および 353、[89]および AISC に従って視覚的評価を行うとされている。

上記が建設現場における直接的品質管理の規定であるが、建築に使われる素材の工業製品規格ドミニカ標準 (NORDOM) がドミニカ品質研究所(INDOCAL)から発刊されている（図 2.3.17）。[90]



出典：品質研究所 INDOCAL

図 2.3.17　工業製品規格 NORDOM のカタログ

ここで網羅しているのは鉄筋、セメント、骨材、ブロック、鋼製部材からプラスチック製品まで多岐にわたる。

(3) 既存建物の耐震診断・耐震補強

1) 耐震診断

ドミニカ共和国の規準枠組みとしては、既存の建物を対象とする診断・耐震補強を新規建物の場合と区別する基準はない。既存建物であっても新規に設計・建設する場合と同じように R-001 を適用して、これに準拠するか否かを判定するのが耐震診断であるとしている。ONESVIE、MOPC、MIVHED へのヒアリングにおいても基本的に構造物耐震設計を規定する R-001 によると回答された。

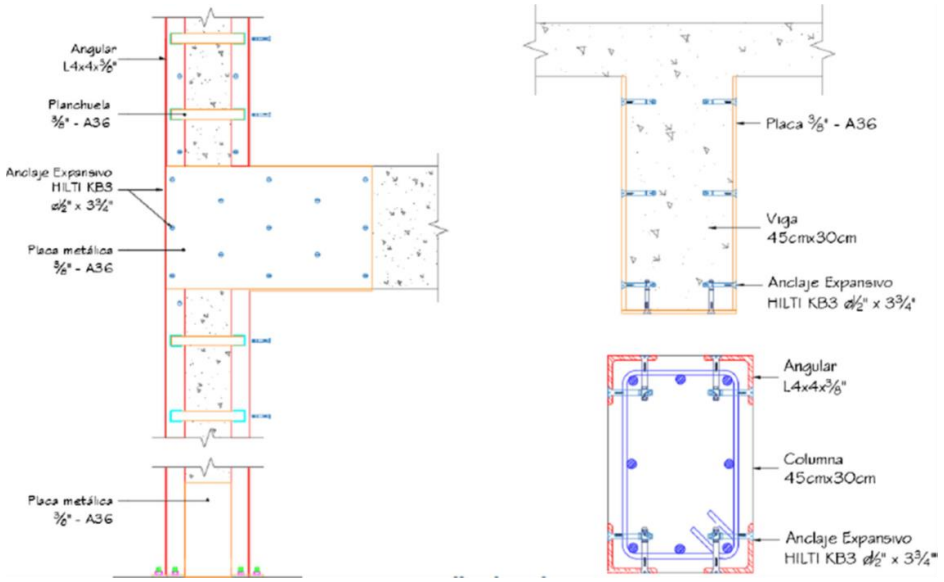
日本の耐震診断制度（例えば官庁施設の総合耐震診断・改修規準など）では、既存の建物は配筋図などの設計図書が入手できない場合があることを見越して外形寸法など現場で測定できるデータだけを適用して計算する手法から、精緻な計算手法まで段階的に診断方法が整備されている。しかし、ドミニカ共和国では既存建物の現状状態を把握する上での困難は認識されていない。原則として部材はサンプリングして載荷試験により、非破壊検査によって補足するとしている。

病院に限られた手法ではあるが PAHO(Pan American Health Organization)と WHO の提供する「病院の安全指数:評価者のためのガイド」があり、設計図書がない場合への適用に該当する。ただし建物の耐震性を定量的に算出するものではない。

2) 耐震補強

[88] 米国材料試験協会の規格である
[89] 米国連邦緊急事態管理庁の規格である
[90] ドミニカ共和国の規格、第 1 版は 2017 年 Instituto Dominicano para la Calid ad (INDOCAL)

学校建物を対象とした耐震脆弱性評価プロジェクトの結果は、構造を強化する必要があることを示唆している。 解決策として、図 2.3.18 に示すような詳細で構造の柱と梁を補強することが提案されており、主鉄筋以外にも帯鉄筋など拘束効果の必要が意識されているように見えるが、それらの知見が規準やガイドラインなどに反映されて実効を発揮するかどうかは今後の課題である。



出典：Rojas-Mercedes, N.J., Di Sarno, L., Simonelli, A.L. et al、2020

図 2.3.18　柱配筋改良の提案・梁接合部補強の提案[91]

耐震補強として何が有効であるかはイタリア、米国などの事例研究が参照されている。イタリアの事例として「座屈が抑制されたブレース」が紹介されている。

3)　ドミニカ共和国の事例研究

ドミニカ共和国の最初で最も完全な耐震脆弱性評価プロジェクトが ONESVIE 2014 によって実施されている。報告が N. J. Rojas-Mercedes サントドミンゴ工科大学（INTEC）ほか”Seismic risk of critical facilities in the Dominican Republic: case study” （ドミニカ共和国の重要施設の地震リスク:校舎の事例研究）として 2019 年に公表され Web 上から閲覧できる。ドミニカ共和国で行われている耐震診断と耐震補強の状態を知るための典型として参照する。

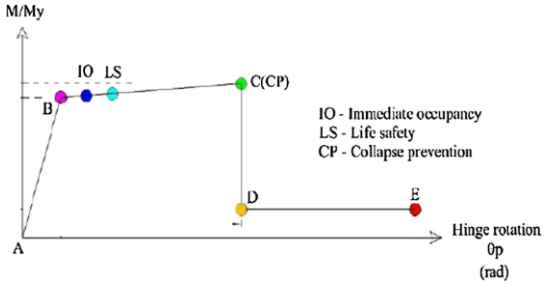
既存建物の配筋状態、コンクリート強度など詳細を知るには設計図書や竣工図が必要であるが、調査対象とした 22 校でそれらは入手できなかったことから構造の一部を取り壊してサンプルを取り出し、破壊試験が行われた。ONESVIE ではこの種の材料特性試験を組織的に実施する態勢を整備する計画である。

この事例では、事前に簡単なモデルによる構造解析が行われ、結果を参照して最適のサンプリング箇所が選定された。

試験結果を適用してプッシュオーバー解析と呼ばれる静的構造解析が行われた。この解析手法

[91] Rojas-Mercedes, N.J., Di Sarno, L., Simonelli, A.L. et al. Seismic risk of critical facilities in the Dominican Republic: case study of school buildings. Soft Comput 24, 13579–13595 (2020). https://doi.org/10.1007/s00500-019-04361-0

では部材端部が降伏した際の非線形特性を反映するために概念図（図 2.3.19）で示すような特性を設定して地震荷重を載荷する。使用したソフトウェアは ETABS（Computer and Structures 2005）である。



出典：Rojas-Mercedes, N.J., Di Sarno, L., Simonelli, A.L. et al、2020

図 2.3.19　部材端の曲げ反力特性

採取したサンプルの載荷試験を参照してコンクリート強度は、梁の f_{c0} = 39 MPa、柱の f_{c0} = 18MPa が設定された。 鉄筋の降伏強度は、この時点で引っ張り試験ができなかったことから、MOPC の規準 “R-033（MOPC 2012）”に示されている “鉄筋に関する情報が入手できない場合”に適用する f_y = 280MPa の値が設定された。基礎については検査を行うことができず、検討対象からはずされた。

解析の結果、 1 階のほぼ全ての柱が life safety limit state を満たさなかった。

このプロジェクト以外にも国家地質学サービス（SGN）、リスク管理プログラムの事務所、文部省の教育地域（MINERD）などの他機関は、JICA の支援による耐震脆弱性評価プロジェクトを実施したと報告されている。そのプロジェクトの主な目的は、サンクリストバル州の学校の構造的脆弱性を定性的に評価することで、rapid visual detection method（FEMA 2002a、b）と他の評価方法（Lewetal。2002; AGIES 2001）を組み合わせて、合計 320 の学校が評価された。このプロジェクトには、構造タイプ、構造構成、建物の位置、基礎、非構造要素の側面を考慮した脆弱性指数（Benedetti and Petrini 1984）による構造の分類も含まれて居り、その結果、290 校（90.7%）が詳細な構造評価を必要としていることがわかったと報告されている。

(4)　耐震化促進に向けた環境整備状況

建築物の耐震化促進には次の 4 つの要素を満たす環境が必要と考えられる。

1)知識・情報、2)資源、3)スキル、4)モチベーション

1)　知識・情報

知識・情報に関してはドミニカ共和国では既に米国の機関から慣行されている Code やガイドラインが知られており、必要に応じて適用されている。

先ず大きな前提として、SEAOC(Vision 2000)による、地震動レベルと構造の耐力性能の組み合わせと言う概念が基本的に受け入れられている。地震動を同定する方法としては R-001 に見られるように設計応答スペクトルが決められており、その形状は ASCE のフォーマットで炮烙されていて ATC とも共通である。

これらの考え方は IBC の規準に適合しており、問題なく適用されているようである。ただし、

規準は読み違えを避ける目的で独特の書き方がされており、記述も平易であるとは言い難い。そのため、規準を読んで理解して使うにはかなりの努力を必要とする。日本では入門書や Web 上の教材が豊富なので学習の手段が豊富であるがドミニカ共和国でのヒアリングではそのようなガイドラインや教材はないと言うことであった。ただし、規準を適用したケーススタディは発表されており、これを利用することができる。実際の建築設計や耐震診断の場では米国製のソフトウェア ETABS などが使われており、ソフトウェアには米国以外の規準事情に対応するメニューが用意されていることが多いことから決定的な不便はないようである。

2) 資源

資源としては材料や機器より人的資源が問題となる。国全体で一千万人の規模であることから刊行物の発行や官庁や学会、協会などを立ち上げたり運営したりすることに日本の事例がそのまま参考になるとは言えない。現在は、すべての技術についてドミニカ共和国単独で自前の組織・機構を持つよりは米国の制度や中米全体の PAHO のような組織・機構とリンクすることが選ばれている。

3) スキル

スキルの問題としては設計や診断を実行する技術者の資格資質があるが、ドミニカ共和国の技術者は日本の国家試験にあたる試験を通して資格が与えられるのではなく、大学で専門課程を修了した者が専門技術を行う企業で一定の期間従事することで資格が得られるインターン制度がある。

4) モチベーション

耐震化促進に関するモチベーションは、民間建物であれば助成制度の拡充が有効である。元々建築の規準は最小限の要求と宣言していることから規準の要求する耐震性を満たすべきなのは当然であるが、日本の耐震等級のような別枠を設定するのであれば助成制度の設定が可能であり、モチベーションとなり得る。例えば日本では平成 12 年「住宅の品質確保の促進等に関する法律」に基づき良質な住宅を安心して取得できる市場を形成するために住宅性能評価制度が設定されている。

また公的性格を持つ建物としては、法律を新設して、多くの人が集まる、学校、事務所、病院、ショッピングセンターなど、一定の建築物のうち、現行の耐震規定に適合しないものの所有者に、耐震診断を行い、耐震改修を行うことを義務付けることも必要である。（ex.日本の耐震改修促進法における特定既存耐震不適格建築物）

⑸ まとめ

1) 耐震設計制度の実態

ドミニカ共和国には法律に基づいた耐震設計制度が存在するにも関わらず依然として informal construction は同国の課題となっている。MOPC と MIVHED によると、informal construction の主な要因は、1) 監督・検査のための人材不足、2)市民の手続きの認知不足の２点である。

ただし、R-021 では現在の一般建築規則の規定およびこの問題に関して施行されているその他の適用される規制に対する違反は、2007 年 7 月第 23 条法第 687 条、または 1982 年の規定に従

って制裁されるとされている。そこではこの法律または執行部が発行する規則に定める規定の侵害は、作業の総費用の 3〜6%の罰金を科される、または 10 日から 6 ヶ月までの矯正投獄または同時に両方の罰金を科されるとされている。

2) 既存建物と言う概念

日本において既存建物と呼ぶ場合には新規に建てる建物とは違う枠で取り扱うことが多い。例えば既存不適格と言う場合には建設後に法規が変わってしまって表面的には違法であるが既得権益を制限することを避ける。既存建物の耐震診断と言う場合には、竣工図が残っていないことを見越して、配筋図や基礎などの情報が得られない場合の対処を意識しているが、ドミニカ共和国では既存建物と新規建物の扱いに区別がないようである。（すべての耐震検討は R-001 によるとし、現状の把握ができない場合のことを配慮することがない。例えば、R004 が挙げられる。）

現在までに行われている既存建物の耐震評価でも、既存建物で設計図書情報がない場合には現場で採寸して取得すべきであるとし、材料特性は破壊試験によって得られると考えられている。この方針で現状は大きな課題は顕著化していないが、耐震化の取り組みが更に進んで取り扱う件数が増加すると、現状では対応できない状況が発生し、それ以上進まないことが考えられる。日本のシステムはこの点で解決の糸口を与えることが考えられる。

3) 参考となる日本の技術事例

- 日本の学校耐震改修に適用される「座屈を抑制するタイプのブレーシングは、この要求に応えることができる。更に鉛のダクティティを利用するタイプのダンパー等も適用の可能性がある。
- 建物の筋交い（ブレース）は地震時の水平方向慣性力に対して有効であるにも関わらず、引っ張り・圧縮の交番荷重を受け、圧縮時に座屈してしまうことが知られている。ブレースの周囲を鋼管で覆い、コンクリート充填で拘束して座屈を抑制する装置はそれ程高価でなくて実効がある。さらにブレースの一部にエネルギー逸散の装置を付加し、制震とすることができる。ニュージーランド発案で日本でも実績のある鉛エクストルージョンダンパーなどが推奨され得る。
- ドミニカ共和国では伝統的に組積造が多いと考えられ、それら石造りや煉瓦造りの保存価値の高いケースが数多くある筈である。日本では、関東大震災の際に組積造の被害が多かったことから、耐震基準の観点では組積造が重要視されていないが、歴史的価値のある組積造建物の保存技術のレベルは高く、ドミニカ共和国の需要に応えることができる。

2.4　インフラの耐震化状況と取組内容

2.4.1　インフラの構造物の種類と耐震化状況

(1)　インフラ構造物の種類と地震への強度

インフラ構造物の例として、ドミニカ共和国における道路の状況を図 2.4.1 及び図 2.4.2 示す。図 2.4.1 は Santiago 市を通るバイパスで、よく整備されていることがわかる。図 2.4.2 はドミニカ共和国南部を走る高速道路で、路肩付近まで法面が迫っていることが見て取れる。特段の被覆工は施されておらず、法面の安定性は法面勾配によって確保されている。

図 2.4.1　Bypass in Santiago

図 2.4.2　High-way in Southern DR

橋梁の内、歩道橋のような規模の小さいもの例を図 2.4.3 及び図 2.4.4 に示す。これらはコンクリートによる単純桁構造で、橋脚は門型フレーム（図 2.4.3）や独立柱（図 2.4.4）のように様々であるが、その形状から道路方向に比べて道路の直角方向の耐震性が低いことが予想される。

図 2.4.3　Pedestrian Bridge

図 2.4.4　Pedestrian Bridge

図 2.4.5　Overpass

図 2.4.6　Overpass

図 2.4.5 はコンクリート製の陸橋である。桁部分に比較して独立橋脚の断面が小さく、大地震時には橋脚の被害が懸念される。また、橋桁の落下防止工はなく、地震時での橋桁の落下も生じる可能性が高い。日本では兵庫県南部地震以降、柱脚の補強や橋桁の落下防止工の設置といった耐震化対策が漸次実施されており、このような技術や経験がドミニカ共和国の橋梁の耐震化に役立つと考えられる。図 2.4.6 は鋼製の陸橋である。桁部分に比較して橋脚の断面が小さいことが見て取れる。

図 2.4.7 は吊り橋、図 2.4.8 は斜張橋の例で、このような長大橋もドミニカ共和国において建設されている。耐震上の課題は本事例からは伺うことはできない。

図 2.4.7　Bridges : Santiago and La Romana

図 2.4.8　Bridges : Santo Domingo

図 2.4.9 は変電所、図 2.4.10 は配電線の例である。日本における地震時の変電所被害の多くは碍子の破損で、配電設備（配電線）の被害の多くは支持物（電柱）被害である。これらの電気設備に関する耐震上の課題は本事例からは伺うことはできない。

図 2.4.9 Substation

図 2.4.10 Distribution Line

(2) インフラ耐震化の状況

道路及び橋梁に関しては橋梁設計部において前述の AASHTO や ACI に従って耐震設計が実施されている。また、設計で考慮される地震動は建築物と同様の R-001 を参照しており、建築物の耐震性能とも整合性のとれたものである。その他のインフラ及びライフラインについては後述するように管轄する事業者が耐震設計基準を策定し用いているため、本調査の中ではその状況を把握するには至らなかった。

他方、既存構造物の耐震化は実施されていない。その原因・理由については後述する。

2.4.2 インフラの耐震化促進に向けた取組状況

(1) 耐震設計基準の整備状況

R-001（2.3.5 参照）は建物に関する耐震基準で、同基準において、その他構造物については下記のように記載されている。

1) 自身の基準を有する構造物

建物以外の構造物の内、十分に整備された基準を持つ構造物（例えば、橋梁、原子炉建屋、送電性網、等）については、R-001 は加速度マップの提供といった基本的なガイドラインとして用いている。なお、道路ならびに橋梁に係る基準としては前述の表 2-8 における複数の基準があるが、これらは International Building Code（IBC）や AASHTO Bridge Design Specifications を基に作成されている。

2) 自身の基準を有しない構造物

建物以外の構造物の内、工業基準を除いて通常自分自身の基準を有しない構造物（例えば、配管橋、貯蔵ラック、発電プラント、貯槽、サイロ、ドックならびに港湾施設、洋上構造物、煙突、冷却塔、アミューズメントパーク、通信鉄塔、工場建物、等）については、R-001 と表 2.4.1 に示す基準を組み合わせて用いている。同表からは、米国基準が参照されていることがわかる。

表 2.4.1　R-001 と組み合わせて用いられる海外基準

基準	基準表題
ASCE/SEI 7	Minimum Design Loads and Associated Criteria for Buildings and Other Structures
ASCE/SEI 41	Seismic Rehabilitation of Existing Buildings
ACI 318"	Building Code Requirements for Structural Concrete and Commentary
ANSI/AISC 341	Seismic Provisions for Structural Steel Buildings
ANSI/AISC 360	Specification for Structural Steel Buildings
ANSI/AISC 358-16	Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications
AWS：American Welding Society	
ASTM：American Society for Testing and Materials	
ASCE 5/6	Code Requirements for Masonry Structures and Specifications for Masonry Structures.
ACI 530	Building Code Requirements for Structural Masonry Structures Specifications and Commentary

出典：JICA Expert Team

(2) 耐震設計の運用状況

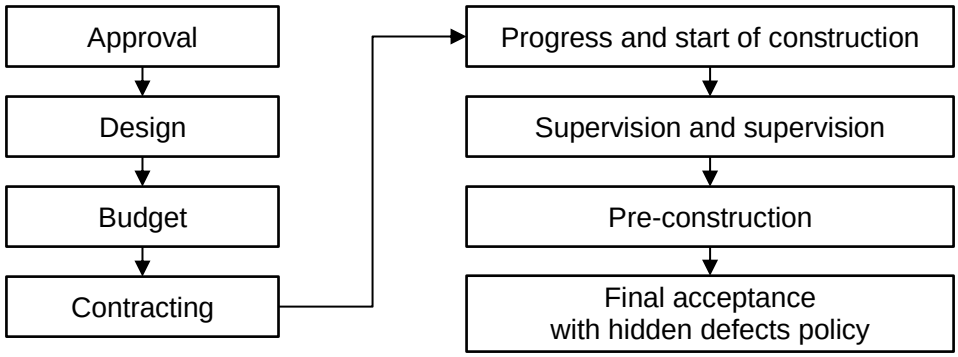
道路及び橋梁に関しては橋梁設計部において前述の AASHTO や ACI に従って耐震設計が実施されている。また、道路の排水設備については R-19 に基づいた設計が行われている。耐震設計は同部の構造技術者によって行われた後、他の技術者によってレビューされる。また、他機関・他組織によって設計が行われた場合には、承認を目的とした内部レビューが実施される。MOPC は R-026 に基づいて、掘削深さのみに関与しているとのことである。

ライフライン設備については、INAPA や CAASD といった機関が各対象設備について自身の基準を有している。各機関の耐震設計基準の入手には至らなかったが、例えば通信会社では地震後の機能維持の確保を目指しているとのことであった。ただし、全インフラ構造物・ライフライン構造物の最低要求基準は甚大被害抑止であり、通信会社が目指すような機能維持に関する要求の有無については確認できなかった。設計においては甚大被害抑止を保証するクライテリアとして、設備が弾性限度に留まることを想定している。これは甚大被害抑止のクライテリアとしてはかなり厳しいもので、現行の耐震基準を用いるならば、結果として高い耐震性能が与えられるこ

とが期待できるものである。

なお、現行基準は 1985 年に草案が作成され、2021 年の段階で IDB の下で改訂されている。現在は有識者によりレビュー中である。

設計が承認され、予算が確保された後、施工が開始される。施工に関しては General Directorate of Construction Supervision and Oversight による監理・監査が実施される。一般的なフローチャートは以下のようである。



出典：JICA Expert Team

図 2.4.11　承認から完工に至るフロー

なお、道路インフラに関しては地震直後にも機能と維持することが求められている。そのため、品質管理を目的として、基準遵守が行われていることを検証するために、道路インフラ検討設計部と橋梁部によって、施工計画が練られ見直されている。

いかなる場合においても、Supervision and Oversight Directorate を通じて、あるいは契約された企業を通じて、州が工事プロセスを監理している。また、大型工事の場合には民間企業の契約が実施され、この時は MOPC の Supervision and Oversight Office の技師が R-014（General Specifications Regulations for Road Construction）ならびに R-004（Regulations for the Supervision and General Inspection of Works）を用いて、この契約企業を監視することになっている。

(3)　既存建物の耐震診断耐震補強

橋梁に関しては耐震診断という名目ではないが、通常の点検・維持管理が行われており、その際に不具合が見つかれば報告されることになっている。橋梁は前述したように耐震設計が実施されており、このような点検・維持管理によって必要な性能が確保されていることは確認可能である。ただし、いわゆる耐震診断のように現行構造物が有する現実的な耐震性能の評価ではなく、耐震設計基準を満たすことの保証であるため、現実的な耐震性能の把握には至らないことに注意が必要である。

その他のインフラ構造物・ライフライン構造物の耐震診断に係る情報は得られず、現実には耐震診断は実施されていないと思われる。

また、インタビューの結果からは、既存インフラ構造物・ライフライン構造物の耐震補強は実

施されていないとのことであった。なお、上水道に関しては設備の定期的な交換計画はなく損傷が顕在化した場合に補修されるとのことであったが、これは予防措置である耐震補強ではなく、あくまでも補修の類である。なお、設備の交換に際しては最新の基準が用いられるが、材料や技術に関しては既往のものが用いられるとのことである。

- 道路の場合，新規プロジェクトに多くの労力が割かれる．
- ライフライン構造物に関しては，個々の企業の責任である．
- 予算が限られており、耐震診断・耐震補強の優先度は低くなる。

実際の耐震補強実績や耐震補強計画はないものの，その促進に係る基準・規則として以下のものが存在する．

- National Disaster Risk Reduction Plan
- National Plan for Seismic Risk Reduction
- Institutional Plan for Disaster Risk Management

これらは、国家防災計画ならびに地方防災計画の中でも言及されている。

なお、ヒアリングの範囲ではインフラ構造物・ライフライン構造物の耐震診断・耐震補強に係る基準類は無いと思われ、これも促進の阻害要因の一つであると考えられる。

(4) 耐震化促進に向けた環境整備状況

1) 耐震化促進制度

耐震化促進制度としては、例えば日本においては地震保険料の低減、耐震診断や耐震補強に関する助成金といった経済面での優遇措置が行われている。また、役所における耐震診断・耐震補強に関する相談窓口の設置、セミナーの実施等も行われている。ただし、これらの施策は個人住宅を対象としており、インフラやライフラインといった役所や事業者に対する促進制度はなく、行政主導で事業が行われているのが実態である。

ドミニカ共和国におけるインフラ耐震に係る情報は乏しく、促進制度に関する状況についてもインタビューの回答を得ることはできなかった。日本での状況からの推察ではあるが、ドミニカ共和国においてもインフラやライフラインに関する促進制度は無いと考えられる。

2) 耐震化に向けた資格制度

日本では、1998 年に「耐震技術認定者」資格制度を設け、認定講習会を行っており、受講資格は、一級・二級・木造建築士、または木造建築工事業の実務経験が 7 年以上と会社が認めた者とされている。

ドミニカ共和国における耐震化に向けた資格制度に関する状況については、インタビューの回答を得ることはできなかった。これは耐震化（耐震診断や耐震補強）に係るニーズが醸成されていないためと考えられる。

3) 耐震化に向けた啓発状況

上記と同様、耐震化（耐震診断や耐震補強）に係るニーズが醸成されていないために耐震化に向けた啓発活動は実施されていない。ただし、MOPC へのヒアリングの際には、耐震診断や耐震補強に関する興味や技術習得の希望はあるという回答があったことから、啓発活動が実施されていない理由としてリソース不足も考えられる。

2.5 国際機関との連携状況（JICA、他ドナー）

2.5.1 JICA による過去の支援内容

ドミニカ共和国において、JICA がこれまで実施してきた防災分野における支援は、表 2.5.1 のとおりである。

表 2.5.1 JICA の過去の支援内容

期間	活動名/プロジェクト名	概要/成果	予算	現地の主な C/P 組織
2013.5-2014.2	サンクリストバル州における学校建物の地震脆弱性の軽減 (Reduccion de la Vulnerabilidad Sismica de las Edificaciones escolares en la Provincia de San Cristobal)[92]	• 主な目的は、サンクリストバル州にある学校の構造的な脆弱性を定性的に評価すること。合計 320 校の学校を対象に評価が実施され、それらは構造タイプ、建物の立地、基礎、非構造要素などを考慮した vulnerability index に基づいて分類された。 • 帰国研修員がフォローアップ協力を活用して実施（日本人専門家の投入なし）	N/A	ONESVIE SGN
2016.9 - 2017.3	ドミニカ共和国における耐震構造に係る規制手法の妥当性と改善 (Adecuación y Mejora de los Instrumentos de Regulación de Construcción Sismo Resistente en República Dominicana)[93]	• JICA は 2015 年より R-001（耐震基準に関する規則）の更新を支援しており、本プロジェクトは、その一連のフォローアップアクションである。 I. 現行の基準の分析と評価 II. 地方の地震災害研究 III. プロジェクト提案のドラフト作成 IV. コンサルティング（ドラフトの査読、会議） • 本プロジェクトは、R-001 の改訂のための文書の作成と、MOPC 内での合意を目的とした。しかし、活動期間の短縮などの影響により、文書は 50%し	$866,625 Dominican pesos（約 180 万円）	MOPC 研修には、ONESVIE, MEPyD, SGN, CNE 等が参加

[92] ONESVIE, SGN, JICA. 2014. Reducción de la Vulnerabilidad Sísmica de las edificaciones escolares de la provincia de San Cristóbal.
https://www.sgn.gob.do/transparencia/phocadownload/Publicaciones/Informe%20del%20%20Proyecto%20Evaluacion%20Escuelas%20Prov.%20San%20Cristobal.pdf

[93] JICA. 2017. INFORME DE EJECUCIÓN DEL PROYECTO
"Propuesta de Adecuación y Mejora de Instrumentos de Regulación de la Construcción Sismo-Resistente en la República Dominicana"

		か完成しなかった。 • 帰国研修員がフォローアップ協力を活用して実施（日本人専門家の投入なし）		
2020−（on going)	The project for Institutional Strengthening on Seismic Risk Reduction of ONESVIE and Seismic Table of the Dominican Republic[94]	• ONESVIE の「2020 年度 年次報告書」に記載 • 今後実施予定の国別研修のことを指す。元々、2020 年度案件として採択されていたが、コロナの影響で 2020 年度は活動が実施されていない	N/A	ONESVIE

[94] ONESVIE. 2020. MEMORIA INSTITUCIONAL.
https://onesvie.gob.do/transparencia/phocadownload/PlanEstrategico/Memorias/Memoria%20Institucional%202020.pdf

2.5.2 他ドナーとの連携

法令整備や地震アセスメントなどでも見られたように、ドミニカ共和国では、これまで防災分野において様々な国際援助機関が、支援を行っている。IFRC（2011）レポートによると、欧州委員会（European Commission）、米州開発銀行（the Inter-American Development Bank：IDB）、スペイン国際開発協力機構（the Spanish Agency for International Development Cooperation：AECID) や世界銀行（World Bank）などが紹介されている[95]。ここでは、収集資料や各関係機関への質問票の回答及びインタビュー結果を踏まえ、具体的な支援内容が明らかとなったドナーの取組を以下のとおり整理する（表 2.5.2）。主に、災害リスク評価や脆弱性の確認、計画や戦略策定、能力強化に関わる取組が多く、地震防災分野に特化した取り組みや耐震化・耐震補強の促進に直接的につながるドナーの取組は確認できない。

表 2.5.2　他ドナーと連携した主な防災の取り組み

組織名	支援内容
UNDP[96]	・ 災害リスク削減関連法（第 147-02 号）の成立支援 ・ 脆弱性の高い 60 のコミュニティを特定し、予防措置と対応能力を強化するとともに、リスク管理計画（緊急時計画と危機管理計画、予防措置と緊急対応のマニュアル策定、緊急時のシミュレーションを併せた避難経路の選定等）の策定 ・ 国家地震リスク削減計画を策定し、自然災害予防・緩和・対応のための国家基金を設置 ・ リスク評価データの収集、緩和・予防のための行動計画、災害対応マニュアル等を含む、緊急時や危機管理のための計画策定を支援 ・ 緊急援助と人命救助がスムーズに行われるよう、ドミニカ赤十字社と協力して避難経路を定め、避難・救援活動訓練を実施
UNDAC[97]	・ 2005 年と 2010 年に、災害対応能力を強化するための評価を実施
UNISDR 、DGECHO	・ 災害リスク軽減戦略の策定[98]
World Bank	・ 安全な学校づくりのための統計整備支援[99]
IDB	・ 地震災害リスク管理能能力の強化を目的とした技術支援プログラムの開発（MEPyD 及び複数の関係組織）[100] ・ 防災・リスク管理プログラム（The Disaster Prevention and Risk Management Program）：災害による人命損失や社会・経済・環境への影響を軽減するため、

[95] IFRC. 2011. Analysis of Legislation Related to Disaster Risk Reduction in the Dominican Republic. P12
[96] IFRC and UNDP. 2014. Effective law and regulation for disaster risk reduction: a multi-country report
[97] IFRC. 2011. Analysis of Legislation Related to Disaster Risk Reduction in the Dominican Republic. P12
[98] MIVHED、https://dipecholac.net/docs/files/525dp-avances-y-desafios-de-la-gdr-en-rd-2012.pdf
[99] MINERD 回答結果
[100] MEPyD 質問票

組織名	支援内容
	国の開発計画や公共投資へのリスクマネジメントの導入（MEPyD-DGODT ）[101]. ・ 2012 年 1 月に、防災・リスク管理プログラムの枠組みの中で、CAPRA（Comprehensive Approach for Probabilistic Risk Assessment）プロジェクトを実施 ⇒確率論的計算手法（Probabilistic calculation methodology）を用いた、地図と自然リスクの大要（compendium of maps and natural risks）の作成[102] ⇒災害リスクの理解、防災意識の向上、関係者の連携と有効なリスク管理および予防志向の取組への関与を促している[103]。(MIVHED) ・ Blue Spot ツールの開発：地震、洪水、その他の災害を異なる再現期間でモデル化し、最も脆弱な地域における災害や気候変動に直面した場合の道路介入の優先順位付けと、道路途絶の可能性がある場合の代替ルートの確立を目的としたツール (MOPC) ・ MOPC とともに、耐震基準（R-001）の更新を実施
Plan International (NGO)	・ 2017 年に学校の構造補強の提案と教育センターの計画策定を支援[104]

[101] DGODT, 2012, Disaster risk management indicators in Dominican republic 2012 Challenges ahead and actions for progress
[102] MOPC 質問票
[103] MIVHED 質問票
[104] MINERD 回答結果

第 3 章 地震防災・耐震に係る課題と対策の方向性

3.1 地震防災・耐震に係る課題と対策の方向性

第 2 章で示した現状を踏まえ、ドミニカ共和国において現在考えられる地震防災・耐震化に関わる課題と解決策提案を、「地震防災（法令・計画、アセスメント、組織、予算）」、「建築物耐震化」、「インフラ耐震化」の大項目に分けて整理した。また、それぞれ、求められる対応、現状、課題、改善策・対策の方向性、参考となる日本の技術事例を記載した。

	災害リスク管理の現状を評価する指標	求められる対応	現状	課題	改善策・対策の方向性	参考となる日本の技術事例
地震防災	法律の策定状況	防災関連法の具体の記載や細則の策定	• 防災法は制定済み（2002） • 現行防災法では、基本方針として、災害リスク評価の実施や、インフラの安全性確保などが示され • 現在、仙台防災枠組に沿った内容となるよう防災法の改訂が進められている	• 防災関連法への地震災害予防・抑制や耐震化に関する取組方針や各組織の役割の明確化	• 改訂内容に、重要建築物の耐震促進に向けた方針を、可能な範囲で追加	• 災害対策基本法：優先的に整備を行う施設（避難所）の指定 • 災害発生後に明らかとなった課題を踏まえた「災害対策基本法」の見直しと改訂方法
	法律に基づく計画及び戦略の策定状況	総合開発計画・戦略への災害リスク管理（特に、耐震化促進）の入れ込み	• 国家開発戦略の「長期ビジョン」には安全性確保や強靭化に関する記載はない • 具体的な取組内容に、公共インフラの保護のための優先的な建設や地震リスク軽減に向けた関連規則の整備と意識啓発についての記載がみられる • 同戦略には、公共インフラの災害リスク軽減のための優先的な建設の実施や災害リスク軽減を促進する関連規則の採用が設定されている	• 関係機関や地方自治体の開発戦略への地震防災・耐震化の展開	• 各組織の開発戦略に地震防災対策導入指導、計画のモニタリングの実施	
		中央政府レベルの機関による計画策定	• 国家災害リスク軽減計画（2001，2011，2022 予定）及び国家地震リスク軽減計画（2013，2022 予定）が策定済み（最新版は策定中） • 国家災害リスク軽減計画改訂版には、建築許可やインフラ建設・再建に関する規制・基準の見直し、重要インフラの防災強靭化の推進のほか、実施プロセスや指標、責任組織も明確化されたが、一部、取組み指標が曖昧なプロジェクトがみられる • 地震リスク軽減計画も、具体的な数値を用いた耐震補強の目標設定や、建築基準法の改訂などが示されている	• 国家災害リスク軽減計画改訂版の明確な取組み指標の設定 • 計画実行のための仕組み（モニタリング制度、予算、体制）の構築	• 計画されている地震リスク評価や耐震補強を達成するための目標や指標の効果的な設定： ➢ 数値的な達成目標の設定 ➢ 達成進捗が評価可能な報告書や調査名を指標に追加 ➢ 達成状況の定期的なモニタリングと見直しの実施に向けた、現状調査の実施やデータ整備 • 国家災害リスク軽減計画及び国家地震リスク軽減計画の定期的なモニタリングの実施と改訂	• 日本における耐震化を推進するための計画体系や仕組み：所管省庁や地方自治体による施設の耐震化状況調査の実施と計画への反映
		地方自治体による計画策定	• 地方災害リスク軽減計画は、一部の自治体でのみ策定 • 策定済みであっても、計画実施には技術的または資金的な能力向上が必要な状況 • 地方自治体レベルでは、地震防災施策は、導入されているとは言い難い状況	• 地方自治体における地方災害リスク軽減計画の策定	• 中央政府への、地方自治体の計画策定支援やモニタリングの仕組み導入 • 地方自治体での計画策定を支援するガイドラインの作成や指導の実施・継続 • 地方自治体による計画策定・モニタリングの実施	• 地域防災計画策定を支える中央政府の仕組み • 耐震化の促進については、地方自治体耐震改修促進計画の導入
	体制構築の状況	組織間の役割分担の明確化と連携体制の構築	• 耐震補強や耐震化の推進に関しては、以下の役割分担となっている： ➢ ONESVIE：建築物評価 ➢ MOPC：公共施設やインフラの建築基準改定、インフラ設計・管理 ➢ MIVHED：建築物の設計施工管理 ➢ MINERD：学校施設の脆弱性評価 ➢ MSP：病院施設の脆弱性評価 • 公共施設の耐震補強の予算を確保し実行する組織はなく、職員の能力向上とともに、耐震設計・改修のための予算要求中 • Seismic Table など、関係省庁が連携して取組を推進する組織があり、定期的な会合を開催	• 重要建築物の耐震化に向けた各防災関係機関の役割の明確化と関係機関内での認識合わせ、連携（機関や組織の機能や権限、範囲の重複が、主要な課題の一つとの意見あり）	• Seismic Table の法的枠組み内での組織化 ➢ 組織体制や目標、地震予防対策に関する役割の明確化 ➢ 防災法など法令や規則での定義づけ	• 日本の防災基本計画の組織体制
		各組織内の地震災害リスク管理部署の設置	• 防災関連部署が設置されている省庁が多く、防災業務を実施する人員も増加 • 地方自治体では、市長室の中に災害リスク管理や都市計画室などが設置される	• 地方自治体の防災組織の技術的、資金的、人的資源の確保	• 中央政府からの地方自治体への防災組織の設立指導と地方自治体職員の能力強化	• 日本の地方自治体の地域防災計画の組織体制
		民間連携や取組促進	• 防災法や関連計画には、住民や民間の参画が強調され、市民に対する防災の取組推進についても必要な活動と定義 • 耐震化促進に向けた民間向けのガイドラインや補助、インセンティブがない[105]	• 民間建築物の耐震化促進及び地震防災の取組促進に向けた仕組み（補助、インセンティブ、ガイドライン）構築	• 民間向けの地震防災ガイドラインの作成と配布による民間連携や取組の促進 • 資金的援助や地震保険などの制度やインセンティブの構築	• 防災意識向上のための施策（防災啓発資料）と住民の取組を支援する仕組み（耐震化インセンティブや補助、地震保険等）

[105] ONESVIE 質問票及びヒアリング

	災害リスク管理の現状を評価する指標	求められる対応	現状	課題	改善策・対策の方向性	参考となる日本の技術事例
			• 行政から民間セクターに対する資金的な支援も不足			• 学校や地域に対する防災教育や講習の実施事例
	リスク評価の実施・活用状況	地震リスクアセスメントの実施と地震災害マップの作成	• 防災法や関連計画には災害リスク評価の実施についての記載がみられる • 特定の地域では、震度分布図の作成や、地震シミュレーションや地震災害想定（災害発生頻度、規模）が実施済み • 地方自治体では技術的・資金的・物理的な資源が限られ、詳細な地震リスク評価が実施されていない	• 全国規模での地震リスク評価や地震震度分布図作成の実施	• 地震リスクアセスメントや地震震度分布図の作成手法（リスク分析手法）の確立及び方針設定 • 地震リスクアセスメントの全国的な実施に向けた情報整備 • 全国地震リスク評価の実施 • 地方自治体による詳細な地震リスク評価のためのガイドライン作成・配布と職員向けトレーニングの実施 • 各地方自治体による詳細地震リスク評価の実施	• 日本の地震リスクアセスメントの実施手法や実施の仕組み
		地震災害アセスメントやマップの活用	• 一部地域の地震震度分布図（Seismic microzonation map）結果は、地震防災対策を実施する優先対象地域の特定や、耐震化の推進、土地利用規制、地震防災意識啓発などで使われている • 国家地震リスク軽減計画には、地震リスクアセスメントの結果と想定被害への対応については記載がない	• 国家地震リスク軽減計画や地方災害リスク軽減計画、土地利用計画などへの地震リスクアセスメント結果の反映・目標設定	• 地震リスク評価結果を考慮した防災計画や土地利用計画の策定 • 住民への地震ハザードマップを含む防災啓発資料の作成と配布	• 地震被害想定の地方防災計画への展開 • 地震ハザードマップの作成方法と周知方法（地方自治体）
	予算の確保・執行状況	国家予算の確保と執行	• 各防災関連組織では、基本的な組織運営予算しか確保されておらず、耐震補強を含む建築物やインフラの強靭化に向けた取組を実施するための十分な財源がない[106] • 耐震補強や耐震設計のための予算を有している省庁が存在しない • 各省庁での防災予算に関する情報がなく、事業の予算管理が困難であると考えられる • 地方自治体においても防災施策を推進するための予算が確保されていない	• 耐震改修工事や耐震補強工事などを実施する各公共施設の所管省庁における当該事業予算の確保 • 各省庁の防災予算に関する情報整備と事業予算管理 • 地方自治体における防災予算の確保	• 予算設定の根拠となる各種計画・戦略への、耐震化事業及び担当組織の明確化 • 各省庁防災予算の情報収集・整備と予算状況の可視化 • 地方開発戦略・計画への、耐震化促進施策の取り込みと、予算の確保	• 日本における事前防災投資の効果の説明
建築物	建築基準の整備状況	建物の耐震性を保証する基準のあり方の体系的な組み立て	• 耐震に関する基準は R-001 に一元化されようとしている • 現在の改訂プロセスは MOPC 内にあり、基準案はほぼ終了している。終了後は、MIVHED に渡される • 規準改訂の議論は構造力学上の先端的な問題と、それ以前の問題がある	• 耐震設計体系が明確でない • 技術者の建築基準の理解が不十分 • 上記の課題に対して、入門書の必要性が認識されていない • 大きな地震動に対する構造物の脆弱性とその対応はある程度は認識されているが、十分でない	• 入門書を編纂する（できれば委員会形式が薦められる） • 当時の建設省研究所で実施された載荷試験の知見が生かす • 耐震設計のための解析手法の構築	• 1995 年阪神・淡路大震災で得た教訓は「稀にではあるが発生の可能性がある大きな地震動に対応すべきだ」と言う点。（SEAOC の Vershon2000 で"Rare"又は"Very Rare"に相当） • 上記の教訓に対してとられた対応の要点は次の通り ➢ 突然の破壊に繋がる"せん断破壊"や"主筋の拘束喪失"を避ける。そのためには構造細目の規定が不可欠（例えば Hoop 筋の密度） ➢ 構造部材の一部が降伏強度を越えた後の挙動を設計法に反映する。非線形挙動を考慮した構造解析手法が不可欠（例えば保有耐力法） • 日本の耐震設計法 ➢ 耐震設計における解析の位置付けの整理 ➢ 「ルート」によって必要な解析を仕分ける（必ずしも厳密な非線形解析を薦めない）

[106] ONESVIE は、耐震設計や耐震改修のための予算要求を試みている状況

	災害リスク管理の現状を評価する指標	求められる対応	現状	課題	改善策・対策の方向性	参考となる日本の技術事例
						• (社)日本建築学会が作成する「建築工事標準仕様書」、「構造計算基準」、「荷重指針」など
	建築確認の手続きと実施状況	実効性のある検査枠組みの構築	• 建築許可の中央事務所はMIVHEDであるが、自治体への届け出だけで十分という誤解がある	• 建築確認申請と、監督および認可制度は既得権益に関わる問題であるが、それが正確に認識されていない • 監督する主体はONESVIEからMIVHEDに移管される途上 • 建築許可を出す建築主事の位置づけが明確化されていない	• 構造力学上の審査視点と非構造の審査視点が必要。 ➢ 確認申請や完了検査の審査を行う建築主事の資格審査制度を創設 ➢ 建築士法の創設および一定期間ごとの建築士定期講習の義務付け ➢ フォローアップ研修	• 建築士制度および定期講習制度
	重要構造物（政府庁舎、病院、学校等）の基準と順守状況	個人所有の建物に求められる最低の基準以上の枠組み	• 重要構造物の所管行政庁がMOPCなのかMIVHEDなのかが不明瞭な段階である	• 建築は私有物であるからMinimum requirementが基本である一方、「公共構造物は別枠で考えるべき」という点が理解されていない • 既存の重要施設の耐震化の優先度の順位付けがない	• 公共構造物に対して、Minimum requirement以上の耐震性能を求める考え方の共有 • 公共建物の耐震改修を促進する法案の制定	• 「特定建築物（新耐震基準に適合しない建築物）」のような特別枠 • 建築物の耐震改修の促進に関する法律(不特定多数が集まる、学校、事務所、病院、百貨店など、一定の建築物（特定既存耐震不適格建築物）のうち、現行の耐震規定に適合しないものの所有者は、耐震診断を行い、必要に応じて耐震改修を行うよう努めることが義務付ける) • 耐震等級の概念
	重要構造物（政府庁舎、病院、学校等）の耐震診断と耐震補強の実施状況	既にある公共建物資源の確保	• ONESVIEは既存の建物を評価・診断および改修設計提案する。改装工事は各機関に依存する • 病院の場合、以下の分担になっている ➢ 構造の責任者:MOPC、SNS（SNSにはエンジニアリング部門があり、建設を監督） ➢ 病院の所有者：SNS ➢ 建設：MIVHED	• 費用対効果が意識されていない • 予算の多くを防災対策にかけることはできない • 防災事前投資努力が効率良く現れるところとそうでないところが意識されていない	• 耐震診断：「竣工図」が得られない場合の診断方法の導入。 • 耐震補強：靭性に期待する構法（例えば座屈を抑制ブレースの適用）から、伝統的組積造を補強する手法までの導入 • 制震構造の実施 （ドミニカ共和国では「免震」「制震」が着目されていて、日本の技術に期待されている。しかしながら費用対効果や確実性を考えると非線形挙動時に得られる履歴減衰を利用する「制震」が推薦される）	• 耐震診断の手法 （配筋状態を知るために、いきなり破壊試験をするのではなく、建設年代を参照する経験則による方法を推奨） • 学校建物の耐震化をはじめとするシリーズの耐震化努力の事例 • 耐震改修促進法の概念 • エネルギー吸収ダンパー • 座屈抑制型ブレース
	違法建築	建築許可申請・確認の励行	• 既存不適格と違法の区別が意識されていない • 既存不適格の中には社会慣習上の許容も含まれる	• 対処のあり方において、法的根拠が問題	• 自治体への届の他に建築確認申請と許可が必要であることを徹底する。	• 資格試験を前提とした建築士制度
	住宅の耐震性	国民の生命・健康・財産の保護のため、建築物の敷地・設備・構造・用途についてその最低基準を満たす	• 個人所有の住宅耐震性は必ずしも判然としない • 一定の水準を満たすものがある一方、不満足なものがある	• 地震被害について国民的な理解が醸成されていない	• 個人所有の住宅に対して出来ることは、啓蒙と助成などモチベーション醸成	• 耐震化促進ガイドライン • 優良建築物等整備事業制度
インフラ	耐震基準、設計基準の整備状況	インフラ設備の設計基準の標準化	• 耐震（地震動レベル）に係る基準はR-001であり、道路ならびに橋梁を除けば詳細な解析や設計に係る基準は民間企業が独自に準備	• 地震時ならびに地震後における構造物の保有性能が明確でないため、総合的な地震対策を検討することができない	• 産業界別に準拠する基準・指針を定め、それらの相互比較を通して、保有する耐震性能の明確化	• 日本では民間企業所有の構造物であっても、関連する官公庁や学協会で設計指針をまとめている ➢ 例えば、水道施設耐震工法指針・解説、原子力発電所耐震設計技術規程／指針等が挙げられる。
	耐震診断基準の整備状況	耐震診断・脆弱性評価手法の構築	• 橋梁においては維持管理を目的とした診断が実施されているが、耐震性を直接評価するものではない • その他のインフラ設備については、耐震診断基準はなく診断が実施されていない	• インフラ設備については、不具合が顕在化した場合に対処するという方針 • 上記の結果、防災における「備え」という観点では極めて不十分であり、また、復旧	• 耐震診断は、個々の構造物と線状構造物に分けて考える。 ➢ 個々の構造物（橋梁や上下水処理場など）は現行設計基準に基づく評価を実施する他、例えば建物耐震診断のように諸特性が得られていない設	• 日本では過去の地震における被害事例を基に被害関数を構築し評価を実施している • 日本の被害関数を基にドミニカ共和国の地盤や設備の特徴を踏まえた被

	災害リスク管理の現状を評価する指標	求められる対応	現状	課題	改善策・対策の方向性	参考となる日本の技術事例
				作業の事前検討を実施するための被害想定も困難	備については簡便な評価手法を構築し評価 ➢ 線状構造物（道路、上下水配管システム、送配電網、通信ケーブルなど）は個別の地点が設定できない。このような設備に対しては単位長さ当たりの被害率を地域メッシュ毎に算定し、脆弱地域を想定する • ドミニカ共和国の地盤や設備の特徴を踏まえた被害関数の構築を行う	害関数の構築を行うことが考えられる
	耐震補強技術の整備状況	耐震補強の必要性や優位性に関する意識の醸成	• ドミニカ共和国においてはインフラ設備の耐震補強実績がない • 上記の結果、耐震補強に係る技術の保有だけでなく、耐震補強に係る諸知見の蓄積が不十分	• 耐震補強は当該国で採用可能な技術や材料を用いることが現実的であるが、施工実績が無いためにそのような選択の幅が限定的 • 耐震補強の経済的な優位性に係る知見も得られないことから、新築を優先する傾向にある • 耐震補強でも十分な耐震性が得られるという技術的な知見、耐震補強が安価に耐震化を実現できるという知見を蓄積し、耐震補強に関する意識の醸成が必要	• 既往インフラに係る耐震補強技術（補強設計、補強施工）ならびに材料（新材料、新技術）の適用性を検討 • 試設計や試施工に基づく費用検討を行い、経済的な優位性を示す	• 日本では、橋脚の強化、橋桁の落下防止、配管のフレキシブルジョイント化などの耐震改修工事が行われている • インフラ施設の耐震改修の経済性評価手法に関する研究論文も公開されている

第 4 章　地震被害軽減のための地震防災分野のロードマップの提案

4.1　ロードマップ作成の考え方

第 3 章で整理した現状と課題、そこから導き出された優先課題を踏まえ、課題解決のために実施すべき対策案を時間軸・実施機関と共に整理し、事前防災投資が促進されるための、ドミニカ共和国における地震防災分野のロードマップ案を作成した。当ロードマップ案は、ドミニカ共和国の建築物及びインフラの耐震化に向けた方針を示すものであり、地震防災に特化したものである。なお、「優先順位」に関しては、表 4.1.1 に示す判断基準をもとに決定した。

表 4.1.1　優先順位の判断基準

優先順位	判断基準
A:高 (High)	防災公共構造物及びインフラの中でも、災害発生後の災害対応拠点となる防災拠点施設及び、災害対応を支えるインフラの整備・耐震強化に関わる施策
B:中 (Medium)	防災拠点施設以外の公共構造物及びインフラ整備に関わる施策
C:低 (Low)	民間施設の耐震化に関わる施策

防災法の改定、国家による各種防災関連計画の改定、建築基準の改定、重要建築物の耐震化計画の策定等が現在進められている状況であり、ドミニカ共和国による地震災害軽減に向けた努力が進められているところであるが、実際の減災に資する重要建築物・インフラ等構造物対策が予算面の課題もあり、実施できていないのが現状である。隣国ハイチでは 2010 年及び 2021 年に大地震が発生しているが、ドミニカ共和国では 1948 年以降大地震は発生していないが、同様の大地震の発生がドミニカ共和国においても危惧されている。地震被害軽減のドミニカ共和国による自国予算による努力のみならず、国際機関による無償・借款事業による具体的な耐震化対策の実施が求められる。

4.2　ロードマップ

次ページに、ロードマップを示す。

大項目 Category	小項目 Sub-Category	施策番号 (No.)	対応すべき課題 Issues to be addressed	実施施策 Implementation Measures	責任機関 Responsible Agency	目標年 Target Year			優先順位 Priority
						短期（-2025) Short Term （-2025)	中期（2025-2030） Mid-Term （2025-2030）	長期（2030-2035） Long-term （2030-2035）	A:高(High) B:中(Medium) C:低(Low)
地震防災 Earthquake Disaster Risk Reduction (DRR)	法制度 Laws and Regulations	D-1	防災関連法への地震災害予防・抑制や耐震化に関する取組方針や各組織の役割の明確化	改訂法への重要建築物耐震促進に向けた方針の追加	MEPyD 及び各関連省庁	✓			A
	組織体制 Institutional Setup	D-2	重要建築物の耐震化に向けた各防災関係機関の役割の明確化と関係機関内での認識合わせ、連携	Seismic Table の法的枠組み内での組織化（防災法や各種計画への組織の役割の明文化）	ONESVIE	✓			A
		D-3	地方自治体の防災組織の技術的、資金的、人的資源の確保	中央政府からの地方自治体への防災組織の設立指導と地方自治体職員の能力強化	OCD		✓		B
	減災計画 DRR Plans	D-4	関係機関や地方自治体の開発戦略への地震防災・耐震化の展開	各組織の開発戦略に地震防災対策導入指導、計画のモニタリングの実施	MEPyD 及び各関連省庁	✓			B
		D-5	国家災害リスク軽減計画改訂版の明確な取組み指標の設定	地震リスク評価や耐震補強実施のための効果的な目標や指標の設定（数値目標の設定、進捗確認に資する調査や報告書の明確化）	MEPyD	✓			A
		D-6	計画実行のための仕組み（モニタリング制度、予算、体制）の構築	国家災害リスク軽減計画及び国家地震リスク軽減計画の定期的なモニタリング及び改訂の実施	MEPyD	✓	✓	✓	A
		D-7	地方自治体における地方災害リスク軽減計画の策定	中央政府への、地方自治体の計画策定支援やモニタリングの仕組み導入	MEPyD、OCD	✓			A
		D-8		地方自治体での計画策定を支援するガイドラインの作成や指導の実施・継続	MEPyD、OCD	✓			B
		D-9		地方自治体による計画策定・モニタリングの実施	各地方自治体		✓		B
	リスク評価 Risk Assessment	D-10	全国規模での地震リスク評価や地震震度分布図作成の実施	全国的な地震リスク評価手法や地震震度分布図作成手法の確立・方針設定、及び、リスク評価実施に向けた情報整備	SGN	✓			A
		D-11		全国地震リスク評価の実施	SGN		✓		A
		D-12	地方自治体での詳細な地震リスク評価や地震震度分布図の作成・実施	地方自治体による詳細な地震リスク評価のためのガイドライン作成・配布と職員向けトレーニングの実施	SGN		✓		B
		D-13		各地方自治体による詳細地震リスク評価の実施	各地方自治体		✓		B
		D-14	各防災計画・土地利用計画等への地震リスク評価結果の反映・目標設定	地震リスク評価結果を考慮した防災計画や土地利用計画の策定	MEPyD、各地方自治体		✓		B
		D-15		住民への地震ハザードマップを含む防災啓発資料の作成と配布	各地方自治体		✓		C
	防災予算 DRR Budgeting	D-16	各公共施設の所管省庁における耐震工事予算の確保	予算設定の根拠となる各種計画・戦略への、耐震化事業及び担当組織の明確化	MEPyD	✓	✓	✓	A
		D-17	各省庁の防災予算に関する情報整備と事業予算管理	各省庁防災予算の情報収集・整備と予算状況の可視化	MEPyD	✓			B
		D-18	地方自治体における防災予算の確保	地方開発戦略・計画への、耐震化促進施策の取り込みと、予算の確保	各地方自治体	✓	✓	✓	B

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						短期（-2025) Short Term (-2025)	中期（2025-2030） Mid-Term （2025-2030）	長期（2030-2035） Long-term （2030-2035）	A:高(High) B:中 (Medium) C:低(Low)
建築物耐震性 Seismic Resistance of Buildings	建築基準 Building Regulations	B-1	耐震設計体系の明確化	耐震基準の体系構築	ONESVIE, MOPC, MIVHED 及び 各地方自治体		✓	✓	A
		B-2		解析手法の構築	ONESVIE, MOPC, MIVHED 及び 各地方自治体		✓	✓	A
		B-3		建築技術教育の普及	ONESVIE, MOPC, MIVHED 及び 各地方自治体		✓		A
	建築確認 Building Permission	B-4	建築許可の要件確認	建築審査会制度の導入	MIVHED			✓	B
		B-5	建築許可を出す建築主事の位置付け	試験制度、資格更新の際に実施する研修制度の導入	MIVHED		✓		B
	重要施設の耐震性 Seismic Resistance of Critcial Buidlings	B-6	既存の重要施設を体系的に診断・評価	既存建物の耐震評価基準の策定	ONESVIE		✓		B
		B-7	既存の重要施設順位付け	公的建物の耐震強度インベントリーの作成	ONESVIE		✓		B
	重要施設の耐震改修 Seismic Retrofitting of Critical Buildings	B-8	耐震改修技術の明確化	既存建物の耐震改修規準の策定	ONESVIE		✓		B
		B-9	重要施設(政府庁舎、病院等)の耐震性確保	重要施設(政府庁舎、病院等)の耐震改修(又は建替え)事業の実施	ONESVIE 及び関連省庁		✓	✓	A
	違法建築 Informal Buildings	B-10	既存不適格と違法の定義明確化	建築確認制度講習会の実施	MIVHED			✓	C
		B-11	建築技術者の資質要件設定	資格試験を前提とした建築士制度の構築	MIVHED			✓	B
	住宅の耐震性 Seismic Resistance of Residential Buildings	B-12	民間建築物の耐震化促進及び地震防災の取組促進に向けた仕組み（補助、インセンティブ、ガイドライン）構築	民間向けの地震防災・耐震化ガイドラインの作成・配布	ONESVIE		✓		C
		B-13		資金的援助や地震保険などの制度やインセンティブの構築	ONESVIE			✓	C
インフラ耐震性 Seismic Resistance of Infrastructures	インフラ耐震基準 Infrastructure Regulations	I-1	インフラの総合的な地震対策の検討	産業界別の準拠する基準・指針の策定	MOPC 及び関連事業者	✓			A
		I-2	地震時ならびに地震後における構造物の保有性能の明確化	相互比較による保有耐震性能の明確化	MOPC 及び関連事業者	✓			A
	インフラの耐震性 Seismic Resistance of Infrastructure and Lifeline	I-3	構造物脆弱性評価の実施及び 復旧計画の前提となる地震リスク評価の実施	個別構造物に対する耐震診断手法の構築	MOPC 及び関連事業者	✓			A
		I-4		線状構造物（配管等）に対する被害関数の構築	MOPC 及び関連事業者	✓			A
		I-5	耐震性評価技術の普及・定着	策定した耐震性評価手法に関する研修の実施	MOPC		✓		B
		I-6		耐震性評価に係る技術認証制度の確立	MOPC		✓		B

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	インフラの耐震補強 Seismic Retrofitting of Infrastructure and Lifeline	I-7	耐震補強手法の選択肢の拡充	耐震補強技術（補強設計、補強施工）ならびに材料（新材料、新技術）の適用性の検討	MOPC 及び関連省庁	✓			A
		I-8	耐震補強工事を確実かつ容易にするための技術資料の作成	補強工事に係る標準工事仕様書の策定	MOPC 及び関連事業者	✓			A
		I-9	耐震補強技術の普及・定着	補強設計ならびに補強施工に係る技術研修の実施	MOPC		✓		B
		I-10		関連技術開発の実施	MOPC 及び関連事業者		✓		B
		I-11		インセンティブの導入による技術修得の促進	MOPC		✓		B
		I-12	耐震補強工事の優位性に係る意識の醸成及び耐震補強の促進	試設計や試施工に基づく費用検討による経済的な優位性の検討	MOPC		✓		B
		I-13	重要インフラの耐震性確保	重要インフラの耐震補強事業の実施	MOPC 及び関係事業者		✓	✓	A

付属資料

1. 収集資料リスト

2. 質問票（英文）

3. ヒアリング議事録

4. 研修プログラムに対する各機関の要望

5. 防災総論スライド

6. ロードマップ発表スライド

1.　収集資料リスト

No	種類	資料名	発行年	頁数	発行元	言語	ファイル形式
1	Law	Decree No.874-09	2009	38	Gov. DR	ES	pdf
2	Law	Law No.160-12	2021	45	Gov. DR	ES	pdf
3	Law	Disaster Risk Management Law No.147-02	2002	24	Gov. DR	ES	pdf
4	Plan	National Plan for DRR	2002	44	Gov. DR	ES	pdf
5	Plan	Comprehensive DRR Plan	2011	114	Gov. DR	ES	pdf
6	Plan	National Plan for the Seismic Risk Reduction 2011	2011	48	Gov. DR	ES	pdf
7	Plan	Law 1-12 National Development Strategy 2030	2012	107	MEPyD	ES	pdf
8	Plan	Strategic Plan Environmental and Risk Management For Year 2020	n.d.	102	MINERD	ES	pdf
9	Plan (draft)	NATIONAL PLAN FOR SEISMIC RISK REDUCTION Draft 2021	2021	142	(ONESVIE)	ES	doc.
10	Plan (draft)	National Disaster Risk Reduction Plan 2017 - 2030 of the Dominican Republic.	2017	35	COE	ES	doc.
11	School DRR Plan	School Risk Management Plan fo the Rosa Duarte School	n.d.	36	MINERD	ES	pdf
12	School DRR Plan	Workbook School Preparedness for Emergencies and Disasters	n.d.	125	MINERD	ES	pdf
13	Report/ DRR	Disaster Risk Management Development Policy Loan with Catastrophe Risk Deferred Distribution Option	2017	66	WB	EN	pdf
14	Report/ DRR	Analysis of Risks and Vulnerabilities of the Dominican Republic (2009)	2009	114	DIPECHO	ES	pdf

15	Report/ DRR	Diagnosis of the Situation of the Dominican Republic in terms of disaster risk reduction	2010	44	UNDRR/PNUD/EU/ Gob. RD	ES	pdf
16	Report/ DRR	Disaster Risk and Risk Management Indicators	2015	98	IDB	ES	pdf
17	Report/ DRR	Improving gender visibility in disaster risk and climate change management in the Caribbeans	2009	42	UNDP	ES/ EN	pdf
18	Report/ DRR	Protecting Development From Disasters: UNDP's Support To The Hyogo Framework For Action	2016	16	UNDP	EN/ Japanese	pdf
19	Report/ DRR	Natural Hazards and Risks of the Dominican Republic. Map compendium.	2012	138	DGODT/MEPyD/IBD	ES	pdf
20	Report/ DRR	Disaster Risk Management in Latin America and the Caribbean Region: GFDRR Country Notes	2010	18	WB/ GFDRR	EN	pdf
21	Report/ DRR	Revision, update and analysis of hazards and risks of the Dominican Republic (2011)	2011	136	CNE	ES	pdf
22	Report/ DRR	Analysis of legislation related to disaster risk reduction in the Dominican Republic	2011	70	IDRL	EN	pdf
23	Report/ DRR	Effective law and regulation for disaster risk reduction: a multi-country report	2014	124	UNDP	EN	pdf
24	Report/ Institutional	Memoria Institucional ONESVIE 2014	2015	14	ONESVIE	ES	doc.
25	Report/ Institutional	Memoria Institucional ONESVIE 2016	2017	80	ONESVIE	ES	pdf
26	Report/ Institutional	Memoria Institucional ONESVIE 2017	2018	37	ONESVIE	ES	doc.

27	Report/ Institutional	Memoria Institucional ONESVIE 2018	2019	35	ONESVIE	ES	pdf
28	Report/ Institutional	Memoria Institucional ONESVIE 2019	2020	27	ONESVIE	ES	pdf
29	Report/ Institutional	Memoria Institucional ONESVIE 2020	2021	65	ONESVIE	ES	pdf
30	Report/ Institutional	Memoria Institucional ONESVIE 2021	2022	102	ONESVIE	ES	pdf
31	Report/ DRR	Progress and Challenges of Disaster Risk Management Disaster Risk Management in the Dominican Republic, 2012	2012	152		ES	pdf
32	Codes/Regulation	Provisional Recommendations for the Seismic Design of Structures (1979)	1979	52	MOPC	ES	pdf
33	Codes/Regulation	Provisional Recommendations for the Seismic Design of Structures (1979): Application examples	1981	46	MOPC	ES	pdf
34	Codes/Regulation	R-001 Regulations for the Seismic Analysis and Design of Structures	2011	65	MOPC	ES	pdf
35	Codes/Regulation	R-002 Regulation for Vehicle Parking in Buildings	1989	80	MOPC	ES	pdf
36	Codes/Regulation	R-003 Regulation for Electrical Installations in Buildings. 2nd Edition. Part I	1990	79	MOPC	ES	pdf
37	Codes/Regulation	R-004 Regulation for Supervision and General Inspection of Works	2017	39	MOPC	ES	pdf
38	Codes/Regulation	R-005 Regulation for Drawing Plans in Building Projects	1985	50	MOPC	ES	pdf
39	Codes/Regulation	R-007 Regulation for Projecting Without Architectural Barriers	1991	58	MOPC	ES	pdf

40	Codes/Regulation	R-008 Regulation for the Design and Construction of Sanitary Installations in Buildings	2010	102	MOPC	ES	pdf
41	Codes/Regulation	R-009 General Specifications for the Construction of Buildings	1982	132	MOPC	ES	pdf
42	Codes/Regulation	R-010 Provisional Recommendations for Electrical Installations in Buildings. Part II.	1982	94	MOPC	ES	pdf
43	Codes/Regulation	R-011 Basic Criteria for Geotechnical Studies of Highways	N.D.	44	MOPC	ES	pdf
44	Codes/Regulation	R-012 Basic Criteria for the Geometric Design of Roads	1982	53	MOPC	ES	pdf
45	Codes/Regulation	R-013 Instructions for Presentation of Proposals for Studies and Road Projects	1982	77	MOPC	ES	pdf
46	Codes/Regulation	R-014 General specifications for highway construction	1985	208	MOPC	ES	pdf
47	Codes/Regulation	R-015_(PT1) P-Δ Effects on Nonlinear Seismic Response	1985	38	MOPC	ES	pdf
48	Codes/Regulation	R-016 Provisional Recommendations for Minimum Spaces in Urban Housing	N.D.	58	MOPC	ES	pdf
49	Codes/Regulation	R-017 Provisional Recommendations for the Presentation of Road Projects	N.D.	41	MOPC	ES	pdf
50	Codes/Regulation	R-018_(PT2) Flexural-Compression Design of Reinforced Concrete Walls	1986	77	MOPC	ES	pdf
51	Codes/Regulation	R-019 Provisional Recommendations for the Presentation of Road Projects	1987	143	MOPC	ES	pdf

52	Codes/Regulation	R-021 Requirements for the Application of the General Building Regulations and the Processing of Plans	2006	56	MOPC	ES	pdf
53	Codes/Regulation	R-022 Regulation for the Design and Construction of Medium to Low Voltage Distribution Substations	N.D.	56	MOPC	ES	pdf
54	Codes/Regulation	R-023 Regulation for the Design of School Physical Plants. (Basic and Intermediate Levels)	2006	54	MOPC	ES	pdf
55	Codes/Regulation	R-024 Regulation for Geotechnical Studies in Buildings	2006	60	MOPC	ES	pdf
56	Codes/Regulation	R-025 Regulation for the Installation of Emergency Power Plants	2006	40	MOPC	ES	pdf
57	Codes/Regulation	R-026 Regulation for the Execution of Excavation Works on Public Roads	2007	27	MOPC	ES	pdf
58	Codes/Regulation	R-027 Regulation for the design and construction of structural masonry buildings	2007	81	MOPC	ES	pdf
59	Codes/Regulation	R-028 Regulation for design, fabrication and erection of steel structures	2007	96	MOPC	ES	pdf
60	Codes/Regulation	R-029 Regulation for the design and construction of structural wood buildings	2009	139	MOPC	ES	pdf
61	Codes/Regulation	R-030 Regulation for the Design and Installation of Liquefied Petroleum Gas System	2010	57	MOPC	ES	pdf

62	Codes/Regulation	R-031 Regulation for the Design of Means of Vertical Circulation in Buildings	2015	29	MOPC	ES	pdf
63	Codes/Regulation	R-032 Regulation for Safety and Fire Protection	2019	92	MOPC	ES	pdf
64	Codes/Regulation	R-033 Regulation for the Design and Construction of Reinforced Concrete Structures	2012	171	MOPC	ES	pdf
65	Codes/Regulation	R-034 Regulation on Special Requirements for the Design and Construction of Works and Deep Excavations in the Ortega & Gasset-UASD Tunnel Zone	2017	11	MOPC	ES	pdf
66	Codes/Regulation	F1-01 Initial Inspection Form	N.D.	2	MOPC	ES	pdf
67	Codes/Regulation	F1-02 Initial Form of Structural Elements By Floor	N.D.	4	MOPC	ES	pdf
68	Codes/Regulation	FI-03 Structural Inspection Form For Mezzanines and Ceilings	N.D.	4	MOPC	ES	pdf
69	Codes/Regulation	FI-04 Phased Facility Inspection Form	N.D.	3	MOPC	ES	pdf
70	Codes/Regulation	FI-05 Final Inspection Form	N.D.	3	MOPC	ES	pdf
71	Codes/Regulation	Requirements For Structural Evaluation of Existing Buildings or Buildings Begun For The pupose of Processing Plans to Obtain A Construction License	2019	7	MOPC	ES	pdf
72	Codes/Regulation (draft)	R-001 Title 1,2,3,4 Draft Version	2022	106	MOPC/IDB	ES	pdf
73	Codes/Regulation (draft)	Bridge Regulation_GENERAL INTRODUCTION OF UNITS	N.D.	3	MOPC	ES	pdf

74	Codes/Regulation (draft)	UNIT I Basic Engineering	N.D.	2	MOPC	ES	pdf
75	Codes/Regulation (draft)	U1_BASIC ENGINEERING	N.D.	53	MOPC	ES	pdf
76	Codes/Regulation (draft)	INTRODUCTION TO UNIT II	N.D.	4	MOPC	ES	pdf
77	Codes/Regulation (draft)	U2_T1_FIELD OF VALIDITY, DESIGN PHILOSOPHY	N.D.	8	MOPC	ES	pdf
78	Codes/Regulation (draft)	U2_T2_GENERAL PROJECT AND LOCATION FEATURES	N.D.	27	MOPC	ES	pdf
79	Codes/Regulation (draft)	U2_T3_LOADS AND LOAD FACTORS	N.D.	109	MOPC	ES	pdf
80	Codes/Regulation (draft)	U2_T4_STRUCTURAL ANALYSIS AND EVALUATION (AASHTO 4)	N.D.	74	MOPC	ES	pdf
81	Codes/Regulation (draft)	U2_T5_REINFORCED CONCRETE	N.D.	211	MOPC	ES	pdf
82	Codes/Regulation (draft)	U2_T6_STEEL STRUCTURES	N.D.	220	MOPC	ES	pdf
83	Codes/Regulation (draft)	U2_T7_BOARDS AND BOARD SYSTEMS	N.D.	29	MOPC	ES	pdf
84	Codes/Regulation (draft)	U2_T8_FOUNDATIONS	N.D.	151	MOPC	ES	pdf
85	Codes/Regulation (draft)	U2_T9_WALLS, ABUTMENTS AND PILES	N.D.	92	MOPC	ES	pdf
86	Codes/Regulation (draft)	U2_T10_BURIED STRUCTURES AND TUNNEL LININGS	N.D.	93	MOPC	ES	pdf
87	Codes/Regulation (draft)	U2_T11_FENDERS AND RAILINGS	N.D.	21	MOPC	ES	pdf
88	Codes/Regulation (draft)	U2_T12_JOINTS AND SUPPORTS	N.D.	81	MOPC	ES	pdf
89	Codes/Regulation (draft)	U3-T1_CONSTRUCTION PROVISIONS	N.D.	85	MOPC	ES	pdf
90	Codes/Regulation (draft)	U3-T2_MAINTENANCE OF BRIDGES	N.D.	24	MOPC	ES	pdf

91	Drawing	apartment drawing	N.D.	n.a.	n.a.	n.a.	dwg
92	Drawing	apartment structure	N.D.	n.a.	n.a.	n.a.	dwg
93	Drawing	Juan Bosch Bridge drawing	N.D.	69	n.a.	ES	pdf
94	Drawing	typical 3 story house plan	N.D.	14	n.a.	ES	pdf
95	Drawing	typical school plan	N.D.	4	MINERD	ES	pdf
96	Guidelines	Guideline for the Construction of Safe Schools and Prototype Models	2013	34	DGODT	ES	pdf
97	Guidelines	Index for Safe Aqueducts	N.D.	135	INAPA	ES	pdf
98	Guidelines	Safe Hospitals: systematization of experiences in the Dominican Republic	2013	195	PAHO/MSP	ES	pdf
99	Guidelines	Safety Index for Educational Centers (ISCERD)	2014	207	MINERD	ES	pdf
100	Guidelines	Hurricane and Seismic Assessment Handbook of Existing Concrete Buildings for the Dominican Republic	2002	157	NIST	ES	pdf
101	Seismic Microzonation	Microzonation, Vulnerability and Seismic Risk of the city of Salcedo	2004	74	ONESVIE/ SODOSISMICA	ES	pdf
102	Seismic Microzonation	Seismic Microzonation Great Santo Domingo (Part 4)	2016	103	SGN	ES	pdf
103	Seismic Microzonation	Seismic Microzonation of Santiago de los Caballeros	2011	108	SGN	ES	pdf
104	Report/ JICA	Proposal for the Adaptation and Improvement of Regulatory Instruments for Earthquake-Resistant Construction in the Dominican Republic.	2017	20	JICA	ES	pdf

105	Report/ JICA	Reduction of seismic vulnerability of schools in the province of San Cristóbal	2014	97	ONESVIE/ JICA/ SGN	ES	pdf
106	Report/ Institutional	Organization Chart of ONESVIE	2019	11	ONESVIE	ES	pdf

2.　質問票（英文）

JICA Information Gathering Survey for designing and implementing an effective knowledge co-creation program for
"Strengthening of capacities in Seismic Evaluation of Buildings in the Dominican Republic".

ONESVIE Questionnaire

The Dominican Republic is located in a zone with a high probability of earthquake occurrence, and historically, severe seismic events have occurred up to once every 5060year on the island of Hispaniola. Even so, there are many problems to identify in the field of earthquake disaster risk reduction.

In this context, the Japan International Cooperation Agency (JICA) has received requests from the Dominican Republic for the creation of a three-year country training program on capacity building in seismic vulnerability assessment. However, JICA has limited experience in technical cooperation in this field in the Dominican Republic and has not accumulated sufficient information to prepare an effective training program.

The purpose of this questionnaire is to learn about the current situation and the challenges of seismic risk reduction and seismic strengthening of buildings. Responses to this questionnaire will be analyzed before individual interviews are conducted. Gathering sufficient information is an essential step in designing the training program and creating a roadmap to organize future actions. Your cooperation in this questionnaire will be highly appreciated. Please enter your answers directly into this text file according to the questions. If the question is not applicable, please enter N/A as the answer. It would also be appreciated if you could attach any documents or materials supporting the answers or provide sources (including URL / source reference).

1. Contents of the questionnaire

Part 1: Respondent information
Part 2: Questions on general measures for earthquake DRR
Part 3: Questions on the construction of new buildings
Part 4: Questions on seismic retrofitting of buildings
Part 5: Questions related to the construction of new infrastructure and lifelines
Part 6: Questions relating to seismic strengthening of infrastructure and lifelines

2. Shipping

◆Deadline: **January 7, 2022**

3. Questionnaire

Part 1: Respondent information

Name	Leonardo de Jesús Reyes Madera
Position	Chief Executive Officer
Institution	National Office of Seismic and Vulnerability Assessment of Infrastructure and Buildings
Date	06/01/2022

Part 2: Questions on general measures for earthquake DRR

General questions

1. What is the role of your institution and other institutions in promoting Disaster Risk Reduction (DRR) and earthquake-resistant construction? Please fill in the following table to clarify the division of roles.

< Function of your institution>

Our role is to contribute to the mitigation of the seismic risk of buildings and public infrastructure, as well as to protect the lives of citizens through technical and educational procedures.

< Other institutions>

Paper	Department/institutions responsible	Law and/or plans that define their responsibility
Determine and set target earthquakes for damage mitigation.	**SODOSISMIC BY MEANS OF MOPC**	**REGULATION R-001**
Conducting seismic risk assessment, including damage estimates	**ONESVIE**	**DECREE 715-01**
Follow-up and updating of the national disaster management plan	**MEPYD- DIRECTORATE OF RISK MANAGEMENT AND CIVIL DEFENSE**	**REFORM LAW 147-02**
Management of seismic design and seismic retrofitting of public facilities	**ONESVIE**	**DECREE 715-01**
Management of seismic-resistant design and seismic reinforcement of social housing (public)	**ONESVIE AND MIVHED**	**DECREE 715-01 AND LAW 160-21**
Issuing the evacuation order and supporting the population for evacuation in case of earthquake	**COE, CIVIL DEFENSE, ONESVIE**	**N/A**
Response to collapsed public buildings after the earthquake	**MOPC/MIVHED**	**N/A**
Public awareness of seismic-resistant design and construction and dissemination programs, promotional activities	**ONESVIE AND MIVHED**	**N/A**

2. What do you think are the main challenges of the application system (available technologies and capacity) for seismic-resistant design and construction?

Implementation of tests that represent our construction typology.

Questions related to corporate systems, policies and planning

3. **How does the National Disaster Risk Management Law establish seismic-resistant design and construction?**

At present, the National Disaster Risk Management Law does not contemplate seismic-resistant design and construction.

4. **Are there any plans to revise the National Risk Management Law in the future?**

It is currently under review.

5. **Does the National Disaster Management Plan include information on promoting earthquake-resistant design and construction? How often is the National Disaster Management Plan updated?**

Currently no, although inclusion is being proposed through the National Seismic Risk Reduction Plan, a program sponsored by UNDP and Onesvie.

6. **How often is the national disaster management plan monitored and updated?**

At present, it is the first time it has been updated after its conception.

7. **Is there an annual budget for the measures to promote earthquake-resistant buildings described in the national disaster risk management plan? If so, how much is the annual budget and which projects have their own annual budget?**

No.

8. **Are local governments required to formulate local disaster risk management plans? What is the current status of their formulation? Does the local risk management plan mention the promotion of seismic-resistant design and construction? Are there systems in place at the national office to regularly monitor local disaster risk management plans?**

Local governments are required to formulate local disaster risk management plans. No to all other questions.

9. **Is there a system of implementation (organization and budget) and coordination among related organizations for earthquake disaster prevention measures? We understand that the Seismic Table has the function of coordination between ministries/organizations related to seismic risk reduction and earthquake resistant design and construction. But is there a problem in terms of the enforcement system to promote seismic resistance? If so, what is it?**

The problem would be that there is currently no implementation system in place.

10. **What kind of measures do local governments take to mitigate earthquake damage?**

Damage prevention plans are contemplated through the municipal prevention, mitigation and response committees.

Risk assessment questions

11. **Has a seismic hazard map showing the seismic intensity distribution of potential earthquakes**

been developed?

Yes, the seismic microzonation map for Greater Santo Domingo, Salcedo and partially Santiago de los Caballeros and in the Regulation for the Analysis and Seismic Design of Structures, R-001, maps from 2 to 10 for different recurrence periods are presented.

12. **Are risk assessments also conducted by local governments? If so, what is the difference in role between the national government and local governments?**

No.

13. **What criteria (e.g. seismic scenario, population and building information) are used for risk assessment?**

The level of threat, the degree of vulnerability or exposure.

14. **Are the results of seismic hazard maps and earthquake damage estimates used to identify priority areas for countermeasures, to promote seismic strengthening, to regulate land use and/or to raise public awareness of earthquakes and their risk?**

Yes, they are used

Questions on encouraging private sector participation

15. **Are there any systems, aids, guidelines and/or incentives to increase the seismic-resistant capacity of private dwellings? If so, what are they, and have annual budgets been secured for these measures?**

No.

16. **Is there any system of earthquake insurance or advance government assistance for victims of future earthquakes? If so, what system is in place?**

No.

17. **What measures and activities are being implemented to encourage local residents to promote seismic risk reduction (e.g., drills, educational materials, lectures in schools/communities, grants for local activities).**

Simulations, lectures, conferences, technical forums, awareness-raising activities for the general public.

Others

18. **What kind of support has been received from other donors in the field of seismic risk reduction? What were the results of their support/activities?**

Institutional strengthening has been provided in terms of equipment, training and joint projects. The results of these projects were an increase in the response capacity of the institutions in terms of seismic risk reduction.

19. **As mentioned on the first page, JICA is planning to conduct a training program on earthquake resistance in your country. Is there a Japanese system, policy or technology that you are interested in or what kind of training would you like to receive? Please also explain the reasons.**

Our main need refers to the development of a procedure that contains the different typologies of buildings constructed in the country. Up to now we have used the seismic regulation R-001 conceived for new buildings and we have tried to adapt it to the evaluation of existing buildings. However, this regulation does not contemplate in any of its parts a procedure for the application of vulnerability studies. On the other hand, in some cases we have used the ASCE 41-17 that proposes three steps to follow to obtain the desired results, it would be of great support for us to establish through this experience with Japan, a local procedure that allows us to evaluate in a rational way the different typologies of existing buildings that we have in the country.
In another order, one of the major challenges that we need your support is the support for the development and implementation of a seismic-resistant engineering laboratory.

Part 3: Questions on the construction of new buildings

Seismic code for new buildings

1. For the moment, we recognize that only the application of R-001 to buildings has been confirmed. Are there any other standards that integrate the structural analysis methods used in seismic design? If so, what are they? Is it a stress standard, a displacement standard or a hybrid?

No.

2. What is the seismic code name and year of the latest version for each function?

Code functions	Code Name	Year of issue of the latest version
To regulate all construction in the national territory to guarantee that in the presence of an earthquake, the life of its occupants, as well as infrastructure and vital lines are guaranteed.	REGULATION FOR THE ANALYSIS AND SEISMIC DESIGN OF STRUCTURES R-001	2011
Code defining structural details (e.g., details of rebar layout for RC construction)	R-033 REGULATIONS FOR THE DESIGN AND CONSTRUCTION OF REINFORCED CONCRETE STRUCTURES R-027 REGULATIONS FOR THE DESIGN AND CONSTRUCTION OF STRUCTURAL MASONRY BUILDINGS	2012 2007
Code for evaluating the seismic resistance of existing buildings different from that of new buildings. For example, "$_s$*I-value*" （Seismic index of structure） in Japan） .	DOES NOT EXIST	
Code regulating buildings made of traditional materials other than reinforced concrete (RC) and steel structures. For example, masonry, wood...).	R-027 REGULATIONS FOR THE DESIGN AND CONSTRUCTION OF STRUCTURAL MASONRY BUILDINGS R-029 REGULATIONS FOR THE DESIGN AND CONSTRUCTION OF STRUCTURAL WOOD BUILDINGS	2007
Code defining structural details. For example, details of the arrangement of reinforcing bars for reinforced concrete construction.	R-033 REGULATIONS FOR THE DESIGN AND CONSTRUCTION OF REINFORCED CONCRETE STRUCTURES	2012

3. Are there any standards that regulate the strength and mechanical properties of materials such as steel and concrete?

No.

4. **Is the effect of ground deformation due to ground movement or other phenomena such as liquefaction in buried structures taken into account in the design? If so, how is it taken into account?**

☑ Yes ☐ No

R-024 Regulation for geotechnical studies in buildings takes into consideration

5. **If no, what are the main reasons (e.g., less effect than other causes, not necessary due to soil conditions, etc.)?**

n/a

6. **What do you think are the elements of seismic design that need to be modified, improved or added in the current design standard to make buildings earthquake resistant?**

Reconsideration of the design earthquake recurrence period, reconsideration of the near-field concept that was applied indistinctly to all faults whether active or not or with an earthquake potential greater than 7, inclusion of seismic energy dissipation devices.

7. **Did past earthquake disasters and/or past earthquakes affect the seismic design code and other standards for buildings? And if so, what were they like?**

☑ Yes ☐ No

Our first Code was published in 1979 under the name of Provisional Recommendations for Seismic Analysis and Design. With the experience of the 2003 earthquake, it was tested to some extent, but most of the affected buildings were pre-code, nevertheless, they allowed to calibrate some hazard estimates that served as a basis for the definition of the parameters and maps of the current seismic code, which had been delivered to the authorities by SODOSISMICA in 2008. The earthquake that occurred in 2010 on the Haitian side was the catalyst for the publication of the current code and presented the opportunity to socialize it with the USGS team that visited our country and, in a way, to agree it with the proposal of preliminary hazard maps that they were proposing for the Island.

Support system for designers

8. **Is there any detailed explanatory material or a manual to help understand the code and the seismic standard that is not included in the Code itself?**

Yes, but they were not published. The code was delivered with two additional parts, a volume of application examples as a guide for its correct application and a third document called Comments, in which we tried to explain the reasons for certain concepts not necessarily handled by the common engineer who is the one to whom the code is addressed, because he is its direct user.

9. **Is there software available to assist designers in complying with the seismic code and standard? If yes, please specify.**

Yes, the programs of daily use such as ETABS, SAP2000, SAFE, among others of minor application.

Part 4: Questions relating to the seismic strengthening of buildings

Seismic evaluation of existing buildings

1. Is there a system of evaluation of each phase of design and construction by the government? Specify who authorizes what type of buildings (e.g., in Japan there is the building confirmation application）.

☑ Yes ☐ No

The Ministry of Public Works and Communications is in charge of the evaluation of the designs, under the methodology called seismic vulnerability study, applicable to existing buildings that change their use or that have been started without the proper construction permits.

2. What do you think are the seismic evaluation items that need to be modified, improved or added in the current evaluation standard to make building structures resistant to future earthquakes?

It does not apply, because there is no evaluation standard. This aspect is the one we need to address most urgently because we need to define a guide of procedures where the required steps to be developed when evaluating an existing structure are made explicit and we understand that as Onesvie is the State office that deals with the preservation of its heritage, it should be the governing body and from whom these requirements emanate.

Seismic retrofit design for existing facilities/structures

3. Has the seismic strengthening design of existing buildings been carried out?

☑ Yes ☐ No

4. If yes, what is the name of the seismic strengthening design standard and the year of the latest version for each building structure?

Type of structure	Name of the seismic reinforcement design standard	Year of issue of the latest version
Reinforced Concrete (RC)	N/A	N/A
Steel	There is no	N/A
Wood	There is no	N/A
Masonry	There is no	N/A
Others	There is no	N/A

5. If the answer is no, what are the main reasons (e.g., but not limited to, periodic replacement, absence of old structures, absence of economic advantages, etc.)?

6. What, in your opinion, are the elements of seismic strengthening that should be modified, improved or added to the current strengthening design standard to make building structures resilient to future earthquakes?

Not applicable because there is no reinforcement design standard.

Seismic retrofit construction for existing buildings

7. Has seismic strengthening construction of existing buildings been carried out?

☑ Yes ☐ No

8. If yes, what is the name of the seismic strengthening construction standard and the year of the latest version for buildings?

Structures/Facilities	Name of the building standard for seismic retrofitting	Year of issue of the latest version
Buildings	None. ACI and/or AISC for steel is used for element details.	N/A

Note: If the facility in question consists of several structures, it is necessary to show the seismic strengthening construction standard for each structure.

9. What do you think are the elements of seismic strengthening that should be modified, improved or added in the current building standard to make building structures resilient to future earthquakes?

Not applicable because there is no reinforcement construction standard.

10. Is there a budget for the construction of seismic strengthening of existing buildings? If so, how is this ensured?

☐ Yes ☑ No

11. Which ministries or agencies are responsible for the construction of the reinforcement of public buildings?

Structures/Facilities		Name of Ministry / Agency
Buildings	Government office buildings	MOPC - MIVHED
	Public hospitals	SNS - MIVHED
	Public schools	MINERD - MIVHED
	Evacuation centers (if not schools)	MOPC - MIVHED

Note: If the facility in question consists of several structures, it is necessary to indicate the ministry/agency for each structure.

Part 5: Questions on construction of new infrastructure and lifelines

Seismic design for new construction

1. What is the seismic code name and year of the latest version for each infrastructure and lifeline?

Structures/Facilities		Seismic code name	Year of last version
Infrastructure	Road	N/A	N/A
	Highway bridge	N/A	N/A
	Bridge	N/A	N/A
	Port facilities	N/A	N/A
	Airport facilities	N/A	N/A
Lifelines	Water supply facilities	N/A	N/A
	Sewage installations	N/A	N/A
	Electric power installations	N/A	N/A
	Gas supply installations	N/A	N/A
	Telecommunications installations	N/A	N/A

Note: If the facility in question consists of several structures, it is necessary to show the seismic code of each structure.

2. In case the seismic code is not available, it could inform the seismic design items for each infrastructure and lifeline as shown below.

Item	Information required
Ground motion	● Ground motion index (e.g. maximum ground acceleration, spectral acceleration, etc.) ● Depth of ground movement (e.g., at the surface, in bedrock, etc.) ● Amplification of ground motion at the surface
Return period of soil movement	● Number of ground motion level (ground motion) ● Return period values
Combination of loads	● Long-term load combination ● Combination of loads for short-term loading ● Load factors used in the above combinations
Limit state	● Number of limit states ● Limit State Definition (e.g., Service Limit, Life Safety, etc.) ● Importance Category of facilities
Design method	● Design stress (e.g. allowable stress, maximum stress) ● Response analysis (e.g., static-linear, static-nonlinear, dynamic-linear, dynamic-nonlinear)

3. If seismic design is not applicable, how is the structure designed?

Until 2011, international standards were used, normally American, then when the R-001 seismic regulation was published, the hazard maps were published and from then on, any work to be carried out must take it into account.

4. Is the effect of ground deformation due to ground movement or other phenomena such as liquefaction in buried structures taken into account in the design? If so, how is it taken into account?

☑ Yes ☐ No

R-024 Regulation for geotechnical studies in buildings takes into consideration

5. If no, what are the main reasons (e.g., but not limited to, not necessary due to soil conditions, etc.)?

6. What, in your opinion, are the seismic design elements that need to be modified, improved or added in the current design standard to make infrastructure and lifelines resilient to future earthquakes?

Not applicable because there is no current design standard for infrastructure and lifelines to be resilient to future earthquakes

Others

7. Did disasters from past seismic events and/or past earthquakes affect the seismic design code and other standards for infrastructure and lifelines? And if so, what were they like?

☐ Yes ☑ No

It does not apply because there is no current design standard for infrastructure and lifelines to be resilient to future earthquakes. Recently there is only available evaluation of safety indexes for hospitals, schools and aqueducts, for which we will have to produce their requirements, without excluding the other aspects such as bridges, dams, docks and ports, among others.

Part 6: Infrastructure and lifeline reinforcement questions

Seismic evaluation of existing facilities/structures

8. Has the seismic assessment of existing infrastructure and lifelines been carried out?

☐ Yes ☑ No

9. If yes, what is the name of the seismic evaluation standard and the year of the latest version for each infrastructure and lifeline?

Structures/Facilities		Name of the seismic evaluation standard	Year of last version
Infrastructure	Road		
	Highway bridge		
	Bridge		
	Port facilities		
	Airport facilities		
Lifelines	Water supply facilities		
	Sewage installations		
	Electric power installations		
	Gas supply installations		

	Telecommunications installations		

Note: If the facility in question consists of several structures, it is necessary to show the seismic evaluation standard for each structure.

10. If no, what are the main reasons (e.g., not limited to, periodic replacement, absence of old structures, failure to recognize the need for evaluation, etc.)?

The non-recognition of the need for evaluation and adequacy as the only guarantee for its preservation.

11. Is the seismic evaluation method for existing infrastructure and lifelines the same as for new construction?

☑ Yes ☐ No

12. If the answer is No, could you please report the items related to seismic evaluation for each infrastructure and lifeline as shown below.

Item	Information required
Soil movement (ground motion)	
Return period of soil movement	
Combination of loads	
Limit state	
Design method	

13. What do you think are the seismic assessment items that need to be modified, improved or added in the current assessment standard to make infrastructure and lifelines resilient to future earthquakes?

Not applicable because there is no current design standard to make infrastructure and lifelines resilient to future earthquakes.

14. Is there a long list and short list seismic assessment for infrastructure and lifelines? If so, how often and how is it reviewed?

No.

Seismic retrofit design for existing facilities/structures

15. Has the seismic strengthening design of infrastructure and lifelines been carried out?

☐ Yes ☑ No

16. If yes, what is the name of the seismic strengthening design standard and the year of the latest version for each infrastructure and lifeline?

Structures/Facilities		Name of the seismic reinforcement design standard	Year of last version
Infrastructure	Road	N/A	N/A
	Highway bridge	N/A	N/A

	Bridge	N/A	N/A
	Port facilities	N/A	N/A
	Airport facilities	N/A	N/A
Lifelines	Water supply facilities	N/A	N/A
	Sewage installations	N/A	N/A
	Electric power installations	N/A	N/A
	Gas supply installations	N/A	N/A
	Telecommunications installations	N/A	N/A

Note: If the facility in question consists of several structures, it is necessary to show the seismic strengthening design standard for each structure.

17. If the answer is no, what are the main reasons (e.g., not limited to, periodic replacement, absence of old structures, absence of economic advantages, etc.)?

The non-recognition of the need for evaluation and adequacy as the only guarantee for its preservation.

18. In case a seismic strengthening design is carried out, what are the specific measures used in the DR?

Structures/Facilities		Reinforcement Measures
Infrastructure	Road	Not applicable
	Highway bridge	Not applicable
	Bridge	Not applicable
	Port facilities	Not applicable
	Airport facilities	Not applicable
Lifelines	Water supply facilities	Not applicable
	Sewage installations	Not applicable
	Electric power installations	Not applicable
	Gas supply installations	Not applicable
	Telecommunications installations	Not applicable

Note: If the facility in question consists of several structures, it is necessary to show the seismic strengthening measures for each structure.

19. What, in your opinion, are the elements that need to be modified, improved or added in the current strengthening design standard to make infrastructure and lifelines resilient to future earthquakes?

Not applicable because there is no reinforcement standard to make infrastructure and

lifelines resilient to future earthquakes.

20. Is there a long and short list of seismic strengthening designs for infrastructure and lifelines? If so, how often and how is it reviewed?

No.

Seismic retrofit construction for existing facilities/structures

21. Has the construction of seismic retrofitting of existing infrastructure and lifelines been carried out?

☐ Yes ☑ No

22. If yes, what is the name of the seismic strengthening construction standard and the year of the latest version for each infrastructure and lifeline?

Structures/Facilities		Name of the construction standard for seismic reinforcement	Year of last version
Infrastructure	Road	N/A	N/A
	Highway bridge	N/A	N/A
	Bridge	N/A	N/A
	Port facilities	N/A	N/A
	Airport facilities	N/A	N/A
Lifelines	Water supply facilities	N/A	N/A
	Sewage installations	N/A	N/A
	Electric power installations	N/A	N/A
	Gas supply installations	N/A	N/A
	Telecommunications installations	N/A	N/A

Note: If the facility in question consists of several structures, it is necessary to show the seismic strengthening construction standard for each structure.

23. If the answer is no, what are the main reasons (e.g., but not limited to, periodic replacement, absence of old structures, lack of economic advantages, lack of necessary technique and/or materials, etc.)?

Lack of awareness, lack of supervision, maintenance and lack of resources as the only guarantee for their preservation.

24. What, in your opinion, are the elements that need to be modified, improved or added in the current seismic strengthening construction standard to make infrastructure and lifelines resilient to future earthquakes?

Not applicable because there is no seismic strengthening construction standard to make infrastructure and lifelines resilient to future earthquakes.

25. **Is there a long and short list of seismic strengthening constructions for existing infrastructure and lifelines? If so, how often and how is it reviewed?**

☐ Yes ☑ No

26. **Is there a budget for seismic strengthening for existing infrastructure and lifelines? If so, how is it ensured?**

☐ Yes ☑ No

27. **What ministries/agencies are responsible for seismic strengthening construction?**

Structures/Facilities		Name of Ministry / Agency
Infrastructure	Road	MOPC
	Highway bridge	MOPC
	Bridge	MOPC
	Port facilities	MOPC
	Airport facilities	MOPC
Lifelines	Water supply facilities	INAPA
	Sewage installations	INAPA
	Electric power installations	CDEEE
	Gas supply installations	MICM
	Telecommunications installations	INDOTEL

Note: If the facility in question consists of several structures, it is necessary to indicate the ministry/agency for each structure.

28. **If any, is it possible to submit example drawings, calculation memories and/or photos of the seismically reinforced infrastructure and lifelines?**

☐ Yes ☑ No

We would also like to ask you to provide us with the following documents;

- Institutional structure (digital version)
- Documents on the budgetary trend (over the past 5 years) in risk management
- Documents showing how the DRR budget has changed over the years.
- Examples of local risk management plans

- Seismic risk assessment results
- Data and photos of the structures of the buildings damaged in the last earthquake.
- Examples of drawings, spreadsheets and/or photos of reinforced building structures.
- Data and photos of infrastructure and lifelines in the past earthquake.
- Examples of drawings, spreadsheets and/or photos of reinforced infrastructure and lifelines

Thank you very much for answering the questions.

JICA information-gathering survey to design and implement an effective knowledge co-creation program for
"Strengthening the capacity for seismic evaluation of buildings in the Dominican Republic."

5

Questionnaire to MOPC

The purpose of this questionnaire is to learn about the current situation and challenges of seismic risk reduction and seismic strengthening of structures. Please enter your answers directly into this text file according to the questions. If the question is not applicable, please enter N/A as the answer. Any documents or materials supporting the answers or providing the sources would also be appreciated. (including URL / source reference).

1. Contents of the questionnaire

Part 1: Respondent information
Part 2: Questions on general measures for earthquake DRR
Part 3: Questions on new construction of public buildings
Part 4: Questions relating to the seismic strengthening of existing public buildings
Part 5: Questions relating to the construction of new infrastructure structures and lifelines
Part 6: Questions relating to seismic strengthening of infrastructure and lifelines

2. Shipping

Deadline: **January 7, 2022**

3. Questionnaire

Part 1: Respondent information

Name	Martha A. Souffront G. /Nestor Matos
Position	Director of Risk and Emergency Management / Director General Directorate Regulations and Systems
Institution	Ministry of Public Works and Communications
Date	January 5, 2022

Part 2: Questions on general measures for earthquake DRR

General questions

1. **What is the role and responsibility of your organization in promoting Disaster Risk Reduction (DRR) and earthquake-resistant design and construction?**

The MOPC is responsible for the establishment and maintenance of adequate land, air and maritime communication networks throughout the national territory, guaranteeing the quality, supervision and oversight of public works in their design and execution.

According to Decree No. 874-09 which approves the Regulations for the Application of Law No.147-02 on Risk Management, the Ministry of Public Works and Communications (MOPC) is assigned the following functions: "The Ministry of Public Works and Communications must carry out and promote the evaluation and reduction of vulnerability in buildings and infrastructure works. In addition, it is responsible for issuing safety standards in the design and construction of buildings and must carry out mobilization and transportation activities, as well as coordination of damage assessment and demolition and cleanup work, in case of disasters".

The MOPC has the role of ensuring good practices in both the formal and informal sectors in terms of design, supervision and construction of civil works in accordance with national and international technical criteria in order to efficiently reduce the risk of disaster of the constructions under its jurisdiction at the national level. This is the reason for the existence of the Directorate of Regulations and Systems of the MOPC, which is responsible for the elaboration of the technical regulations that serve as a basis for the preparation and execution of projects related to engineering, architecture and related branches (See Law 687), in this sense, it establishes the seismic-resistant criteria that projects must meet to ensure the safety of people and infrastructure.

2. **Which organization/department is responsible for seismic resistance of government buildings? If your organization, what is the current status of building seismic resistance and do you have a plan to promote it?**

The mission of the Ministry of Public Works is to manage the public works and communications sector, through the regulation, planning, construction and maintenance of infrastructure, as it relates to public and private buildings.

The MOPC promotes seismic resistance through the dissemination of its regulations, workshops and courses for master builders. To this end, it has the General Directorate of Regulations and Systems, which is in charge of disseminating the technical parameters that govern the practice of construction in the broadest possible sense.

It also has a central plans processing office where it verifies and guarantees that the projects being processed comply with the latest safety and seismic resistance standards.

We also have the department of design and calculation and the direction of supervision and control of both public and private works in which we ensure that our constructions are carried out in accordance with these construction protocols.

Formal buildings in the private sector must have a construction license issued by the office in charge of the processing of plans, which guarantees that their design complies with the seismic-resistant regulations in force in the country, as well as the official inspections established during the construction process.

It should be noted that, as of 2021, the regulation and construction of private and governmental buildings will become part of the Ministry of Housing, Habitat and Buildings, formerly INVI (Law 160-21).
On the other hand, the National Office of Seismic Evaluation and Vulnerability of Infrastructures and Buildings (ONESVIE), created by decree 715-01, is responsible for the seismic evaluation and vulnerability of existing infrastructures and buildings in the Dominican Republic.

3. What do you think are the main challenges of the application system (available technologies and capacity) for seismic-resistant design and construction?

We consider that we have good professionals in the area of seismic-resistant design, however, we have deficiencies in terms of supervision and oversight, which guarantee that the constructions are carried out according to their design. In addition, the agencies that verify the application of technical regulations should be strengthened in quantity and capacity, offering the required working conditions to maintain a high level of specialized personnel, both in design and construction.

In the case of seismic-resistant construction technologies, in the DR we have little experience in the installation of seismic-resistant construction elements such as: base isolators, seismic dissipators, seismic-resistant dampers, etc., in our buildings.

A serious challenge would be to increase investment in the required seismic-resistant technology (equipment and software) for which it is necessary to create awareness at all levels that this is an investment and not an expense.)

Another important challenge is to work continuously on raising public awareness and disseminating our regulations, roles and scope as a Ministry, so that more and more constructions are built with the necessary technical criteria and that informal constructions use the appropriate parameters to mitigate the seismic risks that may arise due to bad practices and lack of knowledge of the current seismic resistance standards for buildings in general.

Risk assessment questions

4. Has a seismic hazard map showing the seismic intensity distribution of potential earthquakes been developed?

Yes. In 2012, within the framework of the Disaster Prevention and Risk Management project carried out with the financial support of the Inter-American Development Bank (IDB), the CAPRA (Comprehensive Approach for Probabilistic Risk Assessment) project was developed. In this project, a compendium of maps and natural risks was prepared using a probabilistic calculation methodology.

The MOPC, with IDB support, implemented a tool called Blue Spot.
in which earthquakes, floods and other hazards are modeled for different return periods, in order to prioritize road interventions in the face of disasters and climate variability in the most vulnerable areas, as well as to establish alternate routes in case of possible interruptions.

5. What organization is conducting the seismic risk assessment, including damage estimation?

There is no institution that carries out seismic risk assessment. There are institutions that

independently analyze risk factors, such as:

ONESVIE, whose mission is to evaluate the seismic capacity of existing buildings and infrastructure, prepare diagnoses and proposals for reinforcement or demolition, and ensure that these are carried out. Advise the different public and private institutions of the country that are involved in the design and construction of civil engineering works. Collaborate with the National Emergency Commission (CNE) in making decisions regarding the safety and use of affected buildings after a major seismic event. Collaborate with the updating and dissemination of seismic regulations in the Dominican Republic.

The National Geological Service (SGN), which is responsible for generating national geological knowledge, storing, updating and disseminating it for the welfare of society, as well as knowing the geological heritage of the country, which is a right and an obligation of the State.

National Center of Seismology, It is in charge of registering and reporting earthquakes that occur in the national territory and its surroundings.

National Geographic Institute, whose function is to regulate, produce and manage policies, information and actions in the areas of geography, cartography and geodesy, to support planning processes, environmental protection and risk management.

The Ministry of Economy, Planning and Development prepared a National Plan for Seismic Risk Management of the Dominican Republic and a Guide for the Construction of Safe Schools and Prototype Models (2012).

6. What criteria (e.g. seismic scenario, population and building information) are used for risk assessment?

In 2012, a probabilistic disaster risk analysis was carried out in the Dominican Republic using the CAPRA platform.

For the hazard assessment, the frequency of occurrence and severity of natural phenomena were analyzed. Taking into account the geographical characteristics of the environment.

The exposed infrastructures and the degree of occupancy were identified.

For the characterization of vulnerability, vulnerability functions were generated that relate the level of damage expected in each construction model in relation to the intensity of the hazard.

Then, with these three variables analyzed, a probabilistic risk analysis model of expected losses was developed for the analysis zones.

It should be noted that these probabilistic analyses have uncertainties due to the lack of information and the considerations made in the evaluation.

For the evaluation of seismic risk in structures, ONESVIE makes a quick visual evaluation and, if necessary, a more detailed evaluation is carried out in which the following steps are followed:

1) Architectural and Structural Survey. Verification of structural elements by means of scanning and preparation of drawings.
2) Destructive testing: sampling of concrete slabs, beams, columns and walls in the building. Non-destructive testing, in order to verify the reinforcement of reinforced concrete structural elements. For the study of the behavior of materials as input in the

structural analysis of the building.

3) Structural Calculation and Design for the evaluation of resistance under static loads and Seismic Vulnerability (Interpretation, analysis and creation of the mathematical model of the buildings, taking into account the technical condition, the results of the scanning and the resistance tests of the witnesses; evaluation of the static and dynamic response of the supporting elements, determination of the degree of structural vulnerability of the building from the result of the evaluation).
4) Definition and Proposal of Reinforcement Solutions where necessary, previously identified in the Seismic Vulnerability Assessment (Analysis of the results of the structural vulnerability assessment, proposal of reinforcement measures with the objective of improving the structural behavior, taking into account the construction materials, architectural design and real conditions for their correct application).

7. Are the results of seismic hazard maps and earthquake damage estimates used to identify priority areas for countermeasures, to promote seismic strengthening, to regulate land use and/or to raise public awareness of earthquakes and their risk?

The isoacceleration maps are taken into account for the design of buildings, by regulating the height, use and structural design according to the zone in which they are located, with the limitations applicable according to the provisions of R-001 and other regulations.

8. Are risk assessments also conducted by local governments? If so, what is the difference in roles between national and local governments?

No, our mayors' offices have risk management and urban planning offices, but the identification and classification of disaster risk areas is done with the support of the central government, since the mayors' offices have limited technical, economic and logistical resources to evaluate such risks.

Others

9. What kind of support has been received from other donors in the field of seismic risk reduction? What were the results of their support/activities?

In the area of regulations, with the support of the World Bank, a seismic code was prepared, updating existing building regulations and creating others that did not exist, according to the report:

1. Elaboration of the current DR seismic code: R-001, Regulation for the analysis and seismic design of structures (Decree No.201-11).
2. Structural design regulations for buildings:
    - R-027, Regulation for the design and construction of structural masonry buildings (Decree No. 280-07).
    - R-028, Regulation for the design, fabrication and erection of steel structures (Decree No. 436-07).
    - R-029, Regulation for the design and construction of structural wood buildings (Decree No. 677-09).
    - R-033, Regulation for the design and construction of reinforced concrete structures (Decree No. 50-12).

Subsequently, starting in 2020, with the support of the IDB, the following has been taking place:

- Updating of the Regulations for the Seismic Analysis and Design of Structures, in process, projected to be completed in 2022.
- Preparation of a Preliminary Draft Regulation for Bridges and Preliminary Draft Modifications to the Highway Regulations, which have already been prepared

and are in the process of being validated by professionals in the area.

In 2012, the National Plan for Seismic Risk Reduction in the Dominican Republic was developed under the coordination of the General Directorate of Territorial Planning and Development (DGODT) with the technical and financial support of the United Nations Development Program (UNDP). It represents a tool for coordinating the actions of the agencies that make up the National Risk Management System, from the public and private sectors, to generate the institutional synergies necessary for the development of specific programs and projects related to the reduction of seismic risk in the territory.

10. As mentioned on the first page, JICA is planning to conduct a training program on earthquake resistance in your country. Is there a Japanese system, policy or technology that you are interested in or what kind of training would you like to receive? Please also explain the reasons.

We would like your support in:

- Training in seismic-resistant analysis and design, energy control and base isolation, technology for evaluation and reinforcement, materials testing and disaster risk reduction policy.
- Jointly develop a methodology for the evaluation, prevention and mitigation of seismic risks in the DR. Our country has a high threat to seismic risk.
- Management of state-of-the-art technologies for evaluation, prevention and mitigation of seismic risks in infrastructures and in the use and management of different technologies to develop seismic-resistant constructions.
- Establishment of a methodology for effective supervision and oversight of road works throughout the country to ensure the quality of the works.

Part 3: Questions on the construction of new buildings

General inquiry

11. Which organization is responsible for the construction of the following facilities?

Structures/Facilities		Responsible organization
Buildings	Government office buildings	Ministry of Housing, Habitat and Buildings (MIVHE). Until 2021 they were the MOPC and the OISOE, which no longer exists).
	Public hospitals	MIVHE in coordination with the Ministry of Public Health
	Public schools	MIVHE and in coordination with the Ministry of Education, (formerly the MOPC, which will continue to be in charge of school projects that began before August 2021, until completion).

Evacuation centers (if not schools)	MIVHE and Private Sector

12. Can the seismic performance of each public building to be constructed be assured?

☐ Yes ☑ Partially / Not fully sufficient ☐ No

13. If not sufficient or not, what are the potential challenges or bottlenecks (e.g., but not limited to, seismic design, construction management, maintenance procedure, etc.) and for which facilities/structures?

Optimize supervision in the construction process and control of construction materials.

14. Has ensuring the seismic performance of new buildings been prioritized in seismic risk mitigation policies?

☑ Yes ☐ No

15. If no, what are the main reasons (e.g., among others, that it is less important than other disasters such as floods, low frequency of earthquakes, budget limit, that it is more important to reinforce existing facilities, etc.) and for which facilities/structures?

Planning questions

16. What is the central government's budgeting process and its legal basis for the construction of public buildings?

The formulation of the general state budget is based on the National Development Strategy, the National Multi-year Public Sector Plan and the Institutional Strategic Plans.

It is governed by the following legal framework:

1) Law The Constitution of the Republic, Articles 233 and 240,
2) Organic Budget Law for the Public Sector, No. 423-06,
3) General State Budget Law, N0.237-20, and the
4) Law that creates the Secretariat of State of Economy, Planning and Development, No. 496-06.

17. What is the local government budgeting process and its legal basis for the construction of public buildings?

The formulation of the local administration budget is based on the provincial development plans.

It is governed by the following legal framework:

1) Law that creates the Secretariat of State of Economy, Planning and Development, No. 496-06.
2) Law of the National District and Municipalities, No. 176-07.

18. What is the audit system and its legal basis for proper project execution?

It regulates the internal control of public funds and resources and of institutional public management and its interrelation with the responsibility for public function, external control, political control and social control; and it establishes the institutional attributions and duties in this area.

Scope of application: Central government, decentralized and autonomous institutions, public social security institutions, public companies with majority state participation and municipalities and the National District.

1) Law that institutes the National System of Internal Control and the Office of the Comptroller General of the Republic, No. 10-07.

19. For the moment, we recognize that only the application of R-001 to buildings has been confirmed. Is there any other standard that integrates the structural analysis methods used in seismic design? If so, what are they, is it a stress-based, displacement-based or hybrid standard?

No, R-001 is only being applied with regard to seismic analysis.
In the Design part, the Design Regulations of the structural area (Reinforced Concrete, Structural Masonry, Structural Timber and Steel Structures) are applied.
In cases not covered by Dominican regulations, internationally recognized regulations or standards, such as ASCE and ACI, are used.

20. Is there a law or system by which the local government can receive financial assistance from the central government for the construction of public buildings? If yes, describe the system.

☑ Yes ☐ No

Law of the National District and Municipalities, No. 176-07.

21. Is there sufficient technical staff specialized in structural engineering in the Ministry responsible for the construction of public buildings?

☐ Yes ☑ No

22. Is there a system in place to ensure compliance with seismic code enforcement? If yes, describe the system.

☑ Yes ☐ No

In the design part. - In the case of State works, the General Directorate of Buildings, through the corresponding Structural Design Department, carries out the structural design according to the indications of the regulations in force. In the case of private works, compliance is verified at the Plans Processing Office.

On the construction side. - The Supervision and Oversight Department monitors the construction process to ensure compliance with regulations and good engineering practices; and in the case of private works, this monitoring is done by the Department of Construction Inspection. Both currently belong to the MIVHED.

However, it should be noted that the seismic code is not faithfully enforced, since there is a lack of resources for supervision and oversight to ensure that informal constructions comply with the code.

Design questions

23. What is the execution procedure of a project? A flow chart is preferable.

The following is the procedure that has been followed by the MOPC, which may be adjusted by the MIVHED in the future:

- The corresponding ministry (schools, health facilities, offices, etc.) conducts a feasibility study to propose the type and magnitude of a project, based on a survey of the needs of the communities.
- Once the project is approved, the MIVHED will be responsible for the architectural design through the corresponding Design Department, according to the guidelines of the ministry requesting the building, which must give its approval.
- With the design completed, the contracting process proceeds, as determined.
- The Contractor in charge of the project must first carry out a soil study by a laboratory qualified by the MIVHED.
- With the soil survey, the Structural Design Department will perform the structural design based on the ground conditions survey and the results of the geotechnical study.
- Once everything related to the design has been completed, the work begins.
- The execution process is supervised by the Supervision and Control Directorate.

In case of private works:

- Elaboration of the architectural design and project plans.
- The projects go through the city council for land use approval.
- Submit to the Ministry of Tourism.
- Submit to the Ministry of Environment.
- Submit to the Ministry of Public Works and Communications, where the structural, sanitary, electrical and architectural aspects are reviewed. If the project is for tourism, it goes to Muelles y Puertos del MOPC.
- If the projects are tourist or large scale they must be approved by the National Institute of Potable Water and Sewage (INAPA) and if they are located in the metropolitan area by the Corporation of Aqueduct and Sewage (INAPA), they must also go through the Ministries of Tourism and Environment and Natural Resources.

24. What is the seismic performance requirement of public building constructions and their quality management, e.g., self-testing and third party inspection?

Public buildings must remain operational immediately after the seismic event (essential structures).
For quality management, the seismic analysis and design of the project is reviewed in the Design and Calculation Department to verify that it complies with regulations. Likewise, the construction process is executed under the supervision of the Supervision and Control Department.

25. Could you please inform us of the annual budget allocation for new construction/design projects for each public building?

Through the National Public Budget

26. Has the guideline/manual for seismic design been developed? If so, how is it used?

☑ Yes ☐ No

Regulation for the analysis and seismic design of structures (R-001), aimed at buildings, and which must be complied with in all projects in the national territory, is used in the

professional practice of civil engineers as an indispensable requirement to be able to practice legally before the state offices that ensure compliance with their technical regulations.

Likewise, the Bridge Regulations, which include seismic provisions, are currently being drafted.

27. Are there standard design plans or prototypes for public buildings? If so, how are they used?

☑ Yes ☐ No

There are design models which must be adapted to the particular characteristics of each site according to its function and use, these require technical analysis taking into account the protocols and standards in force that guarantee the integrity of the buildings for public use.

In the case of schools and hospitals, several standard designs were made to be used according to the needs and existing conditions, through the Structural Design Department. These models are selected and adjusted according to the type of soil, the location in zone 1 or zone 2, the proximity to the near-field of the fault and the particular conditions of each project.

28. Are there enough technical personnel specialized in structural engineering in the department that supervises each public building construction?

☐ Yes ☑ No

29. Which organization performs the structural design of the following facilities?

Structures/Facilities		Organization
Infrastructure	Government office buildings	MIVHE, until 2021 were the MOPC and the OISOE.
	Public hospitals	MIVHE, in coordination with the Ministry of Public Health and formerly the OISOE.
	Public schools	MIVHE, in coordination with the Ministry of Education; (previously it was the MOPC, which will continue to be in charge of school projects that began before August 2021, until completion).
	Evacuation centers (if not schools)	MIVHE

30. Is there a qualification system for architects and structural engineers? If yes, please describe the system.

☑ Yes ☐ No

This qualification process does not exist in general.
At present, the following specific qualification processes are being carried out in this General Directorate of Regulations and Systems of the MOPC (based on the evaluation of the studies acquired and the demonstrable experience of the evaluated professional):

- Companies and Professionals in Structural (*) Evaluation and Surveying.
- Companies and professionals in geotechnical studies and laboratories suitable for testing.

(*) For the moment, not all the professionals in the structural area are qualified, only those related to the structural survey and evaluation works.

It should be noted that civil engineers must have a license for the programs used for structural design.

31. Is there a consultant registration system? If yes, please describe the system.

☐ Yes ☑ No

There is no general registry; but, as indicated in the previous numeral, a registry is kept of professionals and companies qualified to perform structural evaluations and surveys, as well as in the geotechnical area (published on the MOPC web page). This does not cover all professionals in the structural area; only those indicated above.

32. Are there technical associations specialized in the design and construction of structures? If so, what are their names, activities and functions?

☑ Yes ☐ No

Apart from the state agencies with this responsibility within the different ministries, there is the Dominican Society of Seismology and Earthquake Engineering (SODOSISMICA), which is an academic, non-profit association.

Questions about the construction of public buildings

33. Is there a quality management system for design and construction? If yes, describe the system.

☑ Yes ☐ No

In the design part. - In the case of State works, the General Directorate of Buildings, through the corresponding Structural Calculation Department, prepares the structural design based on soil studies, following the guidelines of the regulations. In the case of private works, compliance is verified at the Plans Processing Office.
In the construction area, the Supervision and Oversight Department monitors the construction process to ensure compliance with regulations and good engineering practices; and in the case of private works, this monitoring is carried out by the Department of Construction Inspection. Both currently belong to the MIVHED.
During the construction process, a company must be contracted to verify the quality of the concrete used on site, through sampling by taking samples.

34. Is there a system of third-party review and inspection in place? If yes, describe the system.

☐ Yes ☑ No

35. How is construction supervision carried out and are there internal regulations?

The Regulations and Systems Department coordinated the officialization of the Regulations

for the Supervision and General Inspection of Works, R-004, which regulates the supervision and inspection of building and road works.

The manner in which this is done in the case of private buildings is as follows:

- The user obtains a construction license.
- Prior to each pouring, the user requests the inspection from the Private Works Inspection Department. The part of the continuous and general supervision is contracted by the Owner, the State is basically in charge of the inspection in stages.
- The inspection is carried out and a form is filled out and a report is issued approving or rejecting the casting.
- At the conclusion of all construction stages, the user requests the final inspection, where the use of the building is authorized or not.

The manner in which this is done in the case of public buildings is as follows:

- Once the work has been approved and contracted, the Ministry issues the Letter of Commencement authorizing the Contractor to begin the construction process.
- The different stages of the work are carried out under the supervision of the Ministry.
- Once the work is completed, the final inspection is performed, and the building is authorized for use and a construction defects policy is issued.

36. Has the construction supervision guideline/manual been developed? If so, how is it used?

☑ Yes ☐ No

The Regulation for the General Supervision and Inspection of Works, R-004, which regulates the supervision and inspection of building and road works, was made official.

In addition, there are protocols that serve as a guide for the state inspection process, developed by this Directorate of Regulations and Systems, and applied by the Department of Construction Inspection of Santo Domingo, under the competence of the MIVHED. These protocols establish in an orderly manner all the parameters that must be reviewed by the inspector depending on the stage of the project and the type of structure.

37. Are the seismic design code and related manuals and guidelines reviewed periodically? If so, how often and how are they reviewed?

☐ Yes ☑ No

There is no established periodicity. The first code was prepared as provisional recommendations in 1979, and was updated in 2011, under Decree No. 201-11. It is currently being updated.
In general, for the revision of any regulation, a Preliminary Draft of modification is prepared, which may be in charge of the ministry itself or any state or private sector agency; after which it is submitted to a specialized technical committee for review. Subsequently, it is placed in Public Hearings through newspapers of national circulation, to finally submit it to the Commission established by Law for its approval (which is formed by all the ministries and state agencies related to the regulated subject). Once these steps have been completed, the draft regulation is sent to the Executive Power, which will be in charge of its officialization.

38. Are there systems of practical training (within the institution) or training in academic institutions

for capacity building of designers [1]and construction management?

The internship is required by law for the issuance of the exequatur of professionals, which authorizes them to practice the career.

Apart from the professional training of degree and masters in universities, there are institutions that offer technical courses of interest such as CODIA. Similarly, companies that commercialize a product or system, such as ADOCEM, CEMEX, etc., offer courses on specific topics of interest to them.

Within the Regulations and Systems Directorate there is a Dissemination and Training department that provides courses on current regulations upon request of interested parties.

There is training for master builders

[1] Architects, structural, sanitary, electrical, etc.

Part 4: Questions relating to the promotion of seismic strengthening of existing public buildings.

General questions

1. **Is seismic retrofitting of existing public buildings progressing?**

☐ Yes ☑ Partially / Not fully sufficient ☐ No

2. **If not enough or not, what are the potential challenges or bottlenecks (e.g., but not limited to, regulation, policy, budget, technology and human resources, etc.)?**

For the reinforcement of existing public buildings, the ONESVIE (National Office of Seismic Evaluation and Vulnerability of Infrastructure and Buildings) was created under Decree 715-01, which is in charge of examining the existing structures to prepare a diagnosis and a reinforcement project, so we understand that this entity should be consulted on this issue, to have well-documented answers on the current state.

On the other hand, we understand that, although there have been projects in this sense to improve existing buildings, more state buildings should be included in this effort. This is a budgetary issue in which human and technological resources should be made available for these purposes.

3. **Has improving the seismic performance of existing public buildings been prioritized?**

☑ Yes ☐ No

4. **If the answer is no, what are the main reasons (e.g., but not limited to, building inventory, risk assessment, coordination between ministries, etc.)?**

Assessments and reinforcements have been made, but this action can be extended to cover more buildings. Consult ONESVIE for more details.

5. **Current status of seismic retrofitting and reconstruction of existing public buildings. Regarding the implementation of Seismic Assessment and Seismic Strengthening, please provide the proportion or number**

Installation / Structure	Owner Ministry / Department	Total number of facilities	Reinforcement Plan	Seismic evaluation			Seismic strengthening		
				Total number of target structures	Number of buildings evaluated	Percentage of buildings evaluated	Total number of target structures	No. of reinforced structures	Percentage of structures reinforced
Government buildings						%			%
Public hospitals						%			%
Public schools						%			%
Assessment centers (if other than schools)						%			%

6. **Is there a special law or regulation to promote seismic strengthening of public buildings? If yes,**

please specify the name.

☑ Yes ☐ No

The National Plan for Seismic Risk Reduction is understood as a set of political and technical guidelines aimed at providing strategic orientations to authorities, institutions at different territorial levels and civil society in general, to reduce risk factors in the face of seismic hazards and promote the improvement of response and recovery capacities, as well as the resilience of communities that may be affected by this type of event.

The National Comprehensive Disaster Risk Management Plan proposes in programmatic line 2 (Strengthen the reduction and anticipation of risk factors) of the indicative implementation matrix, specifically in program 2.2, to incorporate risk reduction criteria and strengthen preventive maintenance programs in vital infrastructure.

7. **If the answer to the previous question is no, is there any law or regulation that refers to the promotion of seismic strengthening of public buildings? If yes, please specify the name.**

☐ Yes ☐ No

8. **Does the national DRR plan and/or the ministerial DRR plan include content related to the promotion of seismic strengthening of public buildings? If yes, please specify the name.**

☑ Yes ☐ No

2011 National Plan for Integral Disaster Risk Management and the 2011 National Plan for Seismic Risk Reduction.

9. **Are there any public buildings that have been prioritized for seismic strengthening? If so, what are the prioritization criteria?**

☐ Yes ☑ No

10. **Do ministries or other relevant organizations have a planning plan for seismic strengthening of public buildings?**

No

11. **What is the budgeting process for the execution of a seismic strengthening project?**

12. **Is there a law or regulation for central and/or local government seismic strengthening grants?**

13. **Is there a system in place to validate the realization/achievement of projects from an economic/efficiency standpoint? If yes, please describe the system.**

14. Have seismic vulnerability assessment and seismic strengthening standards been developed for each type of public building? If yes, specify the name of the standard for each facility.

☐ Yes ☑ No

No, in this regard we only have the following documents:

"Requirements for structural evaluation of existing buildings or buildings started for the purpose of processing plans to obtain a construction license". - which is a document that serves as a guide in the structural evaluation and survey process.

Questions on the design of public buildings

15. Does the ministry or other relevant organization have a seismic strengthening implementation plan for public buildings? If yes, please specify the name.

☐ Yes ☑ No

Please consult with ONESVIE.

16. What is the procedure/execution flow of a seismic strengthening project?

Please consult with ONESVIE.

17. Is there a mandatory standard (design and construction) for seismic strengthening?

Please consult with ONESVIE.

18. What are the seismic performance and quality management (self-monitoring and third-party inspection) requirements for seismic strengthening?

Please consult with ONESVIE.

19. In the absence of national standards, what type of seismic evaluation and strengthening standards will be used for seismic strengthening of public buildings?

Please consult with ONESVIE.

20. Has the seismic vulnerability assessment and seismic strengthening guideline/manual been developed? If so, how is it used?

Seismic vulnerability assessment: ☐ Yes ☐ No

Seismic strengthening: ☐ Yes ☐ No

Please consult with ONESVIE.

21. Is there sufficient technical staff specialized in structural engineering in the department in charge of seismic strengthening projects?

☐ Yes ☑ No

Please consult with ONESVIE.

☐ Yes ☐ No

Questions about the construction of public buildings

22. Is there a quality management system for seismic evaluations and seismic strengthening? If yes, describe the system.

☐ Yes ☐ No

Please consult with ONESVIE.

23. Is there a seismic strengthening method that is difficult to apply? Is new technology needed?

☐ Yes ☐ No

Please consult with ONESVIE.

24. Is there a system to ensure seismic performance and maintain construction quality?

☐ Yes ☐ No

Please consult with ONESVIE.

25. Has the construction management guideline/manual for seismic strengthening been created and maintained? If so, how is it used?

☐ Yes ☐ No

Please consult with ONESVIE.

26. If seismic vulnerability assessment and seismic strengthening standards, manuals, and guidelines exist, are they periodically reviewed? If so, how often and how are they reviewed? Could you summarize the system?

No local standards Please consult with ONESVIE.

Part 5: Questions related to the construction of new infrastructure and lifelines

General inquiry

1. Which organization is responsible for the construction of the following facilities?

Structures/Facilities		Responsible organization
Infrastructure	Road	Ministry of Public Works and Communications (MOPC)
	Highway bridge	Ministry of Public Works and Communications (MOPC)
	Bridge	Ministry of Public Works and Communications (MOPC)
	Port facilities	Ministry of Public Works and Communications (MOPC)/APORDOM
	Airport facilities	Ministry of Public Works and Communications (MOPC)/IDAC
Lifelines	Water supply facilities	Instituto Nacional de Agua Potable y Alcantarillados (INAPA) and the Corporaciones de Acueductos y Alcantarillados in the cities such as: In Santo Domingo the Corporacion de Acueductos y Alcantarillados de Santo Domingo (CAASD), Corporacion de Acueductos y Alcantarillados de Santiago (CORAASAN), Corporacion de Acueductos y Alcantarillados de Boca Chica (CORAABO), in Puerto Plata (COAAPLATA), among others. and the Ministry of Public Works and Communications (MOPC) in the part related to the programming and inspection of the excavation process of the public roads.
	Sewage installations	Instituto Nacional de Agua Potable y Alcantarillados (INAPA) and the Corporaciones de Acueductos y Alcantarillados in the cities such as: In Santo Domingo the Corporación de Acueductos y Alcantarillados de Santo Domingo (CAASD), Corporacion de Acueductos y Alcantarillados de Santiago (CORAASAN), Corporacion de Acueductos y Alcantarillados de Boca Chica (CORAABO), in Puerto Plata (COAAPLATA), among others. and the Ministry of Public Works and Communications (MOPC) in the part related to the programming and inspection of the excavation process of the public roads.
	Electric power installations	MOPC/State and Private Electricity Companies
	Gas supply installations	Ministry of Energy and Mines and the Ministry of Public Works and Communications (MOPC) in the part related to the programming and inspection of the excavation process of public roads.
	Telecommunications installations	Private telephone companies/INDOTEL /Industry and commerce

Note: If the installation in question consists of several structures, it is necessary to indicate the organization responsible for each structure.

2. Can the seismic performance of each of the new or to-be-built infrastructure and lifelines be assured?

☐ Yes ☑ Partially / Not fully sufficient ☑ No

3. If not sufficient or not, what are the potential challenges or bottlenecks (e.g., but not limited to, seismic design, construction management, maintenance procedure, etc.) and for which facilities/structures?

In the road and bridge part, the seismic demands applied in the structural designs of the projects are taken into account through the Bridge Design Department, where they are also considered according to AASHTO and ACI guidelines.

4. Has ensuring the seismic performance of new infrastructure and lifelines been prioritized for seismic risk mitigation policies?

☑ Yes ☐ No

5. **If no, what are the main reasons (e.g., among others, that it is less important than other disasters such as floods, low frequency of earthquakes, budget limit, that it is more important to reinforce existing facilities, etc.) and for which facilities/structures?**

International standards have been used as a reference for the design of bridges.

Planning questions

6. **What is the central government's budgeting process and its legal basis for the construction of each infrastructure and lifeline?**

Each institution submits its institutional plans to the executive branch and, based on this information, the national budget is prepared.

7. **What is the local government budgeting process and its legal basis for the construction of each infrastructure and lifeline?**

8. **What is the audit system and its legal basis for proper project execution?**

The Supervision and Oversight Department monitors the execution of the work to ensure that it is carried out in accordance with the approved project.

For payment purposes, the Supervision and Control Directorate prepares the cubicle approved by internal control and subsequently by the audit department of the Comptroller General of the Republic.

On the other hand, the Chamber of Accounts, which is an autonomous agency, has the power to intervene in any project under execution or after its completion, to check that the accounting processes were followed according to the contract and legal basis.

Legal basis:
Internal Control and Comptroller's Law, No. 10-07

9. **What is the seismic code name and year of the latest version for each infrastructure and lifeline?**

There is no specific seismic code for these infrastructures and lifelines. Only Regulation R-001, for the Seismic Analysis and Design of Structures, is available, which basically establishes the minimum criteria for determining seismic forces through isoacceleration maps, according to the corresponding hazard level.

Structures/Facilities		Seismic code name	Year of last version
Infrastructure	Road		
	Highway bridge		
	Bridge		
	Port facilities		
	Airport facilities		

Lifelines	Water supply facilities		
	Sewage installations		
	Electric power installations		
	Gas supply installations		
	Telecommunications installations		

Note: If the facility in question consists of several structures, it is necessary to show the seismic code of each structure.

10. Is there a law or a system that allows the local government to obtain financial assistance from the central government for the construction of infrastructure and lifelines? If yes, describe the system.

☑ Yes ☐ No

Budget Law, No. 423-06
Law of the Municipalities and the National District N0.176-07

11. Is there sufficient technical staff specialized in structural engineering in the ministry responsible for the construction of infrastructure and lifelines?

☐ Yes ☑ No

12. Is the importance of seismic design based on the latest seismic code generally recognized?

☑ Yes ☐ No

13. Is there a system in place to ensure compliance with seismic code enforcement? If yes, describe the system.

☑ Yes ☐ No

The Design is performed by a structural technician from the Bridge Design Department and is submitted for review by another technician who was not involved in the initial process. In the event that the design is performed by an outside firm, an internal review is performed for approval purposes.

If the projects are not designed under this code, a building permit is not issued.

Design questions

14. What is the execution procedure of a project? A flow chart is preferable.

Once the design has been approved and the budget has been prepared, the project is contracted, which is then supervised and audited by the General Directorate of Construction Supervision and Oversight:

Approval - Design - Budget - Contracting - Progress and start of construction - Supervision and supervision (construction process) - Pre-construction - Final acceptance with hidden defects policy.

15. Is there a mandatory standard for design and construction? If so, does it need to be updated?

☑ Yes ☐ No

16. What is the seismic performance requirement for infrastructure and lifelines and quality management, e.g., self-testing and third party inspection?

Road infrastructures must remain operational immediately after the seismic event.

For quality management, the project design is carried out or reviewed by the Road Infrastructure Studies and Design Department and the Bridge Department to verify that it complies with regulations.
Likewise, the construction process is carried out under the supervision of the Supervision and Control Directorate.

17. Has the guideline/manual for seismic design been developed? If so, how is it used?

☑ Yes ☐ No

In the area of highways, there are regulations that regulate design in general, not specifically focused on seismic issues. These regulations are required to the designers through the General Directorate of Study, Design and Budget of Road Infrastructure.
In the area of bridges, a Preliminary Draft of Regulations was prepared with the collaboration of the IDB, and is in the process of being reviewed by specialist engineers from the Bridge Department.

18. Are there standard design drawings or prototypes for infrastructure and lifelines? If so, how are they used?

☐ Yes ☑ No

19. Is there sufficient technical staff specialized in structural engineering in the department supervising the construction of each infrastructure and lifeline?

☐ Yes ☑ No

20. Which organization performs the structural design of the following facilities?

Structures/Facilities		Organization
Infrastructure	Road	MOPC, Department of Study and Design of Road Projects
	Highway bridge	MOPC, Department of Study and Design of Bridges
	Bridge	MOPC, Department of Study and Design of Bridges
	Port facilities	MOPC, Department of Docks and Ports
	Airport facilities	MOPC/AERODOM/Civil Aeronautics
Lifelines	Water supply facilities	INAPA, CAASD, CORAASAN, CORABO, CORAPLATA, CORAAROM, AND OTHER CORAS
	Sewage installations	INAPA, CAASD, CORAASAN, CORABO, CORAPLATA, CORAAROM, AND OTHER CORAS
	Electric power installations	MOPC, STATE-OWNED ELECTRIC COMPANIES
	Gas supply installations	Industry and Commerce
	Telecommunications installations	INDOTEL AND PRIVATE TELEPHONE COMPANIES

Note: If the facility in question consists of several structures, it is necessary to show the organization of the structural design of each structure.

Questions relating to the construction of infrastructure structures and lifelines

21. Is there a quality management system for design and construction? If yes, describe the system.

☑ Yes ☐ No

In any case, the State supervises the construction process through the Supervision and Oversight Directorate, either directly or through companies contracted for this purpose.

22. Is there a system of third-party review and inspection in place? If yes, describe the system.

☑ Yes ☐ No

In the case of large projects, private firms are contracted. In these cases, the MOPC's Supervision and Oversight Office monitors the contracted companies.

23. How is construction supervision carried out and are there internal regulations?

For these purposes, specialized private firms are contracted and technical personnel from the Ministry are assigned to follow up on the process, using as a guide the General Specifications Regulations for Road Construction, R-014, and the Regulations for the Supervision and General Inspection of Works, R-004.

24. Has the construction supervision guideline/manual been developed? If so, how is it used?

☑ Yes ☐ No

The General Specifications Regulations for Road Construction, R-014, are in the process of being updated.

Regulations for the Supervision and General Inspection of Works.

An interdepartmental committee is formed with each area involved.

25. Are the seismic design code and related manuals and guidelines reviewed periodically? If so, how often and how are they reviewed?

☐ Yes ☑ No

No, the current Regulations were drafted in 1985, and are being updated under an IDB project, the preliminary draft of which was completed in 2021, and is currently under review by professionals in the area.

Part 6: Questions relating to the promotion of seismic strengthening of existing public buildings.

General questions

1. Is seismic retrofitting of existing infrastructure and lifelines progressing?

☐ Yes ☑ Partially / Not fully sufficient ☐ No

2. If not enough or not, what are the potential challenges or bottlenecks (e.g., but not limited to, regulation, policy, budget, technology and human resources, etc.)?

In general, the seismic design of bridges is taken care of from the beginning. In the case of existing structures, there is no generalized logistics established for structural review, although maintenance is performed on the bridges and any signs of problems are reported for correction.

3. Has priority been given to improving the seismic performance of existing infrastructure and lifelines?

☐ Yes ☑ No

4. If the answer is no, what are the main reasons (e.g., but not limited to, building inventory, risk assessment, coordination between ministries, etc.)?

In the case of road infrastructure, the effort has been more focused on new projects.

In the case of lifelines, this is the responsibility of each company.

Based on reports from the Maintenance Department, according to logistics and established protocol.

5. Current status of seismic strengthening and reconstruction of infrastructure and lifelines. As for the application of seismic vulnerability assessment and seismic strengthening, it is available to fill in the number or ratio.

There is no reinforcement plan in place.

Installation / Structure	Owner Ministry / Department	Total number of facilities	Reinforcement Plan	Seismic evaluation			Seismic strengthening		
				Total number of target structures	Number of buildings evaluated	Percentage of buildings evaluated	Total number of target structures	No. of reinforced structures	Percentage of structures reinforced
Road						%			%
Highway bridge						%			%
Bridge						%			%
Port facilities						%			%
Airport facilities						%			%
Water supply facilities						%			%
Sewage installations						%			%
Electric power installations						%			%
Gas supply installations						%			%
Telecommunications installations						%			%

Note: If the facility in question consists of several structures, it is necessary to show the seismic code of each structure.
A quantity of facilities can be placed by number, total length or other appropriate indices.

Planning questions

6. Is there a special law or regulation to promote seismic strengthening? If yes, please specify the name.

☑ Yes ☐ No

National Disaster Risk Reduction Plan
National Plan for Seismic Risk Reduction

Institutional Plan for Disaster Risk Management

7. **If the answer to the previous question is no, is there any law or regulation that refers to the promotion of seismic strengthening? If yes, please specify the name.**

☐ Yes ☐ No

8. **Does the national DRR plan and/or the ministerial DRR plan include content related to the promotion of seismic strengthening? If yes, please specify the name.**

☑ Yes ☐ No

National Disaster Risk Reduction Plan
National Plan for Seismic Risk Reduction
Institutional Plan for Disaster Risk Management

9. **Are there infrastructures and lifelines prioritized for seismic strengthening? If so, what are the prioritization criteria?**

☐ Yes ☑ No

10. **Do ministries or other relevant organizations have a programming plan for seismic strengthening of infrastructure and lifelines?**

No

11. **What is the budgeting process for the execution of a seismic strengthening project?**

12. **Is there a law or regulation for central and/or local government seismic strengthening grants?**

13. **Is there a system in place to validate project performance from an economic/efficiency standpoint? If yes, describe the system.**

Consult MEPyD

14. **Have seismic vulnerability assessment and seismic strengthening standards been developed for each of the infra and vital structures? If yes, specify the name of the standard for each facility.**

☐ Yes ☑ No

Design questions

15. **Does the ministry or other relevant organization have a seismic strengthening implementation plan for infrastructure and lifelines? If yes, please specify the name.**

☐ Yes ☑ No

16. **What is the procedure/execution flow of the seismic strengthening project?**

17. **Is there a mandatory standard (design and construction) for seismic strengthening?**

18. **What are the seismic performance and quality management (self-monitoring and third-party inspection) requirements for seismic strengthening?**

19. **In the absence of national standards, what type of seismic vulnerability assessment and seismic strengthening standards will be used for seismic strengthening of infrastructure and lifelines?**

20. **Has the seismic vulnerability assessment and seismic strengthening guideline/manual been developed? If so, how is it used?**

Seismic vulnerability assessment: ☐ Yes ☐ No
Seismic strengthening: ☐ Yes ☐ No

21. **Is there sufficient technical staff specialized in structural engineering in the department in charge of seismic strengthening projects?**

☐ Yes ☐ No

Construction questions

22. **Is there a quality management system for seismic vulnerability and seismic strengthening assessments? If yes, describe the system.**

☐ Yes ☐ No

23. **Is there a system of third-party review and inspection in place? If yes, describe the system.**

☐ Yes ☐ No

24. **Is there a seismic strengthening method that is difficult to apply? Is new technology needed?**

☐ Yes ☐ No

25. **Is there a system to ensure seismic performance and maintain construction quality?**

☐ Yes ☑ No

26. **Has the construction management guideline/manual for seismic strengthening been created and maintained? If so, how is it used?**

☐ Yes ☑ No

27. **If seismic evaluation and strengthening standards, manuals and guidelines exist, are they periodically reviewed? If so, how often and how are they reviewed? Could you summarize the system?**

We would also like to ask you to provide us with the following documents;

- Results of seismic risk assessments available to you.
- Annual budget allocation for new construction/design projects and seismic strengthening of public buildings and infrastructure.
- Annual budget allocation for seismic evaluation/reinforcement projects for public buildings and infrastructure.

Thank you very much for answering the questions.

JICA Information Gathering Survey to design and implement an effective knowledge co-creation program for "Capacity Building in Seismic Evaluation of Buildings in the Dominican Republic".

Questionnaire for MIVHED

The Dominican Republic is located in a zone with a high probability of earthquake occurrence, and historically, severe seismic events have occurred up to once every 50-60 years on the island of Hispaniola. Still, there are many challenges to identify in the field of seismic risk reduction.

In this context, the Japan International Cooperation Agency (JICA) has received requests from the Dominican Republic for the creation of a three-year country training program on capacity building in seismic vulnerability assessment. However, JICA has limited experience in technical cooperation in this field in the Dominican Republic and has not accumulated sufficient information to prepare an effective training program.

The purpose of this questionnaire is to learn about the current situation and the challenges of seismic risk reduction and seismic strengthening of buildings. Responses to this questionnaire will be analyzed before individual interviews are conducted. Gathering sufficient information is an essential step in designing the training program and creating a roadmap to organize future actions. Your cooperation in this questionnaire will be highly appreciated.

Please enter your answers directly into this text file according to the questions. If the question is not applicable, please enter N/A as the answer. Any documents or materials supporting the answers or providing sources (including URL / source reference) would also be appreciated.

1. Contents of the questionnaire Part 1: Respondent information

Part 2: Questions on general measures for earthquake DRR[1]

Part 3: Questions relating to new constructions and seismic strengthening of buildings

2. Shipping

◆ Deadline: **11January 2021**

3. Questionnaire

Part 1: Respondent information

Name	Vivian Reyes Roca
Position	Deputy Minister of Standards, Regulations and Procedures
Affiliation	Ministry of Housing, Habitat and Buildings (MIVHED)
Date	11 of January 2022

[1] Disaster risk reduction

Part 2: Questions about general measures for earthquake DRR

General questions

1. **What is the role of your organization in promoting earthquake risk reduction (DRR) and earthquake-resistance? What kind of facilities your ministry is responsible?**

The Ministry of Housing, Habitat and Buildings of the Dominican Republic (MIVHED) is the body responsible for promoting and establishing policies, principles, programs, planning, strategies and instruments for housing, habitat, decent human settlements, the construction of buildings of the Dominican State, as well as the equipment necessary for the general interest of the Nation.
Within its competencies is the coordination of a multidisciplinary team, grouped for the purpose of generating the necessary strategies to manage risk reduction.

2. **What do you think is the major challenges of the implementation system (available technologies and the capacity) for earthquake-resistance?**

- Informal construction and lack of supervision by the competent agencies.
- Lack of a comprehensive policy or regulations to deal with the occurrence of accidents.

Questions Regarding Institutional systems, Regulations, and Planning regarding social housings

3. **What kind of measures are being taken to mitigate earthquake disasters and promote earthquake-resistance in social houses? Which law and/or plans define these measures (e.g. the National Disaster Management Plan)?**

Law 496-06, which created the Secretariat of State for Economy, Planning and Development (SEEPyD), today Ministry (MEPyD), confers to the General Directorate of Territorial Planning and Development (DGODT), the responsibility to ensure the incorporation of the disaster risk reduction factor in the formulation and implementation of Development Policies and Plans, as well as in Public Investment Projects. The Disaster Prevention and Risk Management Program (1708/OC-DR), financed by the Inter-American Development Bank (IDB), in January 2012 launched the CAPRA (Comprehensive Approach for Probabilistic Risk Assessment) initiative, which offers the opportunity to understand the risk phenomenon, raise awareness and integrate stakeholders to become involved in an effective risk management and prevention-oriented policy.

The laws that define these measures are:

– Law No.147-02, of 22September 2, 2002 on2002, Risk Management. –
National Earthquake Contingency Plan, (COE , 2009).

These regulations define the instruments of the National Risk Management Policy:

- The National System for Disaster Prevention, Mitigation and Response.
- The National Risk Management Plan.
- The National Emergency Plan.
- The National Integrated Information System
- The National Disaster Prevention, Mitigation and Response Fund.

4. **When you take the measures answered in the previous question, do you have any challenges or bottlenecks (Institutional structure, personnel, budget, knowledge, etc.)? If yes, please describe in detail.**

In this sense, we understand that the main challenge is the duplication of functions, powers and scope. We have several ministries and institutions focused on the same objectives, but not working in coordination to achieve them.

5. **Are there budget allocations to promote seismic-resistant design and construction of social housing? If yes, please indicate the budget trend over the last 5 years.**

COMMISSION FOR THE MANAGEMENT OF NATURAL DISASTERS OF THE MINISTRY OF THE PRESIDENCY:

Body responsible for the implementation of the HOPEFOR initiative in the Dominican Republic. Its main purpose is to improve the effectiveness of military and civil defense resources in the event of natural disasters through the creation of a commission as an inter-institutional coordination body, responsible for compliance with the HOPEFOR initiative for the improvement of civil-military coordination to support the emergency response system.

This 2021,Program has a projected budget of RD$ 66,000,000.00.

ONESVIE:

On July 5, 2001, the National Office of Seismic Evaluation and Vulnerability of Infrastructure and Buildings (ONESVIE) was created to diagnose and evaluate the seismic resistance capacity of the country's buildings, and to establish corrections in those cases that merit it.

This 2021,institution has an approved annual budget of RD$ 130,137,102.00.

COE:

The Emergency Operations Center is an agency of the Presidency of the Dominican Republic, created in 2001, with the purpose of timely response to emergency situations and disasters, responsible for promoting, planning and maintaining coordination and joint operation between different levels, jurisdictions and functions of institutions involved in emergency and disaster response.

This 2021,institution has an approved annual budget of RD$ 118,906,520.64.

CIVIL DEFENSE:

On June 17, 1966, Law 257 was enacted, creating the Civil Defense, an institution under the Administrative Secretariat of the Presidency (now the Ministry of the Presidency), which currently presides over the National Emergency Commission.

This 2021,institution has an approved annual budget of RD$ 185,131,244.

MOPC:

The Ministry of Public Works and Communications has a Department of Environmental and Risk Management created in 21August of 2000 under2000, the General Law on Environment and Natural Resources (Law 64-00), which establishes in its Art. 26 that the institutions that are part of the National System of Environmental Management and Natural Resources must have environmental management units.
This department is responsible for coordinating, supervising and monitoring the policies, plans, programs, projects, environmental and risk actions of the MOPC.

6. **Are there seismic code guidelines (R-001) for social housing? If yes, when were these guidelines created and what is their content?**

In this code, there are no particular or exclusive guidelines for social housing. It applies to all buildings, classified according to their function or use, as follows:
GROUP I. Essential buildings and facilities. GROUP II.
Hazardous buildings and facilities.
GROUP III. Special occupancy buildings.
GROUP IV. Normal occupancy buildings.
GROUP V. Buildings not included in the previous groups.

Institutional systems, regulatory and planning issues related to private housing.

7. What kind of measures are being taken to mitigate disasters due to seismic events and to promote seismic-resistant design and construction in private houses? What laws and/or plans define these measures (e.g., the National Plan for Integral Disaster Risk Management in the Dominican Republic)?

We do not have a specific plan aimed exclusively at earthquake resistant construction in private homes. However, the first **National Risk Management Plan** was elaborated in the 2001framework of a program financed by the Inter-American Development Bank.

This Plan could not be implemented because the country did not have several necessary elements:

- Legal framework
- Institutional framework
- Budgetary framework
- Monitoring and evaluation mechanisms

The National Risk Management Plan was2011 updated between and2010 as part of the Technical Committee's mandate and with the financial support of the Spanish Agency for International Development Cooperation (AECID), and constituted the first step to strengthen prevention, mitigation and response actions.

This Plan is therefore the instrument that defines the objectives, strategies, programs and subprograms through which institutional activities for risk prevention and mitigation, preparedness for response, and rehabilitation and reconstruction in the event of a disaster are oriented.

8. In taking the actions answered in the previous question, do you have any challenges or bottlenecks (institutional structure, personnel, budget, knowledge, etc.)? If yes, please describe in detail.

Among the main challenges we can mention:

- Approve a National Land Management Plan.
- Increase the quality of public and social spending.
- Define scope and authority by public institution.
- Unify application criteria.
- Include in the rules and regulations, plans and measures for the exclusive cases of housing, classified by use, vulnerability, habitability characteristics, etc.
- Expand the Law and include specific mitigation measures.
- The National Integral Disaster Risk Management Plan, the National Seismic Risk Reduction Plan, the Seismic Code, as well as all the regulations and advances in regulatory and planning matters, have not yet been adequately socialized and disseminated among the PMR Committees.

9. **Are there seismic code guidelines (R-001) for private dwellings? If so, what is their content?**

There are no particular or exclusive guidelines for private dwellings in the code.

Questions on encouraging private sector participation

10. **Are there any support systems or incentives to increase earthquake-resistant design and construction of private housing? If yes, please describe the system or incentives in detail. If you have web pages that explain them, please inform us of the URL.**

- Work is currently underway, in collaboration with international organizations, on the development of the Dominican Republic's building code. Likewise, construction regulations for massive construction systems are being discussed and elaborated.

11. **Are there budget lines to promote seismic-resistant design and construction of private housing?**

Not defined

12. **Are there earthquake insurance systems or anticipated government assistance for victims of future earthquakes?**

- Report on Financial Management and Disaster Risk Insurance in the Dominican Republic, prepared under the strategic guidance and advice of the World Bank in the Dominican Republic (https://mepyd.gob.do/wp-content/uploads/drive/Banco%20Mundial/Documento%20Gestion%20Financiera.pdf).

- The Council of Ministers of Finance of Central America, Panama and the Dominican Republic (COSEFIN), a sectoral body of the Central American Integration System (SICA) and the Economic Integration sub-system, responsible for dealing with issues related to information, harmonization, convergence, development and coordination of fiscal policies, together with the World Bank, managed a catastrophic risk insurance scheme called the **Caribbean Catastrophic Risk Insurance Facility** (CCRIF).

- **Home Improvement and/or Reconstruction. The** process by which the materials of a home with recoverable structural deficiencies are replaced. These improvements are made by components such as roof, walls, floor, doors, windows or the expansion of a room, as well as the total construction of the house in the same place where it was originally located**.**
  Service provided by the Housing Improvement Division of MIVHED (https://invi.gob.do/mejoramiento-de- vivienda/).

- **Support for Home Improvement.** Service whose objective is to build and rebuild the homes of the families of the excluded population living in conditions of greater vulnerability and social risk. Under the responsibility of the **Presidential Commission for the Support to the**

- **neighborhood development**
  (http://www.desarrollobarrial.gob.do/index.php/serviciosm/item/284- support-housing-improvement-home-improvement-housing-improvement).

13. **What measures and activities are being carried out to encourage local residents to promote earthquake DRR activities (e.g., drills, educational materials, talks in schools/communities, grants for local activities)?**

On October 20, 2021, an **earthquake simulation was carried out**, whose epicenter will be the city of Santiago. This contingency mechanism was carried out by instructions of the Central Government.

On April 19, 2021, the reading of the **draft Organic Law of Territorial Ordering** concluded.

In 2014, a Report on the Reduction of School Seismic Vulnerability in the Province of San Cristobal, Dominican Republic, a collaborative project was carried out between the Japan International Cooperation Agency (JICA) and the National Office for Seismic Evaluation of Infrastructure and Buildings (ONESVIE) with the participation of other institutions such as the National Geological Service (SGN), the offices of the Risk Management Program and the Regional Education Office of the Ministry of Education (MINERD).

In 2016, the Ministry of Public Works provided a **training workshop called "CRISIS-CAPRA" for seismic hazard modeling, within the framework of the project "Adequacy and Improvement of Regulatory Instruments for Earthquake Resistant Construction in the Dominican Republic"**. This activity, carried out with the support of the Japan International Cooperation Agency (JICA), included the participation of representatives from Intec, National Office of Seismic Evaluation and Vulnerability of Infrastructure and Buildings (ONESVIE), IGN, DGODT, National Geological Service (SGN), National Emergency Commission (CNE), and two former JICA scholarship holders.

Others

14. What kind of support has been received from other donors in the field of earthquake DRR in your ministry? What were the results of their support/activities?

Documents sponsored by the United Nations (UNISDR), with the financial contribution of the Directorate General for Humanitarian Aid and Civil Protection of the European Commission (DGECHO), to elaborate a Disaster Risk Reduction strategy (https://dipecholac.net/docs/files/525dp-avances-y-desafios-de-la-gdr-en-rd-2012.pdf).

15. JICA is planning to conduct a training program on earthquake resistance in your country. Is there a Japanese system, policy or technology that you are interested in or what kind of training would you like to receive? Please also explain the reasons.

We would like to have references from:

- **Seismic isolation technology** as a method to protect buildings from earthquakes, increase their seismic resistance, strengthen the structures, etc. This could be applied to both new and existing buildings and in some way mitigate the vulnerability impacts of informal and unsupervised construction.
- **Early warning system for earthquakes.** This would allow us to adapt evacuation plans, safeguarding, prioritizing vulnerable sectors, etc.

Part 3: Questions on new construction and seismic retrofitting of buildings

Seismic code

1. For the time being, we acknowledge that only the application of R-001 to buildings has been confirmed.
Is there any other standard that integrates the structural analysis methods used in seismic design? If so, what are they, is it a stress-based, displacement-based or hybrid standard?

In addition to R-001, we refer to ACI-318 (V.2019), a hybrid standard.

2. Do you have the specific code for the functions listed below? If yes, write the name and year of the latest version.

Code functions	Code Name	Year of last version
Code defining structural details (For example, details of the arrangement of reinforcing bars for construction reinforced concrete)	– Regulation for the Analysis and Seismic Design of Structures (R-001).	2011
Code for assessing the seismic vulnerability of existing buildings different from that of new buildings. (E.g. "$_{s}I$*value*" Seismic index of structure in Japan)	– The Regulation for the Seismic Analysis and Design of Structures (R-001) establishes applicable criteria for existing structures.	2011
	– In addition, there is a guide of *requirements for structural evaluation of existing buildings or buildings started for the purpose of obtaining a building permit (https://www.mopc.gob.do/media/9675/dgrs-die-r004-requisitos-de-evaluaci%C3%B3n-estructural-de-e-ex-existing-rev-01.pdf)*	2009
Code regulating buildings made of traditional materials other than reinforced concrete and steel structures. (e.g. masonry, wood...).	– Regulation for the design and construction of structural masonry buildings (R-027).	2007
	– Regulation for design, fabrication and erection of steel structures (R-028).	2007
	– Regulation for the design and construction of structural wood buildings (R-029).	2009
	Some technical publications are available for reference: – R-015 (PT1) P-Δ Effects on Nonlinear Seismic Response (https://www.mopc.gob.do/media/1948/r- 015.pdf). – R-018 (PT2) Flexural-Compression Design of Reinforced Concrete Walls. Rectangular, L and C Sections (https://www.mopc.gob.do/media/1960/r- 018.pdf). – Seismic and Hurricane Evaluation Manual for Existing Reinforced Concrete Buildings in the Dominican Republic (https://www.mopc.gob.do/media/2016/manual-evaluacion-s%C3%ADsmica.pdf).	

	– Recommendations for Wind Analysis of Structures (http://cidbimena.desastres.hn/docum/crid/Julio-August2005/CD1/pdf/spa/doc3638/doc3638-content.pdf). – Requirements for Structural Evaluation in Existing or Begun Buildings (https://www.mopc.gob.do/media/9675/dgrs-die-r004-requirements-for-structural-evaluation- de-e-existing-rev-01.pdf).	
Code defining structural details (For example, details of the arrangement of reinforcing bars for construction reinforced concrete)	– Regulation for the Analysis and Seismic Design of Structures (R-001).	2011
	– Regulation for the Design and Construction of Reinforced Concrete Structures (R-033).	2012

3. Are there any standards that regulate the strength and mechanical properties of materials such as steel and concrete?

Yes, the references are:
- *Regulations for the Design and Construction of Reinforced Concrete Structures (R-033)* of 2012.
- *Regulations for the design, fabrication and erection of steel structures (R-028)* of 2007.

Support system for designers

4. Is there any detailed explanatory material or a manual to help understand the code and the seismic standard that is not included in the Code itself?

No.

5. Is there software available to assist structural designers in complying with the code and seismic standard? If yes, please specify.

Yes:
ETABS
SAFE
CypeCAD
SAP 2000
Midas Gen and Midas
Civil Among others...

Seismic Resistance Evaluation System

6. Is there a system in place to evaluate each phase of design and construction (e.g., construction confirmation application in Japan） ?

- General Building and Plan Processing Regulations 2006, R-021 (https://www.mopc.gob.do/media/1955/r-021.pdf).
- Regulations for General Supervision and Inspection of Works 2017, R-004 (https://www.mopc.gob.do/media/1252/r-004-supervision-e-inspecci%C3%B3n-de-obra-d-no232-17.pdf).

We would also like to ask you to provide us with the following documents; •

Organizational chart with the number of employees.

- Annual budget allocation for new construction/design and seismic strengthening projects for facilities under the responsibility of your Ministry.

- Any relevant plan that helps to understand:

- Project Actions that Save Lives: Disaster Preparedness and Seismic and Tsunami Risk Reduction on the South Coast (file:///C:/Users/arqja/Downloads/pnud_do_guiaSATtsunami.pdf).
- Report for the reduction of the Seismic Vulnerability of school buildings in the province of San Cristobal (https://www.sgn.gob.do/transparencia/phocadownload/Publicaciones/Informe%20del%20%20Proyecto%20Evaluacion%20Escuelas%20Prov.%20San%20Cristobal.pdf).
- Indicadores de la gestión de riesgos de desastres en república dominicana 2012: desafíos pendientes y acciones para el avance (file:///C:/Users/arqja/Downloads/RE%208.41%20Producto%202.pdf).

Thank you very much for answering the questions.

Questionnaire to MEPyD

The Dominican Republic is located in an area with a high probability of earthquakes, and historically, severe seismic hazards have occurred as often as once every 40-50 years. Still, there are many problems to identify in the field of earthquake disaster risk reduction.

In this context, JICA (Japan International Cooperation Agency) has received requests from the Dominican Republic for a three-year country training program on capacity building in seismic resistance diagnosis. However, JICA has little experience in technical cooperation in this field in the Dominican Republic and has not accumulated sufficient information to prepare an effective training program.

The objective of this questionnaire is to understand the current situation and challenges in seismic disaster risk reduction and seismic adaptation. Gathering sufficient information is an essential step in designing the training program and creating a roadmap to organize future actions. Please also note that you may request a follow-up interview with your organization. Your cooperation in connection with this questionnaire will be greatly appreciated.

Please enter your answers directly into this text file according to the questions. If the question is not applicable, enter N/A as the answer. Any documents or materials supporting the answers or sources would also be appreciated. (including URL / source information).

1. Contents of the questionnaire

Part 1: Respondent information

Part 2: Questions on general measures for seismic risk reduction

2. Shipping

Deadline: **January 11, 2021**

3. Questionnaire

Part 1: Respondent information

Name	
Position	
Institution	
Email	
Date	

Part 2: Questions on general measures for Seismic Risk Reduction

General questions

1. **What is your organization's role in promoting seismic risk reduction?**

The Ministry of Economy, Planning and Development promotes development planning with a risk reduction approach including seismic risk.

2. **What do you think are the main challenges of the implementation system (available technologies and capacity) for seismic risk reduction?**

1. Strengthen institutional capacity to incorporate Disaster Risk Management in its planning.
2. Train human resources in the use of technology for disaster risk analysis and reduction.

Systems, policy and business planning issues

3. **What is the position and importance (priority) of seismic risk reduction and seismic resistance in your country's overall national plan and strategy?**

Seismic risk is considered one of the country's main risks and is therefore an integral part of the national disaster risk reduction plan and there is even a specific plan for seismic risk reduction.

4. **Is the National Integral Disaster Risk Management Plan in the Dominican Republic also managed and supervised by your ministry? How is the plan updated and supervised (calendar, institutions, steps, etc.)?**

The Disaster Risk Management and Climate Change Directorate of the MEPYD has developed a proposal for the implementation of the National Disaster Risk Reduction Plan and the Seismic Risk Reduction Plan, which will be incorporated into national planning (sectoral and territorial).

5. **Do all ministries and departments that have responsibilities in promoting seismic risk reduction develop their annual plans, based on the national plan?**

The Disaster Risk Management and Climate Change Directorate of the MEPYD is making efforts to incorporate indicators and products harmonized with the national DRR plan, including seismic risk, and some institutions have been able to integrate it into their PEI and their POA.

6. **What is the annual budget situation for DRR and seismic-resistance measures/projects? What percentage of the total budget is allocated for these purposes?**

We do not have this data available yet. We are working on a budget scoreboard for climate change and risk management that will allow us to obtain this information in an agile manner.

Others

7. **What kind of support has been received from other donors in the field of seismic DRR in your ministry? What were the results of their support/activities?**

We developed a technical assistance program to strengthen seismic risk management with several institutions financed by the IDB.

8. **JICA is planning to conduct a training program on seismic resistance in your country. Is there a Japanese system, policy or technology that interests you or what kind of training would you like to**

receive? Please also explain the reasons.

We have received training in seismic risk analysis from JICA. Seismic-resistant technology Hospital safety. Safe Schools, strengthening the physical infrastructure of the school system. Strengthening of damage assessment tools and how this can be associated with lines of research to strengthen hospital, school and vital infrastructure systems. Characterization of vital systems.

We would also like to ask you to provide us with the following documents;

- National plans and manuals related to earthquake DRR
- Documents on the budgetary trend (over the past 5 years) in risk management

Thank you very much for answering the questions

Questionnaire to MINERD

The Dominican Republic is located in a zone with a high probability of earthquake occurrence, and historically, severe seismic events have occurred up to once every 50-60 years on the island of Hispaniola. Even so, there are many problems to identify in the field of seismic risk reduction.

In this context, the Japan International Cooperation Agency (JICA) has received requests from the Dominican Republic for the creation of a three-year country training program on capacity building in seismic vulnerability assessment. However, JICA has limited experience in technical cooperation in this field in the Dominican Republic and has not accumulated sufficient information to prepare an effective training program.

The purpose of this questionnaire is to learn about the current situation and the challenges of seismic risk reduction and seismic strengthening of buildings. Responses to this questionnaire will be analyzed before individual interviews are conducted. Gathering sufficient information is an essential step in designing the training program and creating a roadmap to organize future actions. Your cooperation in this questionnaire will be highly appreciated.

Please enter your answers directly into this text file according to the questions. If the question is not applicable, please enter N/A as the answer. Any documents or materials supporting the answers or providing sources (including URL / source reference) would also be appreciated.

1. Contents of the questionnaire

Part 1: Respondent information

Part 2: Questions on general earthquake disaster risk reduction measures

Part 3: Issues relating to seismic-resistant design and construction and seismic strengthening of buildings (schools)

2. Shipping

◆Deadline: **January 11, 2021**

3. Questionnaire

Part 1: Respondent information

Name	Diego Bautista / Abraham Perez
Position	Director General / Director Risk Assessment and Vulnerability Reduction Department
Institution	MINERD
Date	January 11, 2022

Part 2: Questions on general earthquake disaster risk reduction measures

General questions

1. **What is the role of your organization in promoting earthquake Disaster Risk Reduction (DRR) and earthquake-resistant design and construction of school buildings?**

Within the vision of MINERD, through the Directorate of Environmental and Risk Management, the Departments of Risk Assessment and Vulnerability Reduction, Training and the Department of Emergencies and Disasters, conduct lectures and workshops on the behavior of earthquakes, self-protection maneuvers, and the creation of evacuation routes. The same information is promoted in the media, such as television, radio and social networks.

In terms of earthquake-resistant design and construction of school buildings, the ministry performs risk and vulnerability assessments of the land and the environment where a new educational center is to be located. Likewise, we collaborate in the elaboration and modifications that are made to the norms and regulations that are directly related to the design and construction of earthquake-resistant buildings.

2. **What do you think are the main challenges of the application system (available technologies and capacity) for seismic-resistant design and construction?**

The lack of properly trained personnel in the field of seismic resistance and of the appropriate tools (computer equipment and software) to monitor the design and construction of school buildings throughout the construction process and follow-up during their operation.

Systems, policy and business planning issues

3. **What earthquake disaster risk reduction measures are applied in public schools (promoting seismic resistance in school buildings, preparation of necessary equipment, educational activities, etc.)?**

- Periodic evaluations of the condition of the building are carried out.
- Preparation of the educational community to act before, during and after the occurrence of an earthquake.
- Conducting drills at school, municipal and national levels.

4. **Is the annual budget for the implementation of earthquake disaster risk reduction measures guaranteed for each public school?**

- No

5. **Are there defined roles or functions, such as evacuation centers, for public schools in case of earthquakes? If so, what are they, and in which law/regulation are these functions defined?**

If there are defined roles or functions. Law No. 147-02 on Risk Management
https://www.coe.gob.do/phocadownload/SobreNosotros/MarcoLegal/Ley_147-02_Sobre_Gestion_de_Riesgos.pdf
Liaison Directorate National Inventory of Shelters
https://defensacivil.gob.do/images/publicaciones/InventarioNacionaldeAlbergueValidados_202

0.pdf

6. **The National Plan for Comprehensive Disaster Risk Management in the Dominican Republic mentions that each public school has a risk management plan, but who prepares it? What percentage of schools have formulated it? What is the content of the plans?**

Each educational center forms a risk management commission, which meets with members of the Environmental and Risk Management Directorate, Civil Defense, Firefighters and APMAE (Association of Parents, Mothers and Friends of the school) to prepare the School Risk Management Plan. Percentage and Content. The School Plan on Integral Risk Management is prepared by the school committee, with the collaboration of the entire educational community. The percentage of educational centers that have school plans for integral risk management is 25% and 16% are in the process of being updated. The content of the school risk management plans is composed of 13 steps distributed in 4 units. These are: Unit 1 - Organization of the process, with steps 1 and 2. Unit 2 - Risk diagnosis, with steps 3,4,5,6 and 7. Unit 3- Design and construction of the plan, with steps 8,9,10 and 11. Unit 4- Implementation of the plan, with steps 12 and 13.

Others

7. **What kind of support has been received from other donors in the area of earthquake disaster risk reduction in your ministry? What were the results of their support/activities?**

- Financing for the completion of the Diploma in Safer Schools,
- Financing for the Evaluation of Centers with the Educational Centers Security Index Tool of the Dominican Republic (ISCERD). 110 centers evaluated with this tool.
- Funds to carry out a census to determine the different types of school buildings existing at the national level.
- Funds for workshops with the 18 regional technicians and 122 district technicians of DIGAR.
- Support for the formatting, editing and reproduction of materials used in the preparation of center management plans.
- Funds for the acquisition of equipment used in risk prevention and mitigation.

The results of this support were translated into the acquisition of knowledge in the use of tools. The cascade effect was boosted by holding workshops for regional and district technicians. The publication and reproduction of materials used in the preparation of management plans.

8. **JICA is planning to conduct a training program on earthquake-resistant design and construction and other earthquake-resistant measures in your country. Is there a Japanese system, policy or technology that you are interested in or what kind of training would you like to receive? Please also explain the reasons.**

- The use of new materials different from traditional ones
- System and quality control of construction materials
- Soil preparation techniques in soft soils
- Design software for earthquake-resistant structures and training for its use and application.

The reasons are as follows: By incorporating new, more resistant and lighter materials, the structure could have a less rigid behavior in the face of a telluric event. By knowing the modern techniques for ground adaptation when dealing with soft soil or other types of soil that affect

the building to be constructed, it is important to solve this problem. The use of software for the design of seismic-resistant structures will allow us to monitor the designs of school buildings in terms of earthquakes.

Part 3: Questions on seismic-resistant design and construction and seismic strengthening of school buildings.

General questions

1. **What is the predominant building type (structural typology) of school buildings (new construction)?**

   The current building is a frame structure, with three lines of resistance in both directions, and masonry walls.

2. **Is there a standard design for the new school building and is the *seismic performance* of new public buildings assured?**

   - Yes
   - No

Plan and objective established for seismic-resistant design and construction and seismic strengthening of existing school buildings.

3. **Is there a plan to promote seismic resistance and/or seismic strengthening of existing school buildings?**

   - We are working on a plan for the seismic strengthening of school buildings, only of the SEE type (two-story building, with only two lines of resistance in both directions, masonry walls with a tendency to produce the possible effect of a short column).

4. **Are there defined goals or objectives regarding seismic resistance (design and construction) and seismic strengthening of school buildings? If so, what are some indicators (e.g., proportion of seismic-resistant buildings, number of seismic-resistant buildings)?**

   - No

5. **Are there records or inventories showing the proportion (percentage, radius) of school buildings with seismic-resistant design and the proportion of seismically reinforced buildings constructed?**

   - N/A

Current status of earthquake-resistant design and construction and seismic retrofitting of school buildings

6. **What is the current status of seismic-resistant design and construction and seismic retrofitting of public school buildings (e.g., proportion of seismic-resistant buildings, number of seismic-resistant buildings)? Is seismic retrofitting of existing school buildings progressing?**

   - No

7. **If in the previous question, you answered that progress is not sufficient or does not exist, what are the possible challenges or bottlenecks (e.g., but not limited to, regulation, policy, budget, technology and**

human resources, etc.)?

- Factors such as politics, the lack of supervision and implementation of anti-seismic codes, the failure to take into account in budgets the resources to implement from the design and construction of school buildings, the lack of technology and personnel duly specialized in the area.

Systems to promote earthquake resistance

8. **Is there a system in place to assess the seismic vulnerability of existing school buildings? If yes, explain the system.**

- No

9. **Is there a system in place to set priorities taking into account the urgency of the school building immediately after the earthquake and the earthquake resistance of the building? If yes, explain the system.**

- N/A

We would also like to ask you to provide us with the following documents;

- Earthquake disaster risk management plans, guidelines and/or manuals for schools
- Plans, guidelines and/or manuals for earthquake-resistant design and construction and seismic retrofitting of public school buildings

Thank you very much for answering the questions.

JICA Information Gathering Survey to design and implement an effective knowledge co-creation program for "Capacity Building in Seismic Evaluation of Buildings in the Dominican Republic".

Questionnaire to the trainees of the JICA training program

JICA Knowledge Co-Creation Program- "Improvement and Dissemination of Earthquake Resistant Technology for Buildings in Latin American Countries".

The Dominican Republic is located in a zone with a high probability of earthquake occurrence, and historically, severe seismic events have occurred up to once every 50-60 years on the island of Hispaniola. Still, there are many challenges to identify in the field of seismic risk reduction.

In this context, the Japan International Cooperation Agency (JICA) has received requests from the Dominican Republic for the creation of a three-year country training program on capacity building in seismic vulnerability assessment. However, JICA has limited experience in technical cooperation in this field in the Dominican Republic and has not accumulated sufficient information to prepare an effective training program.

The purpose of this questionnaire is to learn about the current situation and the challenges of seismic risk reduction and seismic strengthening of buildings. Responses to this questionnaire will be analyzed before individual interviews are conducted. Gathering sufficient information is an essential step in designing the training program and creating a roadmap to organize future actions. Your cooperation in this questionnaire will be highly appreciated.

Please enter your answers directly into this text file according to the questions. If the question is not applicable, please enter N/A as the answer. Any documents or materials supporting the answers or providing sources (including URL / source reference) would also be appreciated.

1. Contents of the questionnaire

Part 1: Respondent information

Part 2: Questions about the program you participated in and your ideas for the planned program

2. Shipping

Deadline: **January 14, 2021.**

3. Questionnaire

Part 1: Respondent information

Name		Felix Noel Amparo Cordero
Current	Position	Architect
	Affiliation	Onesvie
By participating in the Program *If different.	Position	Architect
	Affiliation	Onesvie
Date		1January 2, 2022

Part 2: Questions about the program you participated in and your ideas for planned training

1. **What do you think are the main challenges and bottlenecks in the application system (available technologies, capacities, budgetary conditions, etc.) for seismic risk reduction, particularly in seismic-resistant design and construction in your country?**

   - Lack of technology for the study, analysis and development of seismic knowledge in the country.
   - Lack of support from government authorities in the budgetary disposition of the institution, in order to promote seismic issues with greater force to the population, in addition to increasing the staff of the institution with the intention of offering greater coverage nationwide and streamlining the processes and results issued by the institution.
   - Lack of local regulations based on the current situation in our country, since we currently use as a basis the FEMA P-154 based on US standards, which is not fully oriented to the reality of local constructions.

2. **What motivated you to participate in the JICA training program and what were your expectations before participating?**

   The desire to expand knowledge on seismic issues and strengthen the technical team of the institution, to be a support tool within the same, in the search to strengthen the ability to evaluate and offer better actions and proposals aimed at correcting the current situation of the country in terms of seismic resistance.

3. **Was there any content of the training that you felt could be applied to your country's seismic risk reduction measures, especially in promoting seismic resistance? What was the most informative content of the training program?**

   The way in which master Nobou Fukuwa (Director of the Disaster Mitigation Research Center) managed to reach the different levels of society through the simple demonstration of the behavior of a structure in the face of natural hazards such as an earthquake.

   The support of the Japanese authorities for private housing developers in Japan, which was based on an economic incentive for those buildings that complied with the provisions of local regulations.

4. **Was there anything you would like to learn more about after the training? If yes, what were they and why do you think so?**

   - Dissemination of seismic knowledge in society.
   - Analysis, design and application of seismic isolators in buildings.
   - Behavior of masonry structures in earthquakes.
   - Design of steel buildings in construction and reinforced concrete.

5. **JICA is planning to conduct a seismic-resistant training program in your country. Are there any**

Japanese systems, policies or technologies that you are interested in or recommend as training content? Please also explain the reasons.

- The policy of creating social awareness on seismic issues should be one of the main topics in the training of future professionals in our country.
- Design of masonry buildings (since we have a large number of buildings based on this construction system).
- Design of portalized buildings.
- Design of steel or combined (steel and reinforced concrete) buildings.

Thank you very much for answering the questions.

JICA Information Gathering Survey to design and implement an effective knowledge co-creation program for "Capacity Building in Seismic Evaluation of Buildings in the Dominican Republic".

Questionnaire to the trainees of the JICA training program

JICA Knowledge Co-Creation Program- "Improvement and Dissemination of Earthquake Resistant Technology for Buildings in Latin American Countries".

The Dominican Republic is located in a zone with a high probability of earthquake occurrence, and historically, severe seismic events have occurred up to once every 50-60 years on the island of Hispaniola. Still, there are many challenges to identify in the field of seismic risk reduction.

In this context, the Japan International Cooperation Agency (JICA) has received requests from the Dominican Republic for the creation of a three-year country training program on capacity building in seismic vulnerability assessment. However, JICA has limited experience in technical cooperation in this field in the Dominican Republic and has not accumulated sufficient information to prepare an effective training program.

The purpose of this questionnaire is to learn about the current situation and the challenges of seismic risk reduction and seismic strengthening of buildings. Responses to this questionnaire will be analyzed before individual interviews are conducted. Gathering sufficient information is an essential step in designing the training program and creating a roadmap to organize future actions. Your cooperation in this questionnaire will be highly appreciated.

Please enter your answers directly into this text file according to the questions. If the question is not applicable, please enter N/A as the answer. Any documents or materials supporting the answers or providing sources (including URL / source reference) would also be appreciated.

1. Contents of the questionnaire

Part 1: Respondent information

Part 2: Questions about the program you participated in and your ideas for the planned program

2. Shipping

Deadline: **January 14, 2021.**

3. Questionnaire

Part 1: Respondent information

Name		Uri Rolando Rodríguez Alba
Current	Position	Civil Engineer I
	Affiliation	Onesvie
By participating in the Program *If different.	Position	N/A
	Affiliation	N/A
Date		January 7, 2022

Part 2: Questions about the program you participated in and your ideas for planned training

1. **What do you think are the main challenges and bottlenecks in the application system (available technologies, capacities, budgetary conditions, etc.) for seismic risk reduction, particularly in seismic-resistant design and construction in your country?**

   One of the main challenges of our country is to create more awareness among the citizens of the seismic risk to which we are exposed.

   One of the main bottlenecks is that there are no regulations for retrofitting existing buildings, in addition to specific regulations for the use of passive and/or active structural control systems.

2. **What motivated you to participate in the JICA training program and what were your expectations before participating?**

   The main reason was to update my knowledge in the field of seismic resistance.
   My expectations were to learn about the latest developments in seismic resistance, assessment technologies, retrofit of existing buildings and DRR policies.

3. **Was there any content of the training that you felt could be applied to your country's seismic risk reduction measures, especially in promoting seismic resistance? What was the most informative content of the training program?**

   In particular, each of the contents addressed in the program, as a whole, can be adapted to seismic risk reduction measures.

   In terms of promotion, Nobuo Fukuwa's lecture gives simple examples to raise awareness of seismic risk reduction to the general public.

   More informative content includes CR seismic design standards, postseismic evaluation, existing building evaluation, retrofit technologies for existing buildings, and the STERRA 3D program for use in training.

4. **Was there anything you would like to learn more about after the training? If yes, what were they and why do you think so?**

   Yes, the program was mostly focused on RC structures, but it is also important to deepen in the evaluation methods of existing steel frame buildings (STEEL).

5. **JICA is planning to conduct a seismic-resistant training program in your country. Are there any Japanese systems, policies or technologies that you are interested in or recommend as training content? Please also explain the reasons.**

   In particular retrofit technologies for existing buildings, the main reason is the existence of essential buildings (hospitals, schools, government buildings, etc.) prior to the "regulation of seismic analysis and design of structures R-001" in force since 2011 and that there are no retrofit regulations for existing buildings and specific standards for the use of passive and/or active structural control systems.

Thank you very much for answering the questions.

National Geological Survey (NGS) Questionnaire

The Dominican Republic is located in a zone with a high probability of earthquake occurrence, and historically, severe seismic events have occurred up to once every 50-60 years on the island of Hispaniola. Still, there are many challenges to identify in the field of seismic risk reduction.

In this context, the Japan International Cooperation Agency (JICA) has received requests from the Dominican Republic for the creation of a three-year country training program on capacity building in seismic vulnerability assessment. However, JICA has limited experience in technical cooperation in this field in the Dominican Republic and has not accumulated sufficient information to prepare an effective training program.

The purpose of this questionnaire is to learn about the current situation and the challenges of seismic risk reduction and seismic strengthening of buildings. Responses to this questionnaire will be analyzed before individual interviews are conducted. Gathering sufficient information is an essential step in designing the training program and creating a roadmap to organize future actions. Your cooperation in this questionnaire will be highly appreciated.

Please enter your answers directly into this text file according to the questions. If the question is not applicable, please enter N/A as the answer. Any documents or materials supporting the answers or providing sources (including URL / source reference) would also be appreciated.

1. Contents of the questionnaire

Part 1: Respondent information

Part 2: Questions on the role of the SGN and reflections on seismic risk reduction policies.

2. Shipping

Deadline: **January 11, 2021**

◆Address: sunakawa@ocglobal.jp ; cc: ash.gmc@gmail.com

3. Questionnaire

Part 1: Respondent information

Name	Yesica H. Perez Alejandro
Position	Head of the Seismic Studies Dynamics Dept.
Institution	National Geological Survey
Email	Yperez@sgn.gob.do and despachodirector@sgn.gob.do
Date	03/01/2022

Part 2: Questions on the role of the SGN and reflections on seismic risk reduction policies.

1. What is the role of your organization in promoting seismic risk reduction in your country?

The National Geological Service is the institution with national responsibility for hazard assessment as its main role and with experience in the generation of geological risk maps.

Those originated directly by the dynamics of internal geological processes (volcanoes, earthquakes and tsunamis). Those derived directly from the dynamics of external geological processes (floods and gravitational movements).

2. What do you consider to be the main geological and geotechnical characteristics of the country, as well as the main characteristics regarding seismic risk?

Geological characteristics are understood as the analysis of (mineralogical composition, type of deposit, lithology, hydrothermal alteration, etc.) its position and spatial correlation with the structural and lithological control. - Identify, in the area, the rocks that are of major geological interest for an epithermal deposit.

The island of Hispaniola constitutes an area of active tectonics, important historical earthquakes and tectonic uplift, due to the northern edge of the Caribbean plate that is currently undergoing an oblique convergence regime (Calais et al., 1992, 1998, 2002; Mann et al., 1998; De Mets et al., 2000; Jansma et al., 2000; Bilich et al., 2001; and Prentice et al., 2002).

The resulting Hispaniola macrostructure consists of a set of tectonic units about 250 km wide, consisting of igneous, metamorphic and sedimentary rocks of Upper Jurassic-Lower Cretaceous to Eocene age, which formed and accreted in an intra-oceanic island arc until arc-continent collision. These rocks are regionally covered by a cover of siliciclastic and carbonate sedimentary rocks of Eocene/Oligocene-present age, which post-date island arc activity and mainly record the period of transcurrent movement between the North American and Caribbean plates (Mann, 1999; Mann et al., 1991a, 2002; Calais et al., 1998; Dolan et al., 1998).

Active geotectonics has given rise to a physiography characterized by an alternation of mountain ranges and valleys, which can be grouped into ten physiographic or morphogenetic zones. Each of these zones has geological characteristics that distinguish it from its contiguous zones and, in general, their limits coincide with well-defined morphostructural alignments.

3. From a geological point of view, what seismic risk reduction policies/measures are needed in the country? What do you think is the current status and/or levels of these measures/policies?

Understanding disaster risk is fundamental for the design of responses and measures focused on integrated risk management. The nature of risk is a combination of various factors, including natural hazards and their interaction with social and economic systems.

The measurements from the geological point of view are:

Characterize major faults by performing paleoseismic, geodynamic and active tectonic studies to determine their behavior and hazard.

Conduct seismic microzonation studies to establish soil zones with similar behavior during an earthquake, so that precise recommendations for the design and construction of seismic-resistant buildings can be defined.

Know the soil class (A, B, C, D, or E) and determine the procedures indicated in the codes to generate a seismic design spectrum for the structure site that will take into account (approximately) the amplification occurring in the soil deposit.

Monitor seismic activity in the country.

The current situation or levels of this measure could be said that the country is focused on disaster risk management, the only conditions are the economic limitations and the different procedures required for its application. Even so, there is a great need to create a culture of prevention and mitigation on the subject.

4. What do you consider to be the obstacles to promoting these measures?

Economic resources due to the fact that these are multidisciplinary investigations that require considerable resources for their execution.

5. JICA is planning to conduct a training program on earthquake resistance (they require quite a lot: design, construction, evaluation, etc.) in your country. From your agency's point of view, what kind of training topics do you think are desirable to promote earthquake resistance and why?

The training topics to be promoted are:

Study earthquake mechanisms, focal parameters, seismogram interpretation and earthquake location for the implementation of epicenter maps and seismic data processing.

Generate seismic hazard map and regional and local geologic active fault maps that contribute to seismic hazard and physical vulnerability.

Perform analysis of seismicity and tsunami generation with their respective scenario modeling, as well as tsunami maps.

Thank you very much for answering the questions.

Questionnaire to the National Seismology Center (CNS)

The Dominican Republic is located in a zone with a high probability of earthquake occurrence, and historically, severe seismic events have occurred up to once every 50-60 years on the island of Hispaniola. Still, there are many challenges to identify in the field of seismic risk reduction.

In this context, the Japan International Cooperation Agency (JICA) has received requests from the Dominican Republic for the creation of a three-year country training program on capacity building in seismic vulnerability assessment. However, JICA has limited experience in technical cooperation in this field in the Dominican Republic and has not accumulated sufficient information to prepare an effective training program.

The purpose of this questionnaire is to learn about the current situation and the challenges of seismic risk reduction and seismic strengthening of buildings. Responses to this questionnaire will be analyzed before individual interviews are conducted. Gathering sufficient information is an essential step in designing the training program and creating a roadmap to organize future actions. Your cooperation in this questionnaire will be highly appreciated.

Please enter your answers directly into this text file according to the questions. If the question is not applicable, please enter N/A as the answer. Any documents or materials supporting the answers or providing sources (including URL / source reference) would also be appreciated.

1. Contents of the questionnaire

Part 1: Respondent information

Part 2: Questions on the role of the NHA and reflections on seismic risk reduction policies.

2. Shipping

Deadline: **January 14, 2021.**

3. Questionnaire

Part 1: Respondent information

Name	Ramon Delanoy
Position	Director
Institution	National Center of Seismology -UASD-.
Date	December 30, 2021

Part 2: Questions on the role of the NHA and reflections on seismic risk reduction policies.

1. **What is the role of your organization in promoting earthquake Disaster Risk Reduction (DRR) in your country, such as seismic risk assessment, seismic observation network, etc.?**

Seismic observation network and seismic risk assessment.

2. **What do you consider to be the characteristics of the country's faults and the potential risks associated with earthquakes that may occur in the future?**

We have concurrent, normal and reverse faults. Inverse faults are characterized by the influences of the iterations of the Caribbean and North American plates. There are two subduction zones. All of them are active, since we register normal seismic events and in the recent past there have been strong earthquakes.

3. **From your organization's point of view, what seismic risk reduction policies/measures are needed in the country? What do you think is the current status of these measures/policies?**

Educate the population about the seismic risk and prepare them on how to act in the event of earthquakes. Install equipment for an early warning system in those provinces with high seismic risk, in order to reduce the number of victims in case of an earthquake.

4. **What do you see as the challenges and obstacles to promoting these measures?**

The lack of policies from the State and its institutions as well as the lack of financing.

5. **What is the current status of the network of seismological stations in your country?**

The National Seismology Center has more than thirty seismic stations; of which only 8 are its own, the rest are loaned by the Puerto Rico Seismic Network, Baylor University and the U.S. Geological Survey. One server was donated by the CBTO and another as part of SINI. There are other institutions that have installed equipment. The Baylor equipment, which is the majority, is in the country in "temporary" conditions. We do not plan to replace them if they are withdrawn.

6. **How is the network developing and what are the remaining challenges to be addressed in the network?**

Together with the Ministry of Higher Education Science and Technology we will evaluate the seismic and tsunami risk of the east-northeast coastal area and install an early warning system. We will need to install more sensors (magnetometer, accelerometer, seismometer, GPS, etc.). There is a need to install accelerometers in the main cities of the country in order to study the behavior of the soil in the face of seismic waves. In order to elaborate a more realistic building code for each zone of the country.

7. **JICA is planning to carry out a training program on earthquake resistance in your country. From your agency's point of view, what kind of training topics do you think are desirable to promote**

earthquake resilience and why?

Analysis of seismic waves and their applications to infrastructure construction. Education of the population, with emphasis on schools.

Thank you very much for answering the questions.

JICA Information Gathering Survey to design and implement an effective knowledge co-creation program for "Capacity Building in Seismic Evaluation of Buildings in the Dominican Republic".

Questionnaire to SODOGEO

The Dominican Republic is located in a zone with a high probability of earthquake occurrence, and historically, severe seismic events have occurred up to once every 50-60 years on the island of Hispaniola. Still, there are many challenges to identify in the field of seismic risk reduction.

In this context, the Japan International Cooperation Agency (JICA) has received requests from the Dominican Republic for the creation of a three-year country training program on capacity building in seismic vulnerability assessment. However, JICA has limited experience in technical cooperation in this field in the Dominican Republic and has not accumulated sufficient information to prepare an effective training program.

The purpose of this questionnaire is to learn about the current situation and the challenges of seismic risk reduction and seismic strengthening of buildings. Responses to this questionnaire will be analyzed before individual interviews are conducted. Gathering sufficient information is an essential step in designing the training program and creating a roadmap to organize future actions. Your cooperation in this questionnaire will be highly appreciated.

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1. Contents of the questionnaire

Part 1: Respondent information

Part 2: Questions on the role of SODOGEO and reflections on seismic risk reduction policies

2. Shipping

Deadline: **January 14, 2021.**

3. Questionnaire

Part 1: Respondent information

Name	Julio Ernesto Espaillat Lamarche
Position	Chairman
Institution	Dominican Society of Geology
Date	January 4, 2022

Part 2: Questions on the role of SODOGEO and reflections on seismic risk reduction policies

1. **What is the role of your organization in promoting Disaster Risk Reduction (DRR) for earthquakes (seismic risk), in particular seismic resilience in your country?**

The Dominican Society of Geology is the entity that groups the majority of geologists and other professionals of the earth sciences in the Dominican Republic. We are a purely scientific-professional entity.
Among our objectives is the development, promotion and dissemination of aspects related to geoscientific research in the Dominican Republic, using all possible means, including publications, congresses, field visits and electronic and written media.

2. **Do you carry out activities and/or support the Government in the field of seismic risk reduction? If yes, what are you doing and/or supporting?**

We participate in the scientific aspects related to the seismicity of the Island of Hispaniola, including the publication of studies and research related to seismic issues.

3. **What do you consider to be the main geological and geotechnical characteristics of the country, as well as the seismic risk?**

We are an island of volcanic origin located on the edge of the North American and Caribbean plates, which can be sectioned into a series of tectonic blocks or micro-plates subjected to significant compressive and tensile stresses that in turn generate significant seismicity throughout the island. From the geotechnical point of view, our rock massifs are generally strongly fractured (discontinuities in different directions and angles) presenting a number of faults, diaclases and other structural deformations.
The seismic risk of the island is high.

4. **From your organization's point of view, what measures for seismic risk reduction are needed in the country? What do you think is the current status of these measures/policies?**

We understand that educating our population is essential to understand how to deal with our seismic vulnerability.

5. **What do you see as the challenges and bottlenecks to promoting such measures (e.g. institution, technical and skills, budget)?**

We understand that a holistic approach is needed to achieve effective results in raising awareness of our seismic vulnerability.

6. **JICA is planning to conduct a seismic resistance training program, mainly focused on seismic evaluation of buildings, in your country. From your agency's point of view, what kind of training topics do you think are desirable to promote earthquake resistance and why?**

We believe that lectures, seminars, conferences, courses and other educational and practical training on seismic resistance and the implications for infrastructure and people's vulnerability to such natural phenomena could be beneficial for engineers and earth science professionals as well as for the general public.

Thank you very much for answering the questions.

Questionnaire to SODOSISMICA

The Dominican Republic is located in a zone with a high probability of earthquake occurrence, and historically, severe seismic events have occurred up to once every 50-60 years on the island of Hispaniola. Even so, there are many pending issues to be identified in the field of seismic risk reduction.

In this context, the Japan International Cooperation Agency (JICA) has received requests from the Dominican Republic for the creation of a three-year country training program on capacity building in seismic vulnerability assessment. However, JICA has limited experience in technical cooperation in this field in the Dominican Republic and has not accumulated sufficient information to prepare an effective training program.

The purpose of this questionnaire is to learn about the current situation and the challenges of seismic risk reduction and seismic strengthening of buildings. Responses to this questionnaire will be analyzed before individual interviews are conducted. Gathering sufficient information is an essential step in designing the training program and creating a roadmap to organize future actions. Your cooperation in this questionnaire will be highly appreciated.

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1. Contents of the questionnaire

Part 1: Respondent information

Part 2: Questions on the role of SODOSISMICA and reflections on seismic risk reduction policies

2. Shipping

Deadline: **January 14, 2021.**

3. Questionnaire

Part 1: Respondent information

Name	HECTOR O'REILLY
Position	CHAIRMAN
Institution	DOMINICAN SOCIETY OF SEISMOLOGY AND SEISMIC ENGINEERING (SODOSISMICA)
Date	January 6, 2021

Part 2: Questions on the role of SODOSISMICA and reflections on seismic risk reduction policies

1. **What is the role of your organization in promoting Disaster Risk Reduction (DRR) for earthquakes, in particular by promoting Seismic Resistant practices in your country?**

THE DOMINICAN SOCIETY OF SEISMOLOGY AND SEISMIC ENG. SISMICA (SODOSISMICA) AMONG ITS MAIN ROLES ARE:

1. TO PROMOTE THE STUDY OF SEISMOLOGY, GEOPHYSICS AND SEISMIC ENGINEERING, ORIENTING THEM TOWARDS THE CREATION OF A CLEAR AWARENESS OF THE SEISMIC RISK CONDITIONS THAT CHARACTERIZE THE ISLAND OF HISPANIOLA.

2. WE SERVE AS A CONSULTING AND ADVISORY BODY FOR THE STATE AND ALL ITS INSTITUTIONS AND AGENCIES, AS WELL AS FOR INDIVIDUALS, IN MATTERS RELATED TO SEISMOLOGY, GEOPHYSICS AND EARTHQUAKE ENGINEERING.

3. WE ORGANIZE IN CLOSE COLLABORATION WITH INSTITUTIONS, UNIVERSITIES, PROFESSIONALS, ACADEMIC SERVICES, GOVERNMENTAL, NATIONAL OR FOREIGN, LECTURES, CONFERENCES, COURSES, ROUND TABLES AND ANY OTHER ACTIVITIES THAT TEND TO SPREAD THE NECESSARY KNOWLEDGE TO DISSEMINATE BY ALL POSSIBLE MEANS THE CURRENT KNOWLEDGE IN THE AREAS OF SEISMOLOGY, GEOPHYSICS AND SEISMIC ENGINEERING, APPROPRIATE TO EACH LEVEL IN ORDER TO GENERATE IN ALL LAYERS OF THE POPULATION, ATTITUDES AND RESPONSES MORE APPROPRIATE TO OUR CONDITION OF SEISMIC ACTIVITY ZONE.

2. **Do you carry out activities and/or support the government in the area of seismic risk reduction? If yes, what do you do (e.g., seismic risk assessment; seismic hazard maps)?**

OUR SOCIETY SUPPORTS GOVERNMENTAL INSTITUTIONS IN THIS SENSE, WE BELONG TO:

- PERMANENT MEMBER OF THE NATIONAL COMMISSION OF TECHNICAL REGULATIONS OF ENGINEERING, ARCHITECTURE AND RELATED BRANCHES (CONARTIA). OF THE MINISTRY OF PUBLIC WORKS AND COMMUNICATIONS.

- PERMANENT MEMBER OF THE REGULATIONS COMMISSION OF THE MINISTRY OF HOUSING, HABITAT AND BUILDINGS (MIVEHD)

- PERMANENT MEMBER OF THE SEISMIC TABLE, INTEGRATED BY NATIONAL ORGANIZATIONS LINKED TO THE COORDINATION AND IMPLEMENTATION OF JOINT ACTIONS TO MITIGATE THE IMPACT OF SEISMIC HAZARDS IN THE DOMINICAN REPUBLIC, WITH THE DESIGN OF TOOLS, METHODOLOGIES AND WORK STRATEGIES TO ENHANCE THEM.

SODOSISMICA HAS BEEN RESPONSIBLE FOR OR HAS PARTICIPATED IN, AMONG OTHERS:

- ELABORATION OF THE REGULATION "PROVISIONAL RECOMMENDATIONS FOR THE SEISMIC ANALYSIS OF STRUCTURES" 1979, FOR THE MINISTRY OF PUBLIC WORKS AND COMMUNICATIONS.

- ELABORATION OF THE "REGULATION FOR THE ANALYSIS AND SEISMIC DESIGN OF STRUCTURES". 2011, FOR THE MINISTRY OF PUBLIC WORKS AND COMMUNICATIONS.

- FOR THE ELABORATION OF THE ABOVE REGULATIONS, SODOSISMICA PERFORMED IN EACH CASE A SEISMIC HAZARD STUDY, AS A RESULT OF WHICH THE RESULTING HAZARD MAPS AND THEIR RESULTING DESIGN SPECTRA ARE SHOWN.

- PARTICIPATION IN SEISMIC HAZARD STUDY IN THE DOMINICAN REPUBLIC. PROJECT FINANCED BY ECHO AND MOVIMONDO 2004.

- PARTICIPATION IN THE STUDY OF MICROZONIFICATION, VULNERABILITY AND SEISMIC RISK OF THE CITY OF SALCEDO. PROJECT FINANCED BY ECHO AND MOVIMONDO 2004.

3. If your organization supports seismic risk assessment and damage estimation, what seismic scenarios, population and number of buildings are used as basic data for the assessment?

IN THE SEISMIC RISK STUDY WE PARTICIPATED IN, IN THE CITY OF SALEDO MENTIONED ABOVE, A SURVEY WAS MADE OF ALL EXISTING HOUSES AND BUILDINGS IN THE CITY. A SURVEY WAS MADE OF ALL THE EXISTING HOUSES AND BUILDINGS IN THE CITY.
THESE HOUSES AND BUILDINGS WERE CATEGORIZED AND THEIR FRAGILITY CURVES WERE OBTAINED TO DEFINE THEIR RISK.
ON THE OTHER HAND, THE SCENARIOS WITH GREATER SEISMIC RISK IN THE DOMINICAN REPUBLIC ARE LOCATED IN THE NORTHERN AND CENTRAL REGION OF THE COUNTRY, DUE TO THE PRESENCE OF TECTONIC STRUCTURES WITH GREATER POTENTIAL AND CLOSER TO THE POPULATION CENTERS, THESE ARE THE NORTHERN FAULT AND THE SUBDUCTION ZONE TO THE NORTH OF THE ISLAND.
IN ALL THE EXTENSION OF THE TRACE OF THE SEPTENTRIONAL FAILURE ARE FOUND IMPORTANT CITIES AMONG THEM THE CITY OF SANTIAGO (2nd. IN IMPORTANCE OF THE COUNTRY), LOCATED A FEW KILOMETERS FROM THE FAILURE, WHICH WE HAVE ESTIMATED CAN PRODUCE EARTHQUAKES UP TO Mw=.7.4.
ON THE NORTH COAST OF THE ISLAND THERE ARE ALSO IMPORTANT CITIES SUCH AS PUERTO PLATA WHICH WAS AFFECTED IN 2003 BY AN EARTHQUAKE OF MAGNITUDE Mw=6.5. ALSO IN THE YEAR 1946 THE HIGHEST MAGNITUDE EARTHQUAKE RECORDED IN THE ISLAND Ms=7.8 NEAR THE CITY OF MICHES, TSUNAMIS OCCURRED IN ALL THE LITORAL OF NAGUA.
THE SOUTH-WEST OF THE COUNTRY CANNOT BE RULED OUT SINCE THE EXTENSION OF THE ENRIQUILLO PLANTAIN GARDEN FAULT PENETRATES THE DOMINICAN REPUBLIC, LOCATING CITIES SUCH AS BARAHONA VERY CLOSE TO THE FAULT.

4. If your organization supports seismic risk assessment and damage estimation, are there any challenges in conducting an accurate seismic risk assessment (e.g., data collection, data reliability, budget, institution, skills and knowledge, tools)?

WE SET OUT SOME OF THE ASPECTS THAT WE BELIEVE NEED IMPROVEMENT

- MORE PRECISE GEOLOGICAL AND TECTONIC STUDIES OF THE TECTONIC FAULTS, BOTH INTERNAL AND EXTERNAL TO THE ISLAND, SHOULD BE CARRIED OUT.
- TO PLACE MORE SEISMOLOGICAL STATIONS THAT GIVE A GREATER COVERAGE TO ALL THE FAULTS, WHICH WOULD ALLOW TO CATEGORIZE WITH MORE PROPERTY ITS SEISMIC POTENTIAL AND DANGEROUSNESS.
- THE SEISMOLOGICAL DATA RECORDED SINCE THE FIRST SEISMOLOGICAL STATION WAS INSTALLED, HAVE GAPS WHERE IT HAS NOT WORKED AND THEREFORE PERIODS WITHOUT EVENTS, ON THE OTHER HAND WE HAD A LONG TIME WITH ONLY ONE STATION AND THEN THE NETWORK WAS EXPANDED WITH EQUIPMENT OF VERY LITTLE RANGE AND NOT WELL DISTRIBUTED, THEREFORE THE LOCAL INFORMATION HAS BEEN INSUFFICIENT, SO IT HAS BEEN NECESSARY TO COMPLEMENT IT WITH RECORDS IN FOREIGN STATIONS.

- THE DATA ARE IN DIFFERENT MANNITUDES, WHICH MAKES IT NECESSARY TO CONVERT IT TO A SINGLE MAGNITUDE FOR THE PURPOSE OF THE HAZARD STUDY, WITH THE CONSEQUENT APPROXIMATION OF THE EXISTING OR GENERATED EXPRESSIONS IN EACH CASE.
- TO HAVE ACCELEROGRAPHIC STATIONS, WHICH WITH THE DATA COLLECTED TOGETHER WITH THE SEISMOLOGICAL DATA, ALLOW TO DEFINE THE ATTENUATION RELATIONSHIPS OF THE SEISMIC EFFECTS, GIVEN THE TECTONIC, GEOLOGIC AND TOPOGRAPHIC DISTRIBUTION ON THE ISLAND. RELATIONS THAT ARE INDISPENSABLE TO BE ABLE TO CARRY OUT AN ANALYSIS OF THREAT MORE ADJUSTED TO THE REALITY.

- TO BE ABLE TO ACCESS FUNDS FROM INTERNATIONAL ORGANIZATIONS FOR THE IMPROVEMENT OF THE PREVIOUS POINTS AS WELL AS FOR THE SURVEY OF SCHOOL, HOSPITAL AND GOVERNMENTAL BUILDINGS OF STRATEGIC IMPORTANCE AND TO BE ABLE TO MAKE A DECISION FROM THE POINT OF VIEW OF THEIR VULNERABILITY.

- IT IS ALSO NECESSARY TO ESTABLISH A CLASSIFICATION OF RESIDENTIAL BUILDINGS TO DEFINE THEIR BEHAVIOR IN THE EVENT OF A MAJOR EARTHQUAKE. DETERMINE THE FRAGILITY CURVE OF THE COUNTRY'S TYPICAL BUILDINGS, BOTH THOSE DESIGNED WITH SEISMIC-RESISTANT CRITERIA AND THE SPONTANEOUS CONSTRUCTIONS MADE BY THE LOW-INCOME POPULATION.

- REQUEST ASSISTANCE FROM INTERNATIONAL ORGANIZATIONS FOR THE TRAINING OF PROFESSIONALS IN THE AREAS OF SEISMIC RISK.

5. From your organization's point of view, what measures for seismic risk reduction are needed in the country? What do you think is the current status of these measures/policies?

- TO CARRY OUT MICROZONATION STUDIES OF THE MOST IMPORTANT PROVINCES OF THE COUNTRY, ESPECIALLY IN THE AREAS OF GREATEST SEISMIC THREAT.
- CONTROL OF INFORMAL BUILDINGS.
- TO PRODUCE BROCHURES THAT ILLUSTRATE TO THE VERY LOW-INCOME POPULATION, WHO DO THEIR CONSTRUCTIONS, THE CORRECT WAY TO USE THE COMMON CONSTRUCTION MATERIALS AND EVEN PROVIDE THEM WITH VERY SIMPLE MODELS WITH SEISMIC-RESISTANT STRUCTURE
- IMPROVE SUPERVISION IN FORMAL CONSTRUCTIONS IN ALL ASPECTS.

6. What do you see as the challenges (e.g., institutional, technical) and obstacles to promoting these measures?

ALTHOUGH WE HAVE HAD QUITE RECENT IMPORTANT EARTHQUAKES IN OUR COUNTRY, IN 1946, PUERTO PLATA 2003 PREVIOUSLY MENTIONED AND IN ADDITION TO THE CATASTROPHIC EARTHQUAKES IN HAITI 2010 AND 2021, WE DO NOT PERCEIVE THAT THE AUTHORITIES ARE SUFFICIENTLY AWARE OF WHAT COULD HAPPEN TO US SOONER RATHER THAN LATER AND CAN MAKE A DECISION TO MINIMIZE THE EFFECTS OF THE EXPECTED EARTHQUAKE. THEY ALSO DO NOT ALLOCATE RESOURCES TO EVALUATION, RETROFIT, EDUCATION AND PREVENTION IN GENERAL.

THE POPULATION ALSO NEEDS TO BE MADE MORE AWARE OF OUR SEISMIC REALITY, JUST AS THE GOVERNMENT SHOULD PROVIDE BENEFITS TO THOSE WHO BUILD SEISMIC-RESISTANT CONSTRUCTIONS THROUGH INSURANCE AND LOWER TAX RATES. THIS IS THE BIGGEST CHALLENGE WE HAVE TO FACE.

7. JICA is planning to conduct a training program on Earthquake Resilience, mainly oriented to seismic vulnerability assessment, in your country. From your agency's point of view, what kind of training

topics do you think are desirable to promote earthquake resistance and why?

- TRAINING OF PROFESSIONALS IN THE AREA OF GEOLOGY, TECTONICS, SEISMILOGY AND SEISMIC ENGINEERING STUDIES, INCLUDING SOIL DYNAMICS, WHICH ALLOWS TO PERFORM MICROZONATION STUDIES AND SITE STUDIES.
- CONSTRUCTION TECHNIQUES AT ALL LEVELS FROM RESIDENCES TO MULTI-STORY BUILDINGS, BUT TAKING INTO ACCOUNT OUR IDEOSYNCRASY AND MATERIALS PRODUCED AND USED IN THE COUNTRY, WE DO NOTHING WITH FOREIGN TEACHINGS THAT DO NOT APPLY IN OUR COUNTRY.
- CONCEPTS, FORMULATION OF TECHNIQUES FOR VULNERABILITY ASSESSMENT OF BUILDINGS IN THE SAME WAY AS ABOVE, WHICH ARE ADAPTED TO OUR REALITY.
- NEW TECHNIQUES AND OPTIMIZE THE EXISTING ONES FOR SEISMIC HAZARD CALCULATION AND HOW TO APPLY THEM IN OUR COUNTRY, TO OBTAIN THE BEST RESULTS FOR OUR REALITY.

Thank you very much for answering the questions.

Loyola Polytechnic Seismological Observatory Questionnaire

The Dominican Republic is located in a zone with a high probability of earthquake occurrence, and historically, severe seismic events have occurred up to once every 50-60 years on the island of Hispaniola. Even so, there are many pending issues to be identified in the field of seismic risk reduction.

In this context, the Japan International Cooperation Agency (JICA) has received requests from the Dominican Republic for the creation of a three-year country training program on capacity building in seismic vulnerability assessment. However, JICA has limited experience in technical cooperation in this field in the Dominican Republic and has not accumulated sufficient information to prepare an effective training program.

The purpose of this questionnaire is to learn about the current situation and the challenges of seismic risk reduction and seismic strengthening of buildings. Responses to this questionnaire will be analyzed before individual interviews are conducted. Gathering sufficient information is an essential step in designing the training program and creating a roadmap to organize future actions. Your cooperation in this questionnaire will be highly appreciated.

Please enter your answers directly into this text file according to the questions. If the question is not applicable, please enter N/A as the answer. Any documents or materials supporting the answers or providing sources (including URL / source reference) would also be appreciated.

1. Contents of the questionnaire

Part 1: Respondent information

Part 2: Questions on the role of the OSPL and reflections on seismic risk reduction policies.

2. Shipping

Deadline: **January 14, 2021.**

3. Questionnaire

Part 1: Respondent information

Name	Javier Rodriguez
Position	Director
Institution	Seismological Observatory of Loyola Polytechnic Institute (OSPL)
Date	January 4, 2022

Part 2: Questions on the role of the OSPL and reflections on seismic risk reduction policies.

1. **What is the role of your organization in promoting earthquake Disaster Risk Reduction (DRR), such as supporting the implementation of seismic risk assessments, developing the seismic observation network and providing seismic observatory data to the government, providing training programs for government officials?**

   Our role is basically informative, in that it records all seismic activity on our island and its surroundings. It also analyzes these records, interprets them and publishes them every time a significant earthquake occurs. This data and its interpretation is published in our portal: ospl.ipl.edu.do.

2. **What do you consider to be the characteristics of the country's faults and the potential risks associated with earthquakes that may occur in the future?**

   Our island has 5 to 6 active faults of certain importance: Los Muertos, Enriquillo, San Juan-Los Pozos, Septentrional, Bahoruco, etc. where earthquakes have occurred in the past. These faults are basically of the "Transpressional or Inverse" type. All except Los Muertos are located within the island. The most important fault in our opinion is the North Hispaniola Fault or Plate Boundary between the Caribbean and North America that runs about 20 km north of the island, this fault is Inverse and its hypocenters are deepening in a southerly direction towards the center-east of the island.
   The main risks are more related to the most vulnerable regions (large populations with poor construction) in the Cibao Valley or where construction has taken place on very soft soils. The risk in these sites is more for vulnerability than for a moderate or major earthquake (Ml 6.0-8.0).

3. **From your organization's point of view, what seismic risk reduction policies/measures are needed in the country? What do you think is the current status of these measures/policies?**

   First of all, the education of the population in schools, colleges and universities through the incorporation of subjects related to natural phenomena. In universities, within the career of Civil Engineering, to reinforce the curriculum with appropriate topics of structural dynamics. In public institutions regulating civil works, courses on the correct application of the updated seismic regulations.

4. **What do you see as the challenges and obstacles to promoting these measures?**

   That the state authorities have the willingness to enforce these standards and that they have qualified technical personnel in the area of civil engineering and earth sciences.

5. **What is the current status of the seismic observatory network in your country? What type of information (e.g., epicenter, magnitude, seismic intensity, etc.) is collected and shared? Please also provide information on the extent of information sharing (e.g. relevant governments, public entities and citizens).**

The OSPL network has 15 seismographs of its own and has real-time access to some 12 additional seismic stations from different countries and institutions. Tremors from magnitude 1.0 with hypocenters and Local (Richter) magnitude are located daily. When sufficient information is available, the focal mechanisms are determined and the acting fault/fault is interpreted. All this information is continuously published in our Portal to which the general public has access. This information is also sent via e-mail to the main authorities of the Dominican Seismic Table as well as to the different seismology experts of the Caribbean and other countries related to our seismological investigations.

6. How is the network developing and what are the remaining challenges to be addressed in the network?

The OSPL network is more concentrated in the southwest and northwest of our country, with less dense deployment of seismographs in the east and south central which is intended to be enlarged to cover the entire Dominican territory. Our challenges would be to have more prepared technical personnel (our country does not have any career seismologist), as well as to improve the crustal model for a better localization of the hypocenters. The acquisition of broadband seismographs would also be important for our studies to be more complete. All of our 15 seismographs are Short Period.

7. JICA is planning to conduct a training program on earthquake resistance (design, construction, seismic-resistant evaluation, etc.) in your country. From your agency's point of view, what kind of training topics do you think are desirable to promote earthquake resistance and why?

Training of Dominican seismologists. But neither courses nor diplomas, Masters and doctorates in seismology properly that can lead a competent national seismological network. The knowledge of the faults, the tectonics of the island, its link with the purely seismic aspect are fundamental for the realization of a probabilistic study of seismic risk and therefore for the optimization of a seismic code for construction.

Thank you very much for answering the questions.

3.　ヒアリング議事録

Meeting Record

Project Name	JICA Information Collection Survey to design and implement an efficient knowledge Co-creation program for"Strengthening Capacity for Seismic Evaluation of Buildings in the Dominican Rep."	
Meeting purpose	Project Explanation from JICA Project Team	
Date	December 16th, 2021	
Time	8:00-10:00 am DR time/21:00-23:00 (JST)	
Location	Online Meeting (Google Meet)	
Attendees	ONESVIE Director General Planning and Development Dep. Scientific Engineering for EQ Dep.	 Mr. Leonardo Reyes Madera (LR) Ms. Camila Gutier Mr. Pedro Ivan Marquez
	JICA DR Office	Ms. Sachiko Komiyama (SK) Mr. Huascar Pena (HP)
	JICA HQ	Mr. Kenichi Sasamori (KS) Dr. Toshiaki Yokoi (TY)
	JICA Project Team	Mr. Ryoji Takahashi (RT) Dr. Akio Hayashi (AH) Mr. Seiichiro Fukushima (SF) Ms. Yuki Tomita (YT) Ryota Sunakawa (RS) Ms. Ashley Morales (AM)
Note taker		RS

The purpose of this meeting was to introduce the survey and its methodology/timeframe, and ask initial questions.

Agenda

1. Self-introduction
2. Introductory of the survey
3. Question from ONESVIE
4. Questions from JICA project team
5. Next steps

Record

1. **Question and comments from ONESVIE**

   a. Comments in general from LR

   In response to the presentation given by RT, LR explained that this year, he is reorganizing the office to introduce new functions and essences (other than evaluation). He commented that this survey will help identify what aspects (functions) should be strengthened in ONESVIE to make a quick response to the national problems, in terms of earthquake DRR.

   LR also shared that ONESVIE is planning to develop its own methodology for evaluation of seismic vulnerability of infrastructure and lifelines, since the Dominican Republic (DR) has a particular way of conducting it. He commented that the inputs from Japan side will help

develop this as well.

RT responded by commenting that the result of this survey will be used to understand DR's situation and implement the knowledge co-creation program.

b. Self-Introduction from ONESVIE members

Ms. Camila Gutier (CG) and Mr. Pedro Ivan Marquez (PM) from ONESVIE also attended this meeting. Ms. Gutier is the head of the Planning and Development department and she is also a JICA ALumini, and had training in Japan on safe and economic housing. Mr. Marquez is a civil engineer and the head of Scientific Earthquake Engineering Department. He recently participated knowledge co-creation program online on disaster prevention of buildings.

2. Questions from JICA project team

a. Focal Point and Staff Attendance from ONESVIE

RT requested LR to appoint 1 focal point, and also have 1 staff attend each interviews in order to centralize the information collected to ONESVIE. LR confirmed the two requests. HP confirmed with LR that he will make internal consolation and inform the JICA Project Team (the team) about the focal point. RT added that the JPT's focal point is Ms. Ashely Morales.

RT asked how the team can communicate with ONESVIE. LR expressed that while he will assign the focal point, he will try to participate in each encounter. AM interpreted that she will contact ONESVIE in person and that LR will redirect her.

b. How to Contact the Institutions (Possible Interviewees)

RT asked HP if he had the contact information listed. HP suggested that the better way is to take advantage of the Seismic table because all the institutions listed in the presentation belongs to the board as well. He added that the Seismic Table is conducted by ONESVIE, and has a meeting on Tuesday every month. HP suggested that the team should participate in the meeting to introduce the survey and make direct contact to the institutions. LR also agreed with this approach.

c. Schedule of the Preliminary Meeting

HP asked LR if it is possible to schedule an extraordinary conference. LR agreed to this. RT responded that the team would like to propose January 7th, 2022. LR and CG suggested RT to propose 2 dates since, the Seismic Table does not have a conference in January. They suggested January 11th, 2022 for the second date. In result of the discussion with ONESVIE, the project team proposed January 7th and 11th as the date for the preliminary meeting.

RT explained to LR that the meeting will take about 1 to 1.5 hours to make the presentation and afterwards ask some questions. He also added that the time difference needs to be considered as well. LR stated that the office starts at 10am (11pm in Japan). RT asked if it is possible to hold it earlier. LR replied that they will make it possible, and AM and HP confirmed this.

With the Preliminary Meeting to be scheduled on Jan 11th, RT stated that the interview with ONESVIE will be shifted to Jan 12th from Jan 11th.

d. Recommendation for Possible Interview

RT asked ONESVIE if they had anymore suggestions for the interviewees and if they knew if the Office of Civil Defense (OCD) takes part in disaster prevention, for example the formulation of disaster management plan and implementation of risk assessment. LR expresses that OCD, with Emergency Operation Center (COE) works mainly in disaster response, but they need to look into it deeper to find out about the rolls related to disaster prevention. HP added that EOC should be in the list of possible interviewees.

HP suggested that COE should be in the list as well. AM is supported this suggestion. RT replied that if COE is oriented to disaster response, the team does not to conduct an interview with them. HP agreed to this, but added that EOC participates and coordinates the drills, in terms of preparedness. HP also pointed out that the MOPC and MEPyD are a large institution with many areas, and suggested Ms. Morales to select the department that is related to this survey.

e. How to distribute the Questionnaire

RT asked ONESVIE for their support in distributing the questionnaire to the representative of the Seismic Table. LR agreed to support, but he also suggested that the requirement (for the questionnaire) should come from Japan, directly. He explained this way, the questionnaire will be taken into more consideration. HP also agreed to this hybrid approach.

RT added that the questionnaire will have an introductory that explains that the survey is being implemented by ONESVIE.

f. Information on the Current DRR Plans

CG shared that the National Disaster Risk Reduction Plan (NDRRP) and the Earthquake Disaster Risk Reduction Plan (EDRRP) are going to be revised under the new law for DRM, which is currently under revision. She has also mentioned, that with the new law, the 2 plans will be aligned to the Sendai Framework.

RT asked CG if the draft of the new law is accessible. CG replied that general director of ONESVIE can make an official request to Ministry of Economic Planning and Development (MEPyD) to gather the drafts and information. LR agreed to this.

CG also explained that the revision is an open process and the draft will be open before the submission of the law, but it is currently in the middle of the consolidation process. She also added that different workshops with various stakeholders are being held to collect comments. CG also added that the revision is led by MEPyD with the sponsor from Japan Funds through IDB.

g. Information on the Current Status of Seismic Risk Assessment and Disaster Management Plan (DMP)

RT explained that the team is aware that there is a national level DMP and that UNDP supported the formulation of the Comprehensive DMP. He pointed out that risk

assessments (such as micro-zonation, deterministic approach, and probabilistic approach, and hazard mapping) is not included in the documents above. RT asked if the local government is responsible for risk assessment and formulation of DMP.

1) Risk Assessment

LR mentioned that two hazard studies were conducted by SODOSISMICA, for the formulation of the code in 1979 and 2008(2011?). He added that after the Haiti EQ in 2011, the United States Geological Survey (USGS) made a hazard map for the island and with this result, the hazard map made in 2008 was adjusted. In 2015, through the SGN (National Geological Survey), with the collaboration with SODOSISMICA and French Geological Survey (VRGM), a seismic microzonation study was developed for the Great Santo Domingo Area. The study also resulted into another hazard map and the acceleration levels were taken from the Santo Domingo Area. The microzonation study is available on the SGN webpage and the hazard studies by SODOSISMICA for the 2011 code, can be requested to SODOSISMICA. LR also mentioned that there is a microzonation study done for the City of Salcedo conducted by SODOSISMICA and an Italian corporation, and it is available online. The microzonation study for Santiago de los Caballeros was started by SGN but is not completed.

Considering these information, RT ask what contents (for example building collapse, human casualty) are included in the microzonation study. s. AM added that from her experience, it has been tried in ONESVIE, but not realized.

2) Formulation of DPM in Local Government level

CG explained that ideally, it is expected for the local government to develop their own risk management plan according to the new law and plans. However, strengthening the capacity of the local government to develop the plan with the Local Committee of Prevention, Mitigation and Response (PMR) is in poor process. CG added that this is why the territorial tables (commissions) are to be developed under the new law, in order to pass this responsibility to the local governments.

RT pointed out that UNDP has supported the development of DPM in many countries, and asked if this is applicable to DR as well. LR replied that UNDP is supporting ONESVIE in the revision? of the National Plan for EDRR, and as an office they have identified the vulnerability of structures at the local level. He has mentioned that over 6000 schools may suffer in a collapse and 2 million children are in danger.

h. Information on Seismic Design

SF asked if the acceleration is applicable to all the structures including infrastructure and lifelines. LR replied that it includes both lifelines and infrastructure, and it is included in the different return periods; 475 yrs. for the buildings and 2045 yrs. for the lifelines and main infrastructures. SF asked if the seismic guideline for the buildings and infrastructures employ

the same wave motion map. He added, that he wanted to know if his understanding that the same wave motion is the referred to when designing buildings and infrastructure is correct. LR replied that his understanding is correct.

i. Existence of Other DRM Tables

RT pointed out that ONESVIE is the leading organization of the Seismic Table. With this, he asked if there any other tables for the disasters other than earthquake. LR responded that the other institutions deal with the other hazards in general terms, such as SGN deals with landslide, but are oriented to response and preparedness. COD and EOC are the only ones touching these aspects. He concluded that there are no similar institutions to ONESVIE.

Next steps

- ONESVIE will inform the project team their focal point
- The preliminary meeting is to be schedule at Jan 7th and 11th, 2022
- Items that need to be requested are;
  - draft of the new law (to MEPyd from ONESVIE)
  - hazard studies by SODOSISMICA for the 2011 code (to SODOSISMICA)
- Items that are available online are;
  - 2015 microzonation study developed for the Great Santo Domingo Area (SGN website)
  - microzonation study developed for the City of Salcedo (SOSOSIMICA website)

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T**his meeting record is made by JICA Project Team and not checked by other participants"**

Meeting Record

Project Name	JICA Information Collection Survey to design and implement an efficient knowledge Co-creation program for“Strengthening Capacity for Seismic Evaluation of Buildings in the Dominican Rep.”	
Meeting purpose	Preliminary Meeting	
Date	January 11th, 2022	
Time	8:30-10:30 am DR time/21:30-23:30 (JST)	
Location	Online Meeting (Google Meet)	
Attendees	ONESVIE	
	Director General	Mr. Leonardo Reyes Madera (LR)
	Planning and Development Dep.	Ms. Camila Gutierrez
	Co-Creation Program Participant	Mr. Felix Noel Amparo (FA)
	〃	Mr. Uri Rolando Rodriguez (UR)
	Seismic Table	
	Advisor of the president	Mr. Romeo Llinás (RL)
	CNS	Mr. Ramón Delanoy
	MEPyD	Mr. Peter Sanchez
	MINERD	Mr. Diego Bautista Gómez (DB)
	〃	Mr. Carol Lisbeth Pujols Castillo
	MIVHED	Ms. Vivian Reyes
	〃	Ms. Giselle Mahfoud
	〃	Ms. Iliana Gallardo (IG)
	MOPC	Mr. Nestor Julio Matos Ureña (NM)
	MSP	Ms. Johanna Thomas Oreste
	OSPL	Mr. Javier Rodriguez
	SGN	Mr. Edwin García Cocco
	SODOSISMICA	Mr. Hector O’Reilly
	SODOGEO	Mr. Eduardo Verdeja (EV)
		Mr. Dino Rodriguez
		Ms. Margarita Gonzalez de Pena
		Mr. Modesto Martinez
		Ms. Zoraida Disla Morales
	JICA HQ	Mr. Kenichi Sasamori (KS)
		Dr. Toshiaki Yokoi (TY)
	JICA DR Office	Mr. Huascar Pena (HP)
	JICA Project Team	Mr. Ryoji Takahashi (RT)
		Dr. Akio Hayashi (AH)
		Mr. Seiichiro Fukushima (SF)
		Ms. Yuki Tomita (YT)
		Ryota Sunakawa (RS)
		Ms. Ashley Morales (AM)
Note taker		RS

The purpose of this meeting was to introduce the survey to the members of the Seismic Table and have an open discussion.

Agenda

1. Introductory of the survey
2. Presentation on Earthquake DRR
3. Open Discussion

Record

1. Introductory of the survey

RT gave a presentation to introduce the survey.

2. Presentation on Earthquake Disaster Risk Reduction

SF and RS gave a presentation on Earthquake Disaster Risk Reduction in Japan.

3. Open Discussion

a. Comments to the Presentation

RL commented that the members of the Seismic Table with the leadership of ONESVIE could take in what is given from this project with the support of JICA and the Japanese Government. RT replied that the result of this survey would help to design effective knowledge co-creation program. LR commented that the measures presented are suited for realization. He also confirmed that Dominican Republic (DR) is on the same path and wants to implement the measures.

b. Building Permit

RT asked who implements the building permits for public and private.

IG (from MIVHED) answered that for the new construction of housing, documents on the technical studies and memories supporting the calculation are required for submission. After the submission, MIVHED gives permission. LR added that for the public buildings and infrastructure did not require approval from the MOPC. For this reason the government's construction of schools, hospitals, and lifeline/infrastructure built by the government was not regulated. LR expressed that he is looking forward to MIVHED taking care of building regulations and permit.

RT asked if MIVHED or the local government grants all private construction permission. IG answered that currently, all documents are sent to the central office (MIVHED) and regulated there. She also added that MIVHED plans to certify and qualify offices for building permission. The number of officers dealing with the permission is not made clear yet.

c. Building Material Quality Standard

RT asked if there were any building material quality standards.

NM (from MOPC) answered that there is some control for the steel and concrete. For concrete used in private projects, the mixture is required to match the technical specifications, and also samples are taken to check the quality. For steel, the requirements are given in the regulation named NORDOM 458. RT asked for references on the two regulations. NM shared the link for NORDOM 458 and stated that there are no documents for concrete quality control. IG explained that in both R-028 and R-027, there are requirements for the quality of the material.

RL stated that the country has documents and guidelines. However, there are not necessarily applied.

They have found concrete buildings that need steel reinforcement because of poor quality. He concluded that the follow-up for control is not sufficient.

d. Inspection of Construction

RT asked if there were any inspection or monitoring systems. IG explained a regulatory system for before, during, and after construction inspection. However, the effectiveness is to be further discussed. HP highlighted that they would like to know Japan's experience on this.

DB (from MINERD) highlights that the country needs to strengthen the capacity of the institutions, for example, the participation of the local government sector to supervise the school, and also the consequence scheme for the institutions and individuals who do not follow the regulations. HP highlighted that the implementation of the monitoring system had been a challenge due to the number of buildings. IG explained that MIVHED has a plan to qualify professionals, internally and externally, and to also train and qualify supervision in order to approach a significant amount of projects. RT shared that the inspection system is spread to the private sector in Japan. HP commented that the training program could strengthen MIVHED's plan.

FA commented that the vulnerability in the DR is the lack of awareness in terms of earthquake risk, especially actions towards earthquake-resistant construction. He also added that ONESVIE is taking steps towards awareness. However, approach against buildings that are commonly built informally is insufficient.

e. Others

EV (from SODOGEO) asked the team if they will have an interview with the other institutions that are not scheduled for interviews. RT replied that they will ask to provide several references and will coordinate the interviews, if found necessary.

Next Steps

- Individual Interviews with ONESVIE, MOPC, MIVHED, MEPyD, MINERD, MSP, and Participants of the Knowledge Co-creation Program

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T**his meeting record is made by JICA Project Team and not checked by other participants"**

Meeting Record

Project Name	JICA Information Collection Survey to design and implement an efficient knowledge Co-creation program for"Strengthening Capacity for Seismic Evaluation of Buildings in the Dominican Rep."	
Meeting purpose	Interview with ONESVIE and the participants of 2021 Knowledge Co-creation Program.	
Date	January 12, 2022	
Time	9:00-11:00 am DR time/22:00-24:00 (JST)	
Location	Online Meeting (Google Meet)	
Attendees	ONESVIE Director General Planning and Development Dep. Head of Research and Development	 Mr. Leonardo Reyes Madera (LR) Ms. Camila Gutierrez Mr. Cesar David Mendez Mr. José Cordero Ms. Zoraida Disla
	Co-Creation Program Participant	Mr. Felix Noel Amparo (FA) Mr. Uri Rolando Rodriguez (UR)
	JICA DR Office	Ms. Sachiko Komiyama (SK) Mr. Huascar Peña (HP)
	JICA Project Team	Mr. Ryoji Takahashi (RT) Dr. Akio Hayashi (AH) Mr. Seiichiro Fukushima (SF) Ms. Yuki Tomita (YT) Ryota Sunakawa (RS) Ms. Ashley Morales (AM)
Note taker		RS

The purpose of this meeting was to obtain further information from ONESVIE and the participants of 2021 Knowledge Co-creation Program.

Agenda

1. Short Introduction of the Project
2. Questions from JICA project team to ONESVIE
3. Questions from JICA project team to Knowledge Co-creation Program

Record

Questions from JICA project team to ONESVIE

RT explained that the interview will be conducted based on the questionnaire they have received from ONESVIE.

a. General Measure for Earthquake DRR

When will the revised National Risk Management Law be enacted and could the draft be share with the team?

CG explained the overview of the revision process. She explained that the law is under consolidation process, and the second round of revision is undergoing at the regional level. Currently, the external consultant is gathering the information, and the draft of the law will be sent to the institutions that

have participated in the process. LR agrees to send a letter to the Directorate of Risk Management, which is the leading institution for the update, to obtain the current draft of the law. Also, CG confirmed that MEPyD is responsible for finalizing the law. RT replied that the team would give a request to MEPyD at the next interview. CG added that the law is being updated by IDB, with support from the Japan Fund.

Is the National Disaster Management Plan under revision?

CG confirmed that they would share the current draft of the Plan for Earthquake Risk Reduction. She also explained that the National Plan was updated in 2017 to align with the Sendai Framework, and it is planned to be published in 2022.→Received on 12 January.

Does ONESVIE have an annual budget for promoting earthquake-resistant buildings and infrastructures?

LR explained that ONESVIE does not have a specific budget for those tasks (planning, designing, development). They have asked for a readjustment of the budget to the president. However, it has not been approved yet. The current budget is dedicated to employees and services.

RT asked which institution had the budget to do this activity. LR answered that no institution has a designated budget for neither retrofit nor seismic design. The institution that is supposed to lead this activity is ONESVIE, but it does not have the budget. This is because for the past 16 years (until 2020), the institution was oriented to services, not technical measures. He has been trying to reorganize the institution with technical people, build capacity, and request the budget for earthquake-resistant design and retrofit.

LR confirmed that currently, no institution is implementing retrofitting for public buildings. However, he plans to start the process of retrofitting hospitals and schools. The budget is not assigned yet. ONESVIE will prepare the plan. ONESVIE is in the process of determining which hospitals to be prioritized, and the schools to be retrofitted are already identified. The fund may come from the responsible ministry because ONESVIE is not an institution for construction. RT asked if the retrofitting plan is being prepared for infrastructures and lifelines. LR replied that the plan now includes Government buildings. He also added that institutions have focused mainly on buildings but plan to expand to infrastructures and lifelines.

Could you provide us with the regulations or laws that define the roles of Seismic Table?

LR explained that the Seismic Table was an initiative by the former director of ONESVIE, and it was informal. Now, an agreement is being created. CG will share the draft.

Could you provide us with the information regarding percentage of private buildings that comply with the seismic code?

LR answered that MOPC may have information on this. Regardless of the participation of the government, private sectors have retrofitted private schools and offices, after Haiti Earthquake.

Could you provide list of donors and projects?

LR answered that it is possible to provide the list.

What are the details of the project for 2020, implementing with JICA?

HP explained that it is a series of support, such as providing training under the knowledge co-creation program and sending senior volunteers.

What is the current status of the laboratory and what do you expect?

LR explains that the ONESVIE's laboratory takes place in an old rented house. They are currently for a larger place in an industrial setting to perform the material test and scale test. At a recent meeting, CISMID (Centro Peruano Japonés de Investigaciones Sísmicas y Mitigación de Desastres) shared with them technical drawings of their laboratory. ONESVIE is trying to get support for the construction.

CM explained that some activities are concrete core compression tests, ultrasound non-destructive tests, and geotechnical tests. However, there are limitations. LR added that the current laboratory does not have the space for new equipment. ONESVIE is undergoing the certification process.

b. Seismic Retrofitting of Buildings

Is there are a plan to prepare the Seismic Retrofitting Standard for buildings?

LR answered that the standard is in plan but, it is not clear whether MIVHED or ONESVIE will lead the update of current code. He also highlighted that they need advisory and education for this type of code. He also added that the codes that are used for retrofitting are American ones (international codes)

c. Construction of New Infrastructure and Lifelines

Are there any specific code for the structure of infrastructure?

LR explained that there are guidelines for the highway from MOPC, the R-012, and the R-014. However, they are very old. For the design of bridges, it uses the AASHTO standards. Currently, the R-001 and the codes regarding the highways are being updated by a company from IDB and an Argentina company. The code needs to be accepted by the ministry. LR also added that, unlike previous updates, SODOSISMICA was not included, so he is not sure if the updates will be accepted.

Is R-001 applied to infrastructure as well?

LR answered, that R-001 is applied to infrastructure and lifeline. He also highlighted that this is one of the major updates from 1979 code to the 2011 code. In the update, they included the acceleration map of three return periods to be utilized for the design of infrastructure and lifelines.

What international code is used for infrastructure?

LR agreed to fill the table.

In addition, LR explained that the design criteria for R-001 is mostly focused on buildings. However, for the infrastructure and lifeline, the acceleration map and some other particular international codes are used for the criteria. SF asked what international code is used for each infrastructure.

Is the R-024 of geotechnical studies to applicable to buildings as well as linear structures?

LR answered that the R-024 is also under revision. AM suggested that the latter topic could be discussed with MOPC.

d. Seismic Strengthening of Infrastructure and Lifelines

Why is there no current design standard for infrastructure and lifelines? Is there no new construction, or are old standards still used?

LR explained that the earthquake-resistant design was mainly focused to buildings in the DR. After the update in 2011, the design of infrastructure and lifeline has been taken into consideration.

e. About the Requested documents

LR and CG agreed to send at least one file for each document requested. AM will send the list to ONESVIE. RT asked if they can send documents on the budget trend of ONESVIE. LR replied that they are working on a new budget and organization structure, and he can share a draft version of it.

Questions from JICA project team to Knowledge Co-creation Program

What kind of program do you think is necessary? Including negatives from the previous program.

LR answered that they would first request training on the latest Japanese method for vulnerability evaluation and seismic diagnosis of building, infrastructure, and lifeline. He also asked for documents on these methods. In addition, they would like a collaboration with Japan to write the retrofitting code for seismic evaluation of buildings, lifelines, and infrastructure. RT answered that the team needs to consider sharing this information through this survey or the knowledge co-creation programs.

FA replied that the program's highlight (in 2021) was the participation of local authorities and the incentives for private sectors to construct buildings with earthquake-resistant measures. RT asked FA If there were any other requests for the program. FA commented that he wished he had more time since the discussion was limited due to the time constraint.

UR replied that in his case, his course was focused on a concrete structure, but he would like to have learned more about steel structure as well. He also explains that one of the takeaways was the topic of the promotion of seismic risk (awareness) through the children. He added that Dr. Nobuo Fukuwa gave the presentation. He highlights, as the negative, that they could not access the provided references and conferences after the program due to copyrights. FA also agreed to this comment.

RT asked what the schedule (timeframe) was for the program. FA answered that it was 2 to 3 hours/day.

Other

RT explained the final report and roadmap. RT explained that they would prepare a roadmap for the survey. He explained that the roadmap would be a table that includes the current situation, challenges, and future directions in earthquake DRR. RT added that they would ask ONESVIE to

confirm the contents.

Next steps

- ONESVIE agreed to help prepare the following
  - Draft of the Plan for Earthquake Risk Reduction.
  - Draft of agreement that define the roles of the Seismic Table
  - List of projects of other donors
  - Information on international codes used for infrastructure and lifeline
  - Other documents requested on the questionnaire
- The team will ask MEPyD about the following
  - the revision of the National Risk Management Law
- The team will ask MOPC about the following
  - percentage of private buildings that comply with the seismic code
  - applicability of R-024 of geotechnical studies

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T**his meeting record is made by JICA Project Team and not checked by other participants"**

Meeting Record

Project Name	JICA Information Collection Survey to design and implement an efficient knowledge Co-creation program for"Strengthening Capacity for Seismic Evaluation of Buildings in the Dominican Rep."	
Meeting purpose	Interview with MIVHED	
Date	January 14, 2022	
Time	9:00-10:30 am DR time/22:00-23:30 (JST)	
Location	Online Meeting (Google Meet)	
Attendees	MIVHED Vice Minister Vice Ministry of Codes and Regulations	 Ms. Vivian Reyes (VR) Ms. Illiana Gallardo (IG) MS. Giselle Mahfoud (GM)
	JICA HQ	Mr. Kenichi Sasmori
	JICA Dominican Republic Office	Mr. Huascar Pena (HP)
	JICA Project Team	Mr. Ryoji Takahashi (RT) Dr. Akio Hayashi (AH) Mr. Seiichiro Fukushima (SF) Ms. Yuki Tomita (YT) Ryota Sunakawa (RS) Ms. Ashley Morales (AM)
Note taker		RS

The purpose of this meeting was to obtain further information from MIVHED.

Agenda

1. Short Introduction of the Project
2. Questions from JICA project team to MIVHED

Record

Questions from JICA project team to MIVHED

RT explained that the interview will be conducted based on the questionnaire they have received from MIVHED.

a. Questions about general measures for earthquake DRR

Is MIVHED responsible for implementing the actual construction of structures?

VR explained that the ministry does not build, but prepares all the building document and guides how the private sectors should perform the construction. GM explained the functions (building process, permission, and supervision) of the Vice Ministry of Construction are stated in Article 32 of the law that creates MIVHED.

Which roles of MOPC are transferred to MIVHED?

GM replied that it is stated in Article 77 and that MIVHED will do all the permits regarding buildings, and permits regarding infrastructure, port facilities, etc. will remain with MOPC. VR

added that there are 3 Directorate in MIVHED from MOPC which are; Directorate of permit, Directorate of inspection, Directorate of regulation and code. However, only the roles for buildings are transferred to MIVHED.

What roles are duplicated regarding DRR?

IG explained that the institutions that confirm SN-PMR (National System of Prevention, Mitigation and Response) have their own DRR plans and lack cooperation and clarity. Also the limitation of COE and COD are not well defined.

Details on informal construction

RT asked if "informal construction" refer to buildings that do not comply with the building codes. GM replied, that informal construction refers to buildings that have not completed the permit, inspection and application of the code process.

RT asked how the ministry approach these informal constructions. IG replied that there is a future plan to integrate to the formal construction, GM explained that in Article 81 of the law, there are specific measures against construction that fail to submit technical document. VR explained that there are two focuses against these construction; 1) The ministry does not have a code to approach the code, 2) The ministry has plans to evaluate projects. First, supervisors from the ministry inspects the project and if the project does not have a license or permit an evaluation is conducted. The evaluation examines if the project can be still fixed to compile with law and code. VR highlights that the main problem is that the ministry dedicates a lot of time on the judiciary part, in order to take legal action against the owner of the project. So, she is looking forward to work with the legal power of the country. VR also explains that the ministry is trying to identify which constructions did/did not pass the needed process. She also added that most of the informal constructions are located in highly vulnerable places, such as riverbeds and highly populated areas.

b. Questions Regarding Institutional systems, Regulations, and Planning

Does MINERD conduct the evaluation of public buildings after the earthquake?

VR replied that this role belongs to ONESVIE.

Are there any other guidelines for R-001?

VR explained that government buildings, hospitals, and schools are currently regulated through the vice ministry of construction and have a different focus and process from the private projects. Also, there are plans to amplify the code to include more details for schools and hospitals. However, there are no future plans to prepare guidelines for other buildings.

Is "the development of Dominican Republic's building code" referring to the revision of the building code with IDB?

GM explains that they are developing an integral local code that compiles all the individual codes, similar to the IBC (international building code). HP added that JICA are in coordination with the

corporation from IDB on this.

RT asked what do GM meant by "wider area?" VR explained that the term definition is not specified between MOPC and MIVHED yet. She also added that both MIVHED and MOPC have a National Technical Council for regulations and code; CONARPET and CONARTIA. The one in MIVHED deals with only buildings and the other deals with only infrastructures.

Inspection and Supervision of the Construction

IG explains that site visiting inspection is conducted after the construction license is given. MIVHED will inspect partially and give a document each time. After the completion, a certificate is distributed. IG added that R-021 is the code that specifies the process. VR highlights that there is private supervision to meet the demand.

Who is responsible for the retrofitting of public buildings (government, hospitals, schools) ?

VR explained that MIVHED is not the responsible body for this. She also added, they do not have information on the structural retrofitting of hospitals. IG replied that ONESVIE is in charge of conducting the evaluation.

c. Questions on encouraging private sector participation

What is the status of insurance system and what disasters does it cover?

VR replied that she will reply to this later.

Is the "Home Improvement and/or Reconstruction" for disaster prevention?

VR explained that this improvement is for the general components such as doors, roofs, floors, etc in means of function. She added that if they identify vulnerability through the visual assessment, they will try to improve it as well.

What kind of support is provided in the "Support for Home Improvement"?

IG replied that it includes loans and physical improvement to the house. She added that this project is led by the Ministry of Presidency (central government).

Awareness of the Permission Process at the residential level

RT asked if MIVHED have promoted actions for DRR. VR explained that they currently do not have a plan to promote earthquake resistance with the local residents to build awareness for earthquake-resistant housing. She also added that the building owners of informal construction did not recognize that MIVHED is the institution they need to receive approval from, not the local government. Therefore, she will explain to the building owners and the Code Department has the responsibility to explain why it is needed to compile with the code. VR explained that the informal construction is referring to single family houses. VR also highlighted that the local government is responsible for approving the land use and this permission is given with the submission of the architectural drawing. Some residents thought that this is the only permission they needed for

construction. However, the technical inspection is done by MVHED (the central government).

Next Steps

- MIVHED agreed to try to gather further information on the following
  - Insurance system

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"This meeting record is made by JICA Project Team and not checked by other participants"

Meeting Record

Project Name	JICA Information Collection Survey to design and implement an efficient knowledge Co-creation program for"Strengthening Capacity for Seismic Evaluation of Buildings in the Dominican Rep."	
Meeting purpose	Interview with MEPyD	
Date	January 17, 2022	
Time	8:30-10:00 am DR time/21:30-23:00 (JST)	
Location	Online Meeting (Google Meet)	
Attendees	MEPyD	Mr. Peter M. Sanchez (PS) Mr. Dionys De la Cruz (DC) Ms. Maria Betania Roque Quezada (MB)
	JICA HQ	Dr. Toshiaki Yokoi
	JICA DR Office	Ms. Sachiko Komiyama (SK) Mr. Huascar Peña (HP)
	JICA Project Team	Mr. Ryoji Takahashi (RT) Dr. Akio Hayashi (AH) Mr. Seiichiro Fukushima (SF) Ms. Yuki Tomita (YT) Ryota Sunakawa (RS) Ms. Ashley Morales (AM)
Note taker		RS

The purpose of this meeting was to obtain further information from MEPyD.

Agenda

1. Short Introduction of the Project
2. Questions from JICA project team to MEPyD

Record

Questions from JICA project team to ONESVIE

RT explained that the interview will be conducted based on the questionnaire they have received from MEPyD.

a. General questions

What is the main responsibility of MEPyD?

PS replied that MEPyD works with National Plan for Risk Reduction in the country, and the main role is to promote the inclusion of disaster risk reduction (DRR policies in the strategic plans. These strategic plans are 4 years long and they must be aligned to many criteria such as gender, environment, landuse, etc. So, the ministry is overviewing all the government institutions to see if they are including DRR in their yearly actions.

b. Questions Regarding Institutional systems, Regulations, and Planning

What is the position of the strategic plan?

DC points out that in the National Strategy of Development, in axis 4-action2, it is highlighted that efficient DRM must be pursued in the individual strategies. MB explains that the directorate of Disaster Risk Management is a new directorate, and they set the baseline for DRR in the country. Their main role is to go transversely to all the institutions in DR, so that they include DRR. From this year, they will give direct support and develop tools to generate risk information with respected companies.
AM shared the (Long Term) National Development Strategy. AM explained that this is the executive strategy that the strategic plans developed by the institutions, must be aligned with.

Have MEPyD developed any other strategy plan?
PS answered that the ministry is working on the legal framework of DRR (the DRR law) and have made constellation with 9 sectors to revise the law. DC shared the list of sectors which are; 1) Sectoral planning roundtable for DRM and Climate Change, 2) Table for territorial resilience: Municipalities and cities, 3) Emergency and Disaster Management Committee, 4) Disaster Risk Management and Climate Change Financing Roundtable, 5) Table of Humanitarian Aid, 6) Social Protection Roundtable, 7) Disaster Risk Analysis and Information Board, 8) Table of Consequence Regime - audit and control of disaster risk management, 9) Table of Articulation of DRM with cross-cutting axes and selected strategic sectors.
RT asked if the draft of the new DRR law is accessible. PS replied that, the consolidation process finished in December (2021) and they will consult Ms. Mercedes to see if they can send the draft to the team.

Details on the strengthening of institutional capacity to incorporate DRR in the planning at the local level
PS explained that MEPyD is strengthening the internal process of both the sectorial level and territorial level institution, and guiding them to include DRR in the strategic plan. DC added at the territorial level focus, they are undergoing a bottom up process (in order from municipal, provincial, national). The main challenges are the finance and the technical capacity for DRR in the local government level. DC highlights that for this reason, a policy that make sure that the local government has the budget for DRR needs to be taken into consideration. He added that currently the budget for DRR in the local government is very small.

Details on land-use planning at the local level
RT asked if MEPyD is working with the local government. DC answered that the ministry is providing support to the local government and that 25 municipalities have been prioritized to develop land-use planning for DRR and create the Development Council.
RT asked what kind of disaster is considered in the land-use planning at the local level. DC replied that the land use is mainly focused on the agricultural land-use because it is the main economic resource. Now they are updating the National Plan for Land Use and Planning, so that each type of soil have its own adequate use, with a multi hazard focus. MB answered that the ministry have

identified gaps in the local planning and through the Directorate MEPyD of DRM, MEPyD is supporting the local government to create their own land-use plan with the consideration of multi hazards.

RT asked whether there are any regulations regarding disaster in the land-use plan. DC replied that there is, but regarding to earthquake disasters, there is no individual document for it. MB explained that although there is R-001 and the National Plan for Seismic Risk Reduction, seismic DRR has not been applied at the local government level. She also added that it is only after the 2010 Haiti EQ, that seismic risk has been taken into consideration. PS added that the tasks and measures stated in the National Plan for Seismic Risk Reduction is very general and it does not provide a clear guideline nor specify the actions to be taken.

Details on the National Plan for DRR

PS and MB explained that one of the priorities this year for MEPyD is the implementation of the National Plan for DRR (2011) made through the National Emergency Commission. PS added that he will try to share the updated version of this, which may not be published yet. He also explained that the implementation strategy has not been formulated yet.

Additional Information on the local DRR Plan

RT asked whether there is a DRR plan prepared by the local government. DC replied that some of the municipalities and mayor's office have a department to deal with DRR. PS points out there is the need to strengthen the technical and financial capacity of the few local government with a DRR plan. RT asked if the local DRR plans are accessible. PS replied that he will try to access them through Ms. Mercedes.

Additional Information on the budget trend for DRR

RT asked about the trend of the budget. PS implied that there is a growth, for example his department members grew from 5 to 15 people since late 2020. However, he explained that there is no data on the budget.

Additional Information on the programs financed by IDB

PS said that he will obtain the list of the programs supported by IDB. PS and MB also added that IDB is supporting MOPC on the update of their internal plan for DRR, supporting the revision of R-001, supporting the seismic mircro-zonation study of Jimaní and Barahona with SGN, ONESVIE, and MOPC. PS also added, all the project are under the umbrella of MEPyD and financed by the Japan Fund through IDB.

Knowledge Co-Creation Program

PS confirmed that MEPyD would like to receive the contents listed in the questionnaire, however, the list needs some editing. PS highlighted that they would especially like to receive training/tools to evaluate hospitals and characterizing lifelines. DC added that he has identified the need for

implementing early warning system oriented to agriculture. He also added that there is a system called “SIRED”, however, it is oriented to hydrological events and would be interesting to strengthen the capacity in order to update it for geological events. MB highlighted that they need training in risk analysis and assessment because they are working to create a platform for DRM that shows the risk and damages.

RT pointed out that it is interesting to know that the ministry is interested in technical topics. PS explained that they have a very diverse team; with engineers, architects, economists, and geographers, etc. He also

Next steps

- MEPyD agreed to help prepare the following
  - Current draft of the revised Law for DRR
  - Revised version of the National Plan for DRR
  - Example of DRR Plan of the Local Government
  - List of Programs supported by IDB
  - Edited version of the contents for training

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Meeting Record

Project Name	JICA Information Collection Survey to design and implement an efficient knowledge Co-creation program for"Strengthening Capacity for Seismic Evaluation of Buildings in the Dominican Rep."	
Meeting purpose	Interview with MINERD	
Date	January 18, 2022	
Time	8:30-10:00 am DR time/21:30-23:00 (JST)	
Location	Online Meeting (Google Meet)	
Attendees	MINERD	Mr. Diego Bautista (DB) Mr. Abraham Perez (AP)
	JICA HQ	Dr. Toshiaki Yokoi
	JICA Dominican Republic Office	Ms. Sachiko Komiyama (SK) Mr. Huascar Pena (HP)
	JICA Project Team	Mr. Ryoji Takahashi (RT) Dr. Akio Hayashi (AH) Mr. Seiichiro Fukushima (SF) Ms. Yuki Tomita (YT) Ryota Sunakawa (RS) Ms. Ashley Morales (AM)
Note taker		RS

The purpose of this meeting was to obtain further information from MINERD

Agenda

1. Short Introduction of the Project
2. Questions from JICA project team to MINERD

Record

Questions from JICA project team to MINERD

RT explained that the interview will be conducted based on the questionnaire they have received from MINERD.

a. Questions about general measures for earthquake DRR

Could you give details on the role of the departments?

AP explained that the Departments of Risk Assessment and Vulnerability Reduction is oriented to the evaluation of the vulnerability of the school buildings, and the Department of Training for Emergencies and Disasters is oriented to the trainings of the administration and students.

Who are targets of the lecture and workshops?

AP and DB answered that is the whole school community. AP answered that the workshop is targeted mainly on the administration and the students. They also highlighted that recently the whole country was in a national drill and had a great participation from school community (1 million participants out of 2.3 million). The drill is to be performed twice a year by the country.

RT requested for a report that summarize the activities. AP answered that they do have reports that they can share with us.

b. Questions about system and policies

Does the ministry deal with the design and construction of schools?

RT asked AP answered that the ministry does not build, and that this responsibility belongs to the MOPC. However, the ministry keep in close collaboration to follow-up the design and construction.

Is MINERD involved in the retrofitting of schools buildings?

AP explained that ONESVIE has its own evaluation of school buildings to identify the vulnerability. MINERD also does the evaluation through their Evaluation Department to identify items to be intervene. ONESVIE and MINERD have held an agreement to socialize the issues found. AP also added that ONESVIE and MINERD have been working together to conduct a deeper evaluation and cover the whole school buildings. RT asked what the exact role of MINERD is in this initiative. AP answered that the central government has prioritized schools to be resistant to earthquake.

How is the monitoring process implemented?

AP answered that in order to monitor the design part, the ministry makes sure that the drawings compiles with code. To monitor the construction, the ministry visit the site to conduct inspections and verify that the construction has a geotechnical study (soil condition). AP added that the monitoring process is done independently, apart from MOPC.

Could you give details on the evaluation method?

AP explained they first conduct a visual evaluation, then the information obtained is computed into a sheet to give the safety index of the target school. Regarding the visual evaluation, they verify the whole school as well as the elements and structures. RT asked about the frequency of the evaluation. AP answered that it takes place twice a year. He also added that the ministry has an engineering team to implement the evaluation and they schedule it throughout the year or deploy when it is needed.

Disaster Risk Management Plans

RT asked if they could share documents on the disaster risk management plan prepared by the schools. AP agreed to share samples of the plan with the team. RT asked if the ministry have developed guidelines to prepare the plans. AP answered that initially, the department of training generates customized plans and distributes them to the school districts. RT asked if they could share the prototype of the plans. AP agreed to share the proto-type plan with the team.

Budget for DRR

RT asked about the statistic and trend of the budget. AP answered that the ministry does not have actions in the budget, oriented specifically to earthquake DRR. However, the evaluation of schools have a budget. RT asked if there is budget for DRR in general. AP answered that they do have a

budget for it. RT also asked about the budget tend of this action. AP answered that it is incremental.

c. Questions on plan for seismic-resistant design and construction and seismic strengthening

What is your opinion on seismic strengthening of school buildings?

AP replied that the analysis should be done by the corresponding software and the design should go accordingly to the geotechnical type, the structure must have the appropriate construction method.

Do you mean that the standard does not ensure seismic performance?

AP explained that he was referring to architectural standard in the questionnaire. He commented that ensuring the appropriate design and construction is the problem

What is the status on the plan for the seismic strengthening of school buildings and why is it focused on only SEE type? AP replied that they are currently under preparation and they have started to communicate with ONESVIE. He also explained that majority of the school buildings are SEE.

d. Others

Are schools used as evacuation centers or shelters?

AP explained that schools are not defined as shelters and evacuation centers. He added that they are used only when the community does not have any other buildings, after extreme events. RT asked what buildings are then used as evacuation centers. AP answered that community centers, churches, sports clubs are used as evacuation center. He also explained that the buildings are not designated as evacuation center but it is accustomed to evacuate in it after a disaster. Especially, sports clubs tend to be constructed by steel and steel decks. On the other hand, schools are generally prohibited to be used as evacuation centers in DR. In the past, school buildings have been occupied by the residents, especially in the vulnerable areas after hydrological disasters which interfered the recovery of classes.

Support from Other Donors

RT asked if they could share a list with the programs and donors. AP answered that he will obtain the list.

Contents for the Co-Creation Program

AP confirmed that they would like to learn about the construction material. RT replied that construction materials differs from structure so it may not be applicable, but will be noted.

Technical Drawings of Typical School plans

AP explained that predominant structure for schools is reinforced concrete structure. RT asked if they could share typical drawings. AP answered that they do not have it with them in the ministry, but they will share pictures of the school. RT asked if the drawings should be requested to MOPC. AP answered that they will make an effort first.

Next steps

- MINERD agreed to prepare the following
  - Report on the nation-wide drill
  - Proto-type and example of Disaster Risk Management Plans of the school
  - Pictures of school buildings and if possible technical drawings
  - List of programs funded by other donors

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Meeting Record

Project Name	JICA Information Collection Survey to design and implement an efficient knowledge Co-creation program for"Strengthening Capacity for Seismic Evaluation of Buildings in the Dominican Rep."	
Meeting purpose	Interview with MSP	
Date	January 19, 2022	
Time	8:30-10:00 am DR time/21:30-23:00 (JST)	
Location	Online Meeting (Google Meet)	
Attendees	MSP	Ms. Johanna Thomas Oreste (JT)
	JICA HQ	Dr. Toshiaki Yokoi
	JICA Dominican Republic Office	Mr. Huascar Pena (HP)
	JICA Project Team	Mr. Ryoji Takahashi (RT) Dr. Akio Hayashi (AH) Mr. Seiichiro Fukushima (SF) Ms. Yuki Tomita (YT) Ryota Sunakawa (RS) Ms. Ashley Morales (AM)
Note taker		RS

The purpose of this meeting was to obtain further information from MSP.

Agenda

1. Short Introduction of the Project
2. Questions from JICA project team to MINERD

Record

Questions from JICA project team to MSP

a. Questions about general measures for earthquake DRR

The role of the DRR Directorate

JT replied that the Directorate create and promote all the DRR regulations and coordinate with the local hospitals. RT asked for the details on the regulations mentioned. JT explained that the documents are for the assessment and survey of all the health risks and hazards. However, the risks caused by earthquakes are not handled in the department. JT also added that every hospitals has an emergency plan which includes the response to earthquake along with the other hazards.

Responsibility of the Structure of the Building

RT asked if the emergency operation is the responsibility of MSP, and the structure is the responsibility of MOPC. JT explained that the owner of hospital is the SNS (National Service of Health), and the construction is done with MIVHED. So, the responsible body for the structural safety is SNS. She also added that SNS has an engineering department and that they are responsible for supervising the construction.

RT asked if SNS is attached to MSP. JT replied that SNS act as an independent entity from MSP and

have different roles; SNS has an operation role and MSP has a regulation role.

b. Questions about evaluation of hospitals

"Safe Hospitals Program"

RT explained about the "Disaster Response Hospital" to JT and asked if DR has a similar designation system. JT answered that there is no such designation, however, the ministry leads the safe hospital program. The main objective of the program is to ensure the continuous operation of the hospital after an event.

ISH (Safe Hospital Index)

JT explained that in the program, they utilize the Safe Hospital Index (ISH). The index is applied only to existing hospitals and evaluates the structural, non-structural, and functional component. JT explained that the methodology of ISH is ruled by OPS (Pana American Health Organization) and now they are updating the methodology to include the "green and smart" component.

JT added the in the program, DR has examined 80 hospitals with ISH. From this, it has been revealed that over 85% of the hospitals are in the C category, 15% is in the B category and no hospitals is in the A category. C category means that the hospital will be able to function after an event.

RT asked what are the reasons that there are no A category hospital. JT explained that the B category buildings are more likely to become an A. After the evaluation, the result is sent to the head of the hospital so that they can make decisions for improvement. However, the hospitals remain at the same category, when evaluated again. She also added that within the index the structural point is highly weighted so if deterioration and other negatives factors to the structure is not improved, the building tends to stay in the same category. The structural component is also the most costly to improve in the index.

RT asked how often the ministry implement the evaluations. JT replied that she cannot give a specific date because it depends on the international cooperation. She also added that they was a plan to conduct a large survey but it was postponed due to the pandemic.

RS asked if the result of the ISH is publicized. JT replied that the details are only for internal use but, the result of the category are given to the hospitals, decision maker, and authorities.

Support to the hospitals

RT asked if there are any support to the hospital based on the evaluation. JT replied that MSP does give support, but they support they functional and non-structural component. She explained that these component require minimum intervention of cost compared to structural component. Delivering emergency plans to support the functional component is the basic part of their work.

RT asked if the ministry is seeking to obtain support from international funds. JT replied that Safe Hospital Program is supported by PAHO as the ministry does not have a budget for the evaluation.

Quantity of hospitals

RT asked about the selection criteria of the hospitals. JT replied that when the organization

implements the evaluation, MSP first define the quantity of hospitals. After, the quantity is reported to SNS, SNS will select the list of hospitals. Or in other cases, the international corporation/organization will select the hospitals for a specific region that match the scope of the project.

RT asked how many hospitals are there in DR. JT replied that in the MSP, hospitals are defined as buildings that have a room for admission and treatment, and with this criteria, the country has 180 hospitals. She also mentions, that UNAP (units of primary attention) are not considered as hospitals. AM added that this means that 44% has been evaluated.

Next steps

- The structural components will be discussed with MOPC

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Meeting Record

Project Name	JICA Information Collection Survey to design and implement an efficient knowledge Co-creation program for"Strengthening Capacity for Seismic Evaluation of Buildings in the Dominican Rep."	
Meeting purpose	Interview with MOPC	
Date	January 25, 2022	
Time	8:30-10:30 am DR time/21:30-23:30 (JST)	
Location	Online Meeting (Google Meet)	
Attendees	MOPC General Directorate of Regulations and Systems Director General Department of Risk Management and Emergency Department of Bridge	 Ms. Rosa Ortiz (RO) Mr. Nestor Matos (NM) Ms. Martha Souffront (MS) Ms. Anna Maria (AM) Mr. Yoni Pujols (YP)
	JICA HQ	Dr. Toshiaki Yokoi
	JICA Dominican Republic Office	Mr. Huascar Pena (HP)
	JICA Project Team	Mr. Ryoji Takahashi (RT) Dr. Akio Hayashi (AH) Mr. Seiichiro Fukushima (SF) Ms. Yuki Tomita (YT) Ryota Sunakawa (RS) Ms. Ashley Morales (AM)
Note taker		RS

The purpose of this meeting was to obtain further information from MOPC.

Agenda

1. Short Introduction of the Project
2. Questions from JICA project team to MOPC

Record

Questions from JICA project team to MIVHED

RT explained that the interview will be conducted based on the questionnaire they have received from MOPC.

a. Questions about general measures for earthquake DRR

Is the " seismic-resistant criteria" mentioned in Law 687?

RO replied yes. She highlights that the Law 687 establishes the creation of the system for the regulation and codes along with the creation of CONARTIA. But, it does not establish the technical specifications. These are specified in each regulations.

What is MOPC's responsibility for private buildings?

RO explained that the government has a procedure for private projects; revising and approving

the private designs, and giving inspections.

What does "central plan" mean?

NM replied that the central office of building permission will be part of MIVHED. This is the department responsible for processing (permitting) the technical drawings and blueprints to issue the construction license. The office makes the revision of the technical drawings according to the codes of MOPC.

Which office issues the license?

NM replied that it is the same central office (= Department of Plan Processing) with building permission. AM added that this is in MIVHED now.

Is the regulation and construction of private buildings in MIVHED or is it under transition?

NM replied that it is in a transitioning process.

Is the MOPC responsible for the planning and maintenance of infrastructure?

NM replied that from now on, MOPC will only work on infrastructure, roads, maintenance. NM also confirmed that it has nothing to do with buildings. He added that all the on-going projects will be continued under MOPC, until they are completed.

NM explained that ONESVIE was only created to evaluate existing buildings and infrastructure. Its role is to conduct the evaluation, diagnosis, retrofit design proposals, however the retrofit construction relies on each institution.

Do you mean that the construction is not implemented according to the design?

NM replied yes. He explained that the main challenge for MOPC is that they have deficiency for following up the constructions to check if it has been built according to the approved technical drawings.

RT asked what the main problem is to comply with the building code, given that MOPC is implementing supervision and completion inspections. NM explained that from a personal perspective, the engineers and private sector have built enough capacity. However, the human infrastructure, referring to the capacity of the system to follow up the design in the construction, is the main problem. The ministry cannot afford to have the amount of engineers needed to supervise the amount of constructions that are under-going.

NM also mentions that, on the other hand, the informal constructions (=buildings that does not pass through the permitting office) has many vulnerabilities.

RT asked if there are any legal framework to prevent these constructions. NM replied that there is a legal framework, however, they are "informal" because they do not follow the legal course. He added that every time the MOPC detected informal construction, they have tried to stop it. However, there are many constructions that the ministry cannot even detect.

MS explained that although MOPC has the control department for the follow up, it is not

enough to address the amount of informal construction, which are the main source of vulnerability.

RT commented that in Japan, the authority to supervise has been given to the private sectors as well.

Does "prioritize road" mean that DR have "designated emergency road network"?

MS replied no. She explained that MOPC conducted a probabilistic evaluation of the roads, according to the different types of the natural hazards, in order to identify the vulnerability. The result was then utilize to give prioritize interventions and to identify alternative routes in the middle of an event.

RT asked if the evaluation included damages to the bridges. MS replied yes.

Are the revisions of the codes regarding buildings implemented by MIVHED or MOPC?

NM explained that the current revision process of R-001 is within MOPC right now and the draft code is almost finished. The draft code will be passed on to MIVHED. RO explains that all the code follow ups will be passed through MIVHED. All the processes of buildings will be the responsibility of MIVHED but, MOPC will complete the on-going school projects.

RT requested MOPC to share information on the revised R-001. RO and NM agreed to share the draft version.

Are there any specific actions implemented from the National Plan for Seismic Risk Reduction?

MS replied that the only action MOPC have taken is the update of R-001.

RT asked if there were any physical updates made. MS highlighted that some roads were under rehabilitation and reconstruction, but it was not implemented under the seismic DRR plan.

b. Questions on the construction of new buildings

Are there any information to understand the budget trend for public building construction?

NM explains that the budget allocated for public building is hard to determine. RT replied that they would like to know the trend. NM replied he will try.

Are there any guidelines and/or manuals to apply the R-001?

RO replied no. For the new update of the R-001, they have included requirements to add application examples with comments in the TOR (terms of reference) with IDB.

MOPC also agreed to share the draft of the bridge regulations.

c. Questions relating to the promotion of seismic strengthening of existing public buildings

What is CODIA?

MS replied that it stands for the Dominican College of Engineers, Architects and Surveyors. AM

added that it is the association that gives the license to the engineers, architect, and surveyors. After you graduate university a license is issued if you have worked under a professional engineer for a year. No periodic renewal as well.
RO explains that ADOCEM is the association of concrete company and CEMX is a large concrete company. They provide technical trainings. Sometimes, they will come to MOPC to ask what kind of training to provide.

Which organization has the statistics on the current status of seismic retrofitting and reconstruction of existing public buildings?
Mr. Valcidez explained that ONESVIE has done evaluations on public and private buildings. Also, in the Permitting Department has evaluators who do the seismic evaluation of private projects that are to be retrofitted. However, MOPC does not have a data.

d. Questions related to the construction of new infrastructure and lifelines

Are the lifeline companies dealing with the construction and maintenance?
RO replied yes.

Are there policies to ensure seismic performance of infrastructure and lifelines?
YP replied that seismic performance is considered in the design process by using international codes because with the R-001 only includes the hazard part (acceleration map).

What items (view points) are prioritized in the design of bridges?
NM explains that in the past there were no plans to intervene the infrastructure. It was based on the deterioration. Now, they are developing a plan.

How do you determine the section of each member in each structure?
YP replied that AASHTO standards are used.

How do you determine the section and sections of lifelines?
YP replied that for the drainage of the roads, R-019 is used. AM added that regarding all the lifelines, the institutions, such as INAPA and CAASD, has the code for it. MOPC only interfere with the excavation depth that is stated in the R-026.

Are the seismic performance of other infra- and lifeline structures not mentioned in Dominican Republic?
RO replied that the other companies have the code and standards for each lifeline. She also commented that she has done a personal investigation to the telecommunication company regarding the antennas. The company explained that they have ensure the continuity after an event. However, all infrastructures and lifelines follow the minimum requirement for collapse prevention.

SF asked how the collapse of infrastructure and lifelines is prevented in the design process. MOPC replied that all the drawings are revised so that it stays in the linear elastic range.

e. Questions relating to the promotion of seismic strengthening of existing infrastructure and How is the situation especially for the pipelines? Do you replace or retrofit?

RO replied that do not retrofit of the in bedded lifelines. NM explained that water pipelines are intervened, when they are damaged.

Why is lifeline not prioritized for strengthening?

NM replied that with the limited budget, evaluation, seismic diagnosis, and retrofit (measures for prevention) cannot be prioritized.

Do you feel necessity for retrofitting of infrastructure and lifeline?

NM commented that he understands that there is a need in order to prevent life loss.

Next Steps

- MOPC agreed to try to gather further information on the following
  - Current revised version of R-001 (draft)
  - Bridge Regulation (draft)
- JICA Project Team will prepare questionnaire to the following
  - CAASD (if necessary)
  - INAPA
  - CORAASAN (if necessary)

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"This meeting record is made by JICA Project Team and not checked by other participants"

Meeting Record

Project Name	JICA Information Collection Survey to design and implement an efficient knowledge Co-creation program for"Strengthening Capacity for Seismic Evaluation of Buildings in the Dominican Rep."	
Meeting purpose	Interview with ONESVIE	
Date	March 4, 2022	
Time	8:30-10:30 am (DR)/9:30-11:30 (JST)	
Location	Online Meeting (Google Meet)	
Attendees	ONESVIE Director General Planning and Development Dep.	 Mr. Leonardo Reyes Madera (LR) Ms. Camila Gutierrez Mr. Pedro Ivan Marquez Ms. Claudia Deveaux Garrido
	JICA DR Office	Mr. Huascar Peña (HP)
	JICA Project Team	Mr. Ryoji Takahashi (RT) Dr. Akio Hayashi (AH) Mr. Seiichiro Fukushima (SF) Ms. Yuki Tomita (YT) Ryota Sunakawa (RS) Ms. Ashley Morales (AM)
Note taker		RS

The purpose of this meeting was to present the survey findings and roadmap to ONESVIE.

Agenda

1. Presentation of Survey Findings and Roadmap
2. Feedbacks on the Presentation

Record

1. Presentation of Survey Findings and Roadmap

RT, AH, FS gave the presentation. RT explained that the draft roadmap will not be finalized during this survey. He added that it is expected for the participants of the Knowledge Co-creation Program to finalize the roadmap through the implementation of the program.

2. Feedbacks on the Presentation

LR commented that he feels content and is thankful for the survey findings and roadmap.

LR stated that he agrees to all the observations made to R-001. He also agrees that there is a lack in knowledge and its dissemination on the R-001 for structural engineers. He commented that this is due to the lack of publications of applications, guides, and examples, which were proposed in the revision of R-001.

LR expressed that he is satisfied that the survey identified that lack of procedure to indicate the performance of each type of structure and infrastructure.

LR commented that he would like to reassure his and ONESVIE's support in the upcoming years.

3. Others

RT asked ONESVIE to distribute the presentation material to the members of the Seismic Table through their channel.

AM explained to LR that the JICA team will share the documents to ONESVIE, after the meeting. AM also asked ONESVIE to give back comments to the prepared documents. LR also requested that they would like the team give links to the reference on the example of knowledge and technology, mentioned in the survey findings.

RT explained that there may be some misunderstanding in the findings of the survey, so he would like ONESVIE to point them out and help collect information.

RT asked Ms. Morales to give the presentation in the next meeting in order to optimize it and make time for discussion. Ms. Morales agreed on this. AM also explained that she will meet with the Seismic Table in person, at the next meeting.

Next steps

- Local consultant will share the presentation and excel to ONESVIE
- Meeting with the Seismic Table will be held on March 8th

. ==========

T**his meeting record is made by JICA Project Team and not checked by other participants"**

Meeting Record

Project Name	JICA Information Collection Survey to design and implement an efficient knowledge Co-creation program for"Strengthening Capacity for Seismic Evaluation of Buildings in the Dominican Rep."	
Meeting purpose	Meeting with Seismic Table	
Date	March 8, 2022	
Time	10:00-12:00 am (DR)/11:00-13:00 pm (JST)	
Location	Online Meeting (Google Meet)	
Attendees	Members of the Seismic Table	
	ONESVIE	Jose S. Velazquez
		Camila Gutierrez
	SGN	Edwin Rafael Garcia Cocco
		Hanlet A Berges
	CNS	Ramon Delanoy
	SODOGEO	Julio Espaillat
		Eduardo Verdeja
	MOPC	Nestor Juilo Matos Urena
	MINERD	Diego Bautista Gomez
	MEPyD	Mercedes Feliciano
		Peter Michael Sanchez
	Advisor	Romeo A Llinas Capellan
	SODOSISMICA	Hector O'Reilly (HR)
		Juan A Chalas
	OSPL	Javier Rodriguez
		Jose Altagracia Victoriano Reyes
	MIVHED	Vivian Reyes Roca
		Giselle Mahfoud
	INESDYC	Milagros Nanita
		Maritza Vasquez
	JICA DR Office	Mr. Takayuki Kondo
		Ms. Sachiko Komiyama
		Mr. Huascar Peña
	JICA HQ	Mr. Yokoi Toshiaki
		Mr. Kenichi Sasamori
	JICA Project Team	Mr. Ryoji Takahashi (RT)
		Dr. Akio Hayashi (AH)
		Mr. Seiichiro Fukushima (SF)
		Ms. Yuki Tomita (YT)
		Ryota Sunakawa (RS)
		Ms. Ashley Morales (AM)
Note taker		RS

The purpose of this meeting was to present the survey findings and roadmap to the Seismic Table.

Agenda

1. Presentation of Survey Findings and Roadmap

2. Feedbacks on the Presentation

Record

1. Presentation of Survey Findings and Roadmap

Ms. Morales (local consultant) gave the presentation on behalf of the project team.

2. Feedbacks on the Presentation

HR(SODOSIMICA) asked about the incentive system for private housings in Japan. RT replied that there are several incentive systems in Japan, such as low interest rate housing loans, discount on seismic insurance. RS explained that the incentive system cooperates with the national housing evaluation system, which ranks the earthquake resistance performance.

3. Others

RT explained that the project team will provide references on the Japanese example with the use of ai translation services.

Next steps

- The members from the Seismic Table will give feedbacks to the project team by March 11th (DR)
- The JICA project team will provide the references through the local consultant

. ==========

T**his meeting record is made by JICA Project Team and not checked by other participants"**

4.　研修プログラムに対する各機関の要望

表　研修プログラムに対する各機関の要望

機関名	システム、制度（ソフト）	技術、手法（ハード）	そのほか要望
ONESVIE（国立地質・インフラ・建造物耐久調査局）		• （ドミニカ共和国の実情に即した）建築物の脆弱性（耐震性）を評価する手法	• 耐震工学の実験設備の支援
MOPC（公共事業・コミュニケーション省）	• 日本の防災政策（リスクアセスメント、減災、防災）	• 耐震設計、耐震構造（制震、免震）、耐震診断、耐震補強、材料実験の技術 • 最新的のインフラの地震リスク評価と維持管理の技術 • 効率的な道路工事の監理と検査の手法	
MIVHED（住宅・居住・建物省）	• 地震の早期警報システム	• 免震構造の技術	
MEPyD（経済・企画・開発省）	• インフラ・ライフラインの（性能別）分類システム	• 耐震構造の技術 • 病院の安全性の向上 • 学校の安全性の向上 • 被害評価ツールの強化	
MINERD（教育省）	• 建設資材の品質管理システム	• 新しい建築材料 • 軟弱地盤における土質改良技術 • 耐震構造用の設計ソフトウェアの使用	
2020 年度課題別研修参加研修員 (Architect)	• 地震防災に関する市民の認識を高めるための政策	• 石積み構造の建築物の耐震設計 • 門型建築物の耐震設計 • 鉄骨造または混構造（鉄骨と鉄筋コンクリート）の建築物の耐震設計 • 免震構造	
2020 年度課題別研修参加研修員 (Civil Engineer)		• 既存建物の改修技術 • 鉄骨構造の耐震設計	
SGN（国家地質サービス）		• 地震メカニズム、焦点パラメータ、地震波形の解釈、震源の研究 • 地震ハザードマップや地質活断層マップの作製技術 • 地震の発生と津波の発生のシナリオモデルの解析とそれに基づく津波マップの作成技術	
CNS（国立地震学センター）		• 地震波の解析とそのインフラの設計・施工への活用方法	• 学校を中心とした市民の防災教育

SODOGEO（ドミニカ共和国地質学会）			• 地震災害のインフラ及び市民への被害に関するレクチャー
SODOSISIMICA（ドミニカ共和国地震学・地震工学協会）		• マイクロゾーニングの手法 • ドミニカ共和国の実情に即した建築工法、建築材料 • ドミニカ共和国の実情に即した建築物の脆弱性評価 • 地震危険度の評価手法	
OSPL（ロヨラ工科大学精密地震観測室）		• 地震リスクの確率論的研究 • 地質条件等を考慮した耐震基準	

出典：質問票を元に作成

5.　地震防災総論スライド

Overview of Earthquake Disaster Risk Reduction in JAPAN

2022.01.11

JICA Project Team

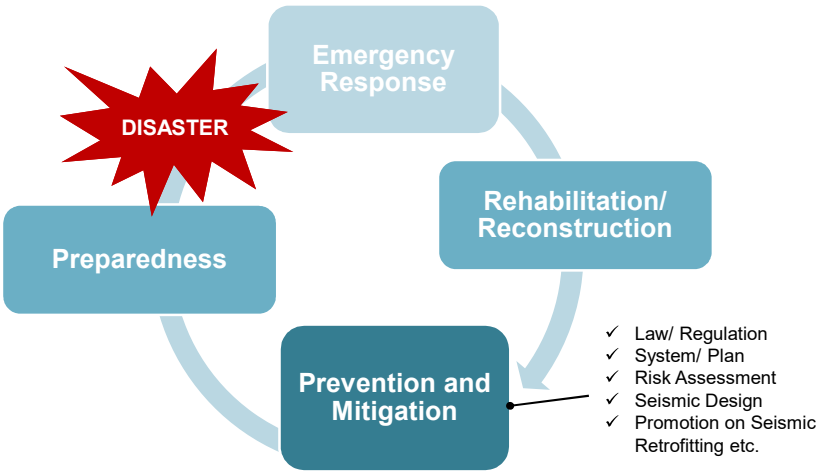
Outline

1. General Understanding of Earthquake DRR
2. Overview of Earthquake DRR in Japan
3. System and Plan for Earthquake DRR
4. Required Measures to be taken by Government Against Earthquake Disaster Risk
5. Measures to be Promoted by Government for Earthquake DRR

2

1.1 Earthquake Disaster Management Flow

Disaster Management Cycle



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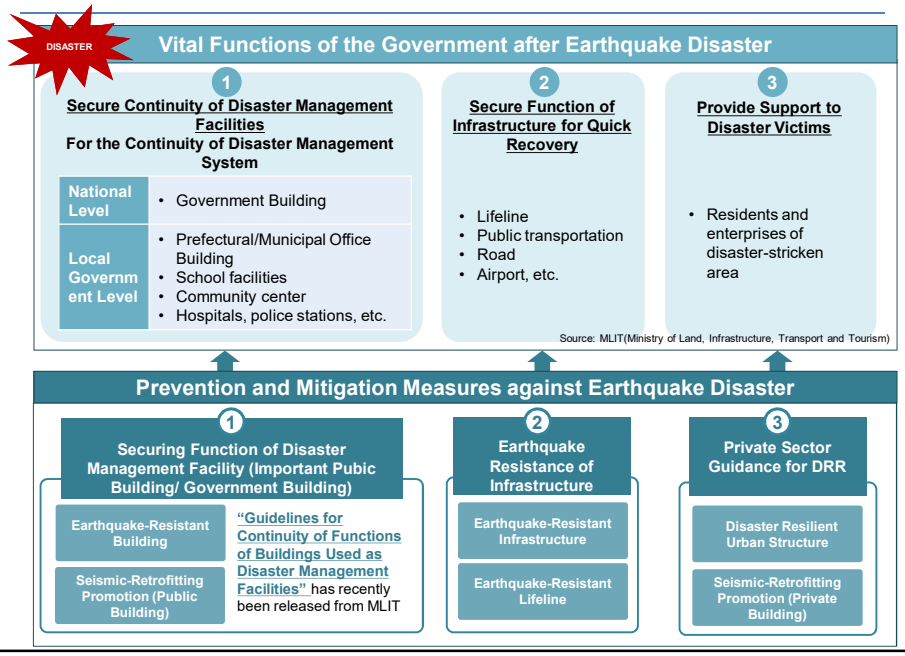
2. Overview of Earthquake DRR in Japan

2.1 Required Measures To Be Taken By the Government



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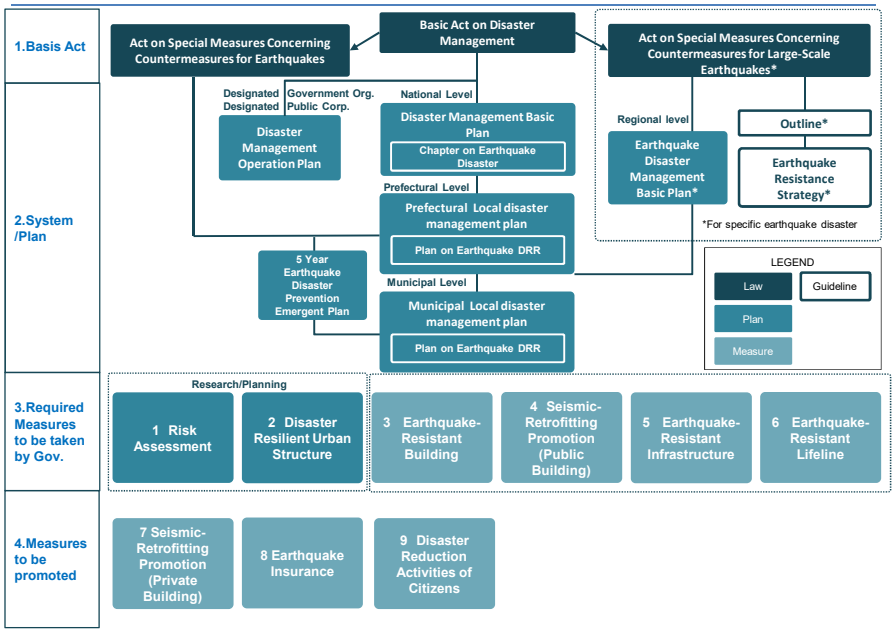
2.2 Overview of Earthquake DRR in Japan



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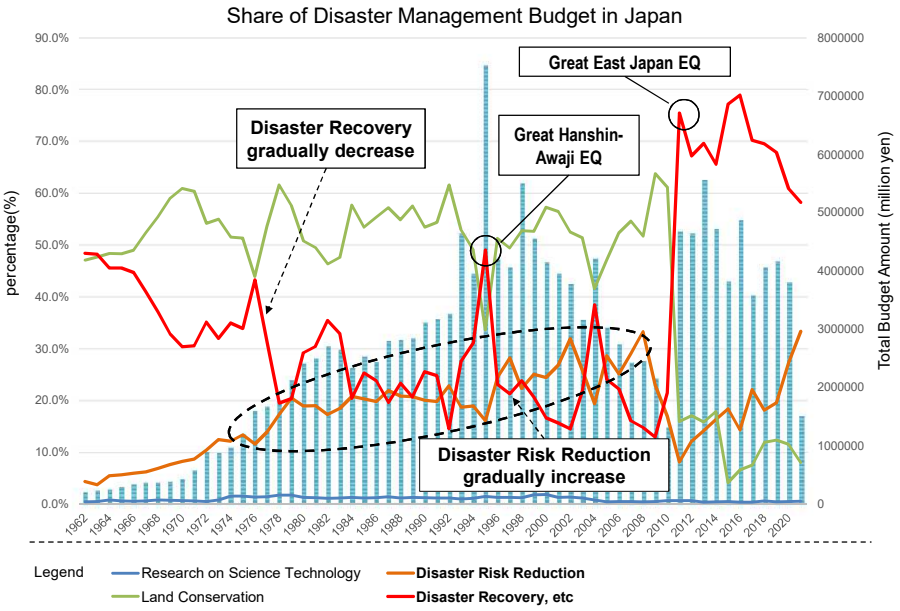
2.3 Disaster Management Investment in Japan



Source: Disaster Management, Cabinet Office (2021)

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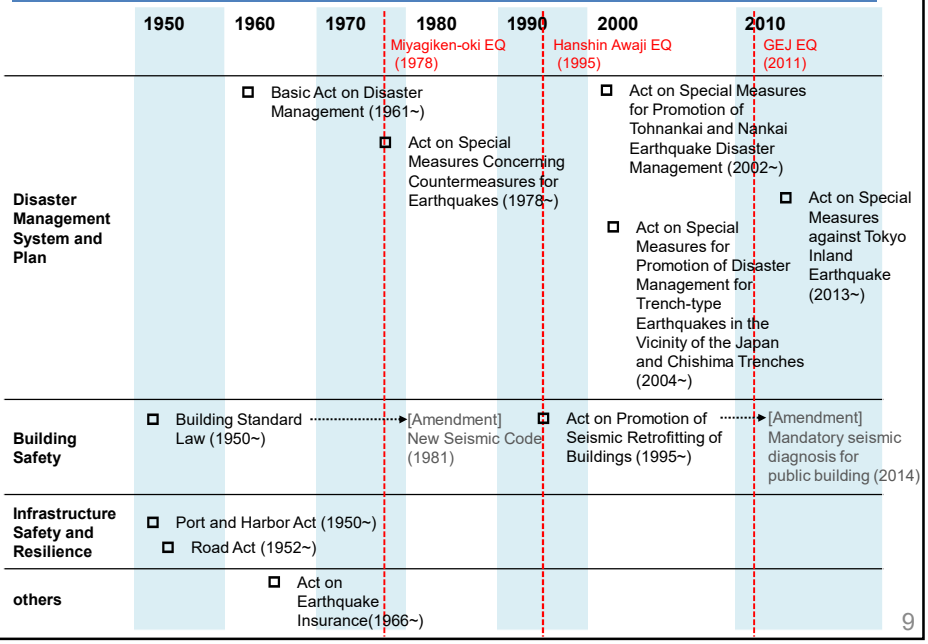
3. System and Plan for Earthquake DRR

3.1 Disaster Management Laws and Systems



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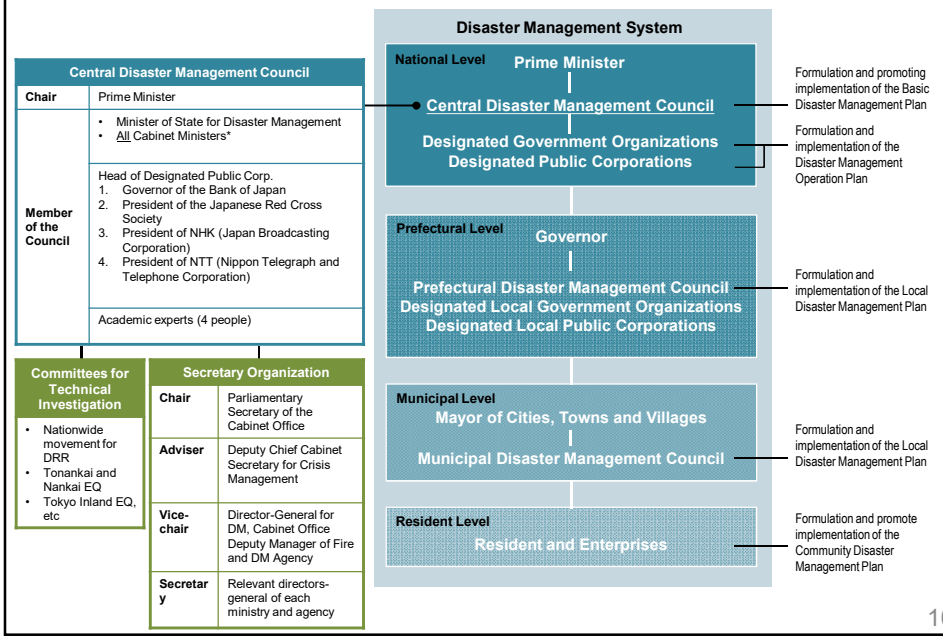
3.2 Outline of the Disaster Management System



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3.3.1 Disaster Management Plan

National Level

Basic Disaster Management Plan

The plan sets forth the basic activities for each type of disaster management plan, which is the foundation of the nation's disaster management measures. In the discipline of disaster management, it is the master plan prepared by the Central Disaster Management Council in accordance with Article 34 of the Disaster Countermeasures Basic Act

Disaster Management Operation Plan

A plan made by the respective Designated Administrative Organizations and Designated Public Corporations according to the Basic Disaster Management Plan

Prefectural/ Municipal Level

Local Disaster Management Plan

A plan made by respective prefecture and municipal disaster management councils according to local circumstances and the Basic Disaster Management Plan.

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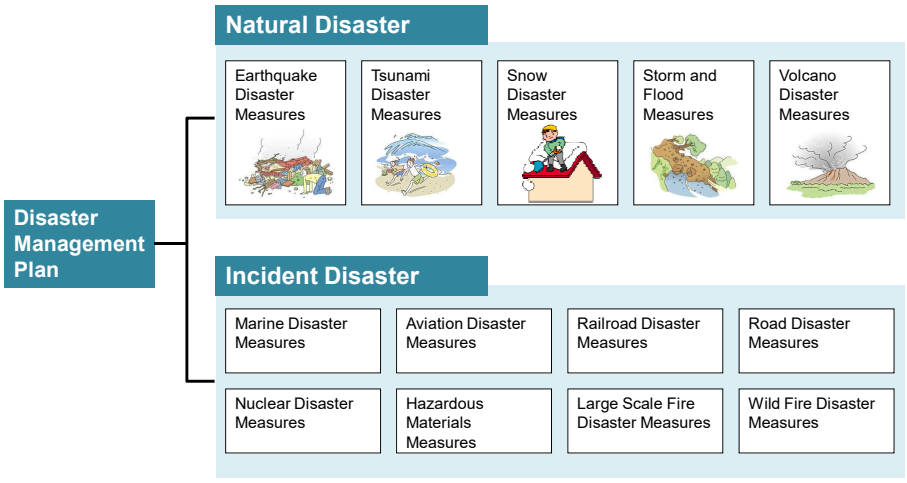
3.3.2 Structure of Disaster Management Plan



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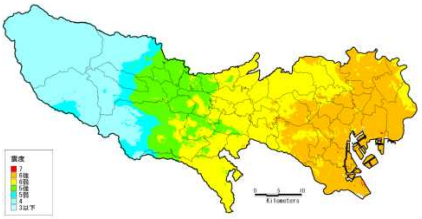
4. Required Measures to be taken by the Government Against Earthquake Disaster Risk

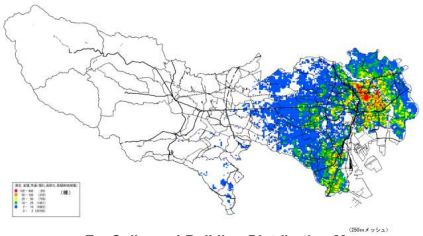
4.1 ①Disaster Risk Assessment

The main purpose of Disaster Risk Assessment is to gain perspective on the damage under worst-case scenario and to promote DRR measures.
Simulations are conducted by the prefectural government and hazard maps are created by the municipalities to raise awareness.



Ex. Seismic Intensity Distribution Map
(In the case of Northern Tokyo Bay EQ (M7.3))

Source: Tokyo Metropolitan Government



Ex. Collapsed Building Distribution Map
(In the case of Northern Tokyo Bay EQ (M7.3))

Source: Tokyo Metropolitan Government

In general,
Earthquake Hazard Map is made through scenario-based approach and Earthquake Damage Estimation is calculated based on the hazard map and other information (population, building density, etc.)

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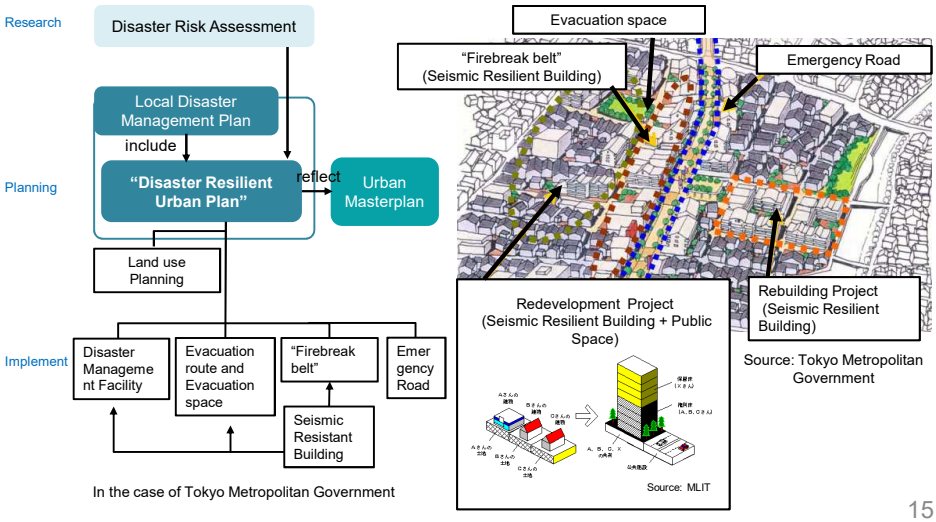
4.2 ②Disaster Resilient Urban Structure

Disaster Resilient Urban Structure is planned based on disaster risk assessment and implemented through public and private efforts.



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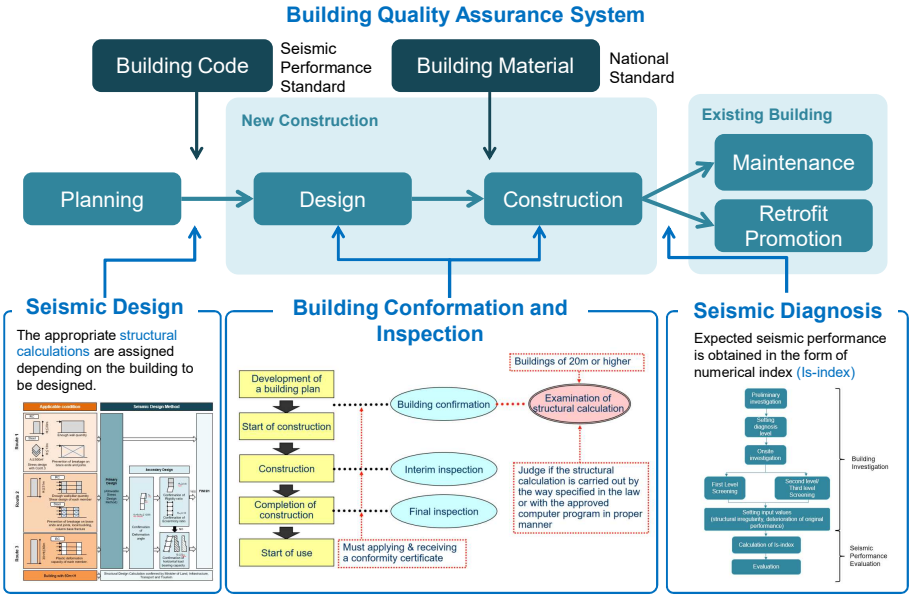
4.3 ③Earthquake-Resistant Building



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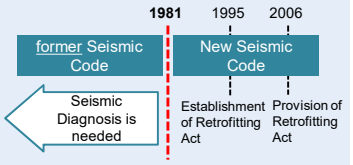
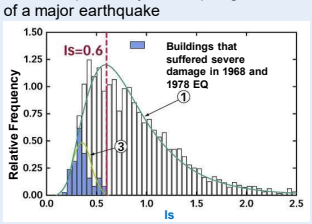
4.4 ④Seismic-Retrofitting Promotion (Public Building)

Public buildings play an important role in case of disasters.
The Act on Promotion of Seismic Retrofitting of Buildings has been established to make its seismic diagnosis mandatory and promote its retrofitting.

Seismic Diagnosis and Seismic Code



Is-index is used to evaluate seismic performance of buildings built under former seismic code. Building with **Is≧0.6** has a low possibility of collapsing in the case of a major earthquake



Regulation and Flow under the Retrofitting Act

Housings that are dangerous to the public
① Guidance

Office, Complex Housing, etc.
① Guidance

"Designated Buildings"
Hospital, School, Hotel, Department Store, Senior Housing, Hazardous Factory
① Guidance, Submission of Report, Inspection, Publication

② If there is a high possibility of collapse, Seismic-retrofitting under the Building Code is demanded

③ Penalty

Ex. The Role of School Buildings

School buildings are used as evacuation space/disaster management base after disaster.

After Hanshin-Awaji EQ ▸


Source: Kobe City


Source: Kobe Shinbun Next

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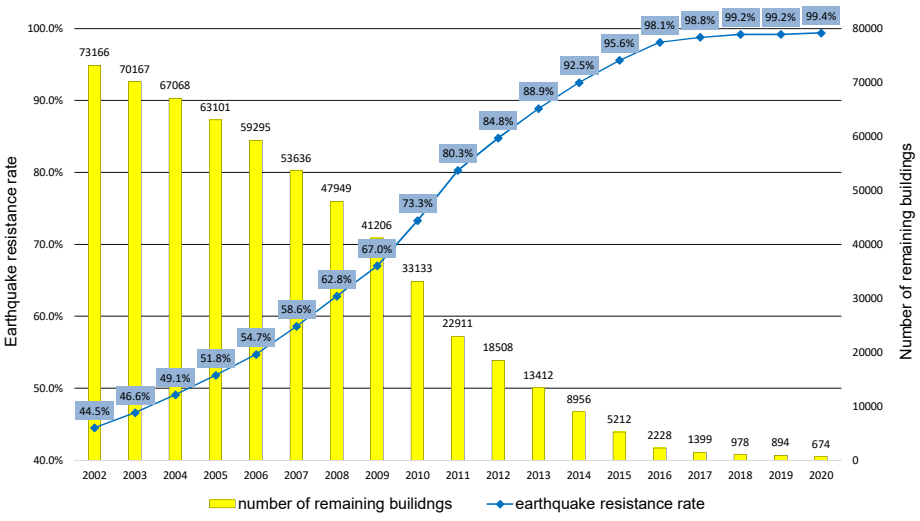
4.5 ④Seismic-Retrofitting Promotion (Public Building)

Progress of Earthquake-Resistance of Public School Buildings



Source: Disaster Management, Cabinet Office (2021)

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4.6 ⑤Earthquake-Resistant Infrastructure

Roads & Highway Bridges

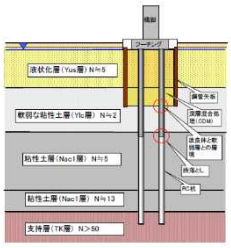
Basic Concept of SPECIFICATIONS FOR HIGHWAY BRIDGES

Design Ground Motion		Type-A Bridge •Other Bridges.	Type-B Bridge •Highway Bridge •DRR related Bridge
Level 1 Ground Motion		Performance 1: Maintain the soundness as bridge.	
Level 2 Ground Motion	Inter-Plate EQ.	Performance 3: No essential damage occurs.	Performance 2: Damage is limited and quick recovery is maintained.
	Crustal EQ.		

SEISMIC RETROFITTING OF BRIDGES

Prevention of Bridge Fall

Strengthening of Piers



Prevention of Liquefaction

Port Facilities

Structure of TECHNICAL STANDARD

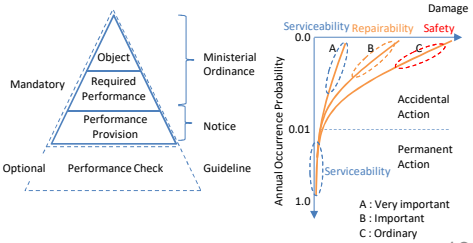
Port and Harbor Act
[2-5] Definition
[56-2-2] Technical Standard
[56-2-21] Recommendation for Administrator

Enforcement Order
[19] Port Facilities Subject to the Technical Standards

Ordinance for Enforcement
[28] Excluded Port Facilities
[28.2] Port Facilities subject to Specific Technical Standard

TECHNICAL STANDARD
- Ministerial Ordinance
  - Technical Standard
  - Construction Standard
  - Maintenance Standard
- [56-2-2.3] Design Standard

Introduction of PERFOMANCE-BASED DESIGN



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4.7 ⑥ Earthquake-Resistant Lifeline

Water Supply Facilities

Basic Concept of RECOMMENDATION FOR WATER SUPPLY FACILITY EARTHQUAKE-RESISTANT CONSTRUCTION METHOD

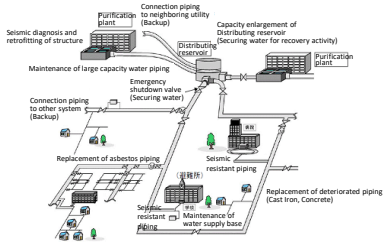
Facility	Performance		
	1	2	3
A1	L1	L2	-
A2	L1	-	L2
B	-	L1	L1/L2

Facility
A1 : Important facilities without alternatives or less possibility of second disaster
A2 : Important facilities with alternatives and less possibility of second disaster
B : Other facilities

Performance
1 : Maintain functions
2 : Do not give serious effect on functions with slight damage and small repairment
3 : Do not give serious effect on functions with slight damage and repairment

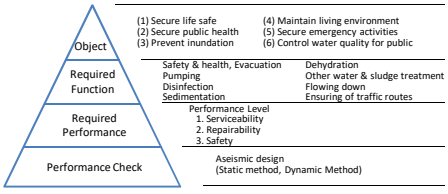
Ground Motion Level
L1 : Ground motion with high occurrence probability within service period
L2 : Maximum ground motion expected at the site

Promotion of COUNTERMEASURES

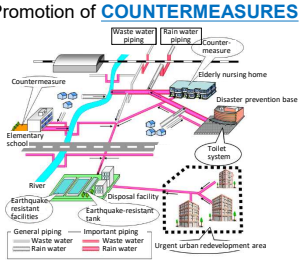


Sewer Facilities

Basic Concept of EARTHQUAKE-RESISTANT MEASURES GUIDELINE OF THE SEWER FACILITIES



Promotion of COUNTERMEASURES



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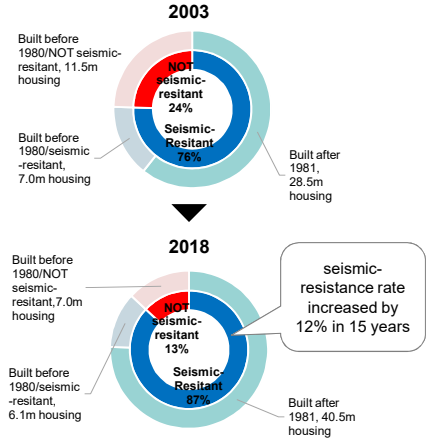
5. Measures to be Promoted by the Government for Earthquake DRR

5.1 ⑦Seismic-Retrofitting Promotion (Private Building)

Seismic-retrofitting of housing/private building is the responsibility of the owner. Therefore, raising public awareness and the spread of knowledge on available and affordable methods are important.

Progress of Seismic-Resistance of Housing



Source: MLIT

Pamphlet on Seismic-Retrofitting Methods For Housing by Municipality

Certification of Seismic-Resistance

Building owners can prove and appeal seismic-resistance of the building to the public.

Source: Tokyo Metropolitan Government

5.3 ⑧Earthquake Insurance

Earthquake insurance is promoted and supported by the Government to contribute to the stabilization of the victims of earthquakes.

Act on Earthquake Insurance

The Act was enacted in 1966 with the aim of promoting the spread of earthquake insurance and thereby contributing to the stabilization of the lives of victims, by the system that the government reinsures the earthquake insurance liability of insurance companies.

Insurance Coverage

It covers damage to residential buildings and household goods inside such buildings, caused by earthquakes, eruptions, or tsunamis.

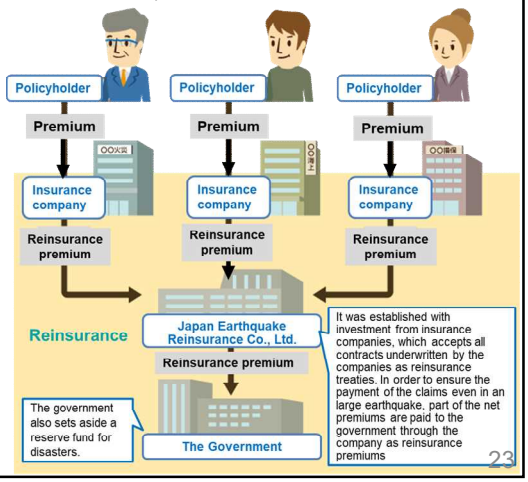
Earthquake　Eruption　Tsunami

Premium rate and discount

The premiums are calculated based on the structure and location of the building. 10% to 50% discount is applied to the buildings depending on the year of construction or seismic performance
(e.g. Earthquake-resistance class, diagnosis).

The mechanism of the system

The insurance is jointly administered by the government and insurance companies.



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5.4 ⑨Disaster Reduction Activities of Citizens

The Government promotes awareness raising of earthquake and encourages citizens to conduct disaster reduction activities.

Awareness raising and knowledge dissemination

Develop and disseminate public information materials, promote earthquake disaster prevention measures among citizens such as;

- ✧ Know the danger of disasters and necessary actions to be taken in emergency
- ✧ Prepare an emergency bag and stockpiles (e.g. food, water) at home
- ✧ Prevent objects from falling over at home
- ✧ Set disaster prevention equipment (fire extinguishers, etc.)
- ✧ Confirm evacuation sites and routes
- ✧ Purchase earthquake insurance

Enhancement of the environment for citizens' activities

Promote and encourage activities of the Volunteer Fire Corps and voluntary disaster management organizations in local communities, through improving their facilities and equipment, and so on.

Disaster Prevention Drills

- ✧ Actively and continuously conduct DRR drills
- ✧ Promote familiarization with actions to be taken in the event of an earthquake, for example, by incorporating EEW into the drill scenarios

Disaster education

- ✧ Enhance education on DRR through organizing instruction contents of DRR education
- ✧ Secure the time for implementing DRR education in schools

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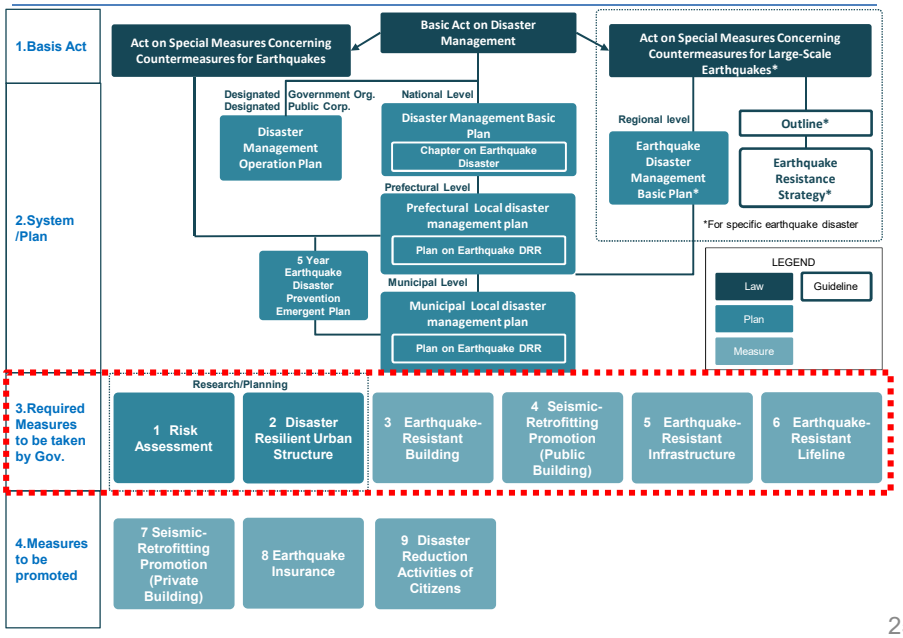
5.5 Conclusion



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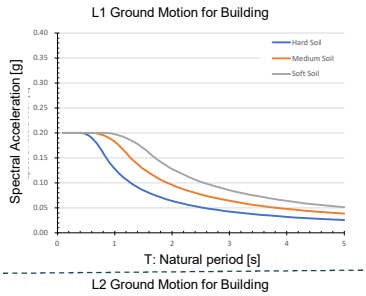
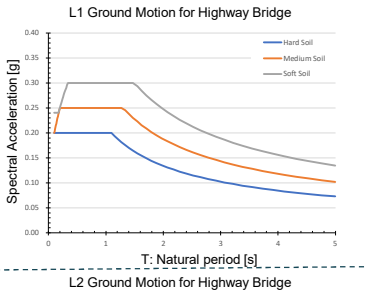
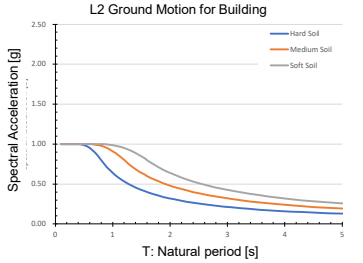
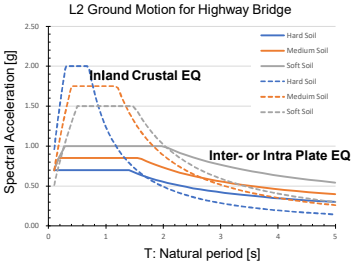
APPENDIX

appendix

Comparison of Design Response Spectrum

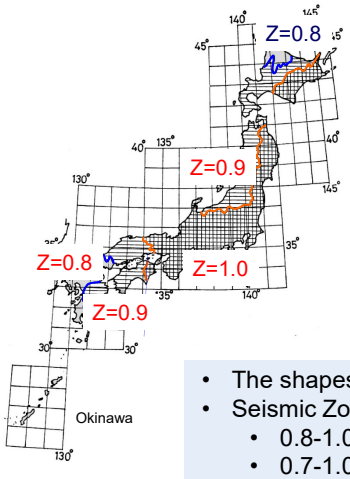
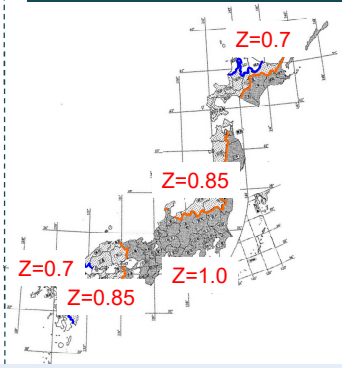
In Japan, the **Design Response Spectrum** differs between target design

	For Building	For Highway Bridge
For Serviceability		
For Life Safe		

appendix

Comparison of Seismic Zone Coefficient

Seismic Zone Coefficient: Z takes into the consideration the scale of disaster based on past earthquake records and the status of seismic activity

For Building	For Highway Bridge
	

- The shapes of zonation are similar to each other
- Seismic Zoning Coefficient differ between target
  - 0.8-1.0 (except for Okinawa) for building
  - 0.7-1.0 for highway bridge

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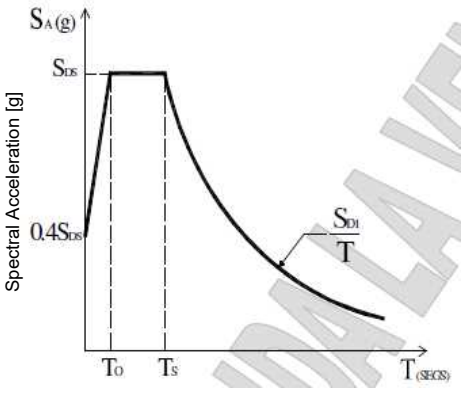
Design Response Spectrum and Seismic Zone Factor in DR

Linear Elastic Seismic Spectrum

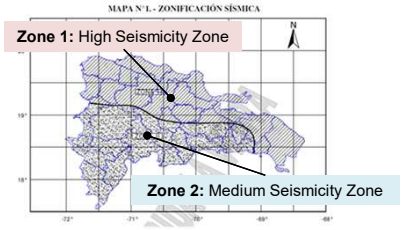


T: Natural period [s]

Source: Dominican Seismic Code (R-001)

Seismic Zones

The country is divided into two seismic zones according to its level of spectral acceleration



$S_{DS} = {}^{2}/_{3}\, F_a \cdot S_S$ $\quad S_{D1} = {}^{2}/_{3}\, F_V \cdot S_1$

F_a, F_V ;
Coefficients due to amplification in surface layer

Spectral acceleration values for each S_s (short period) and S_1 (long period) are the following;

Zone	S_s	S_1
I	1.55 g	0.75 g
II	0.95 g	0.55 g

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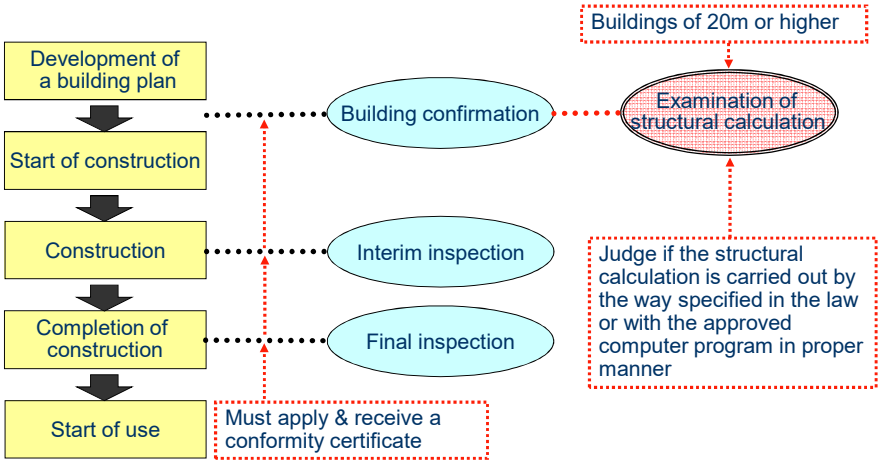
Building Confirmation and Inspection Flow

Confirmation and inspection by building officials or designated organization



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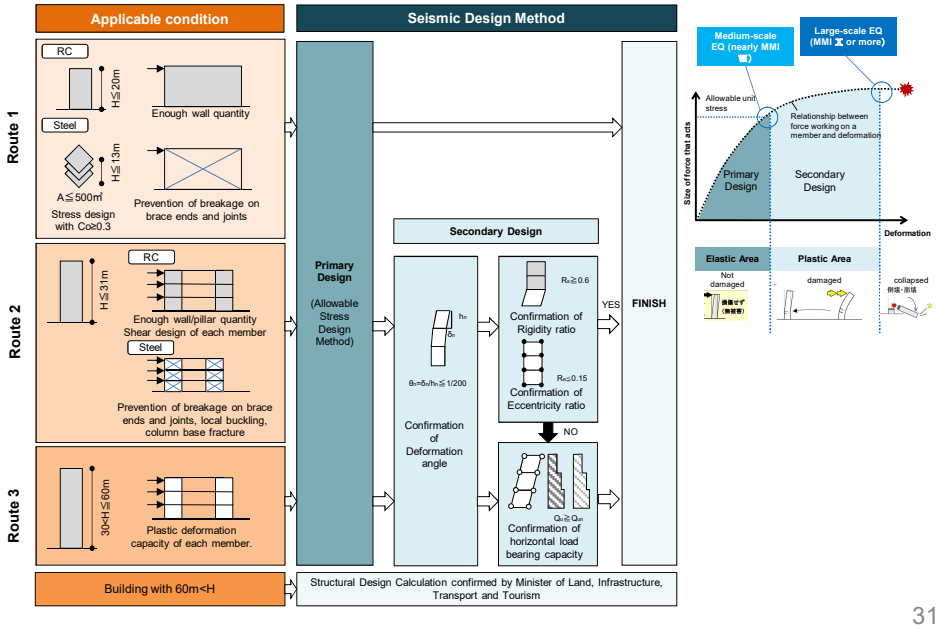
Seismic Design Route and Flow



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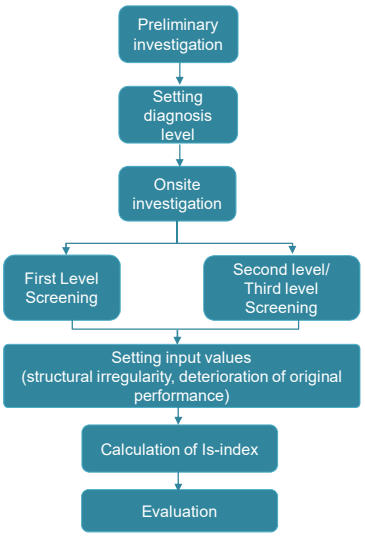
Seismic Diagnosis Flow



Seismic Capacity is Numerically evaluated by Is-Index

Is = Eo × SD × T

Eo : a basic structural seismic capacity index = C [Strength Index] × F [Ductility Index]

SD : a factor to modify Eo-Index due to structural irregularity (torsion, soft story mechanism etc.)

T : a factor to allow for the deterioration of original performance

Higher Value ⇒
Better Seismic Performance Expected

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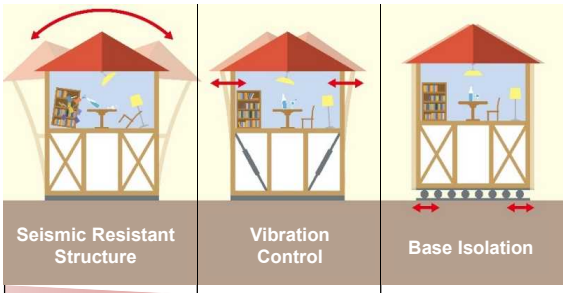
Earthquake Resistant Structure

Earthquake Resistant Structure



	Seismic Resistant Structure	Vibration Control	Base Isolation
Damage from EQ	large	small	none
Cost	inexpensive	moderate	Expensive
Retrofitting	Possible	Possible	Not possible (only for newly built)

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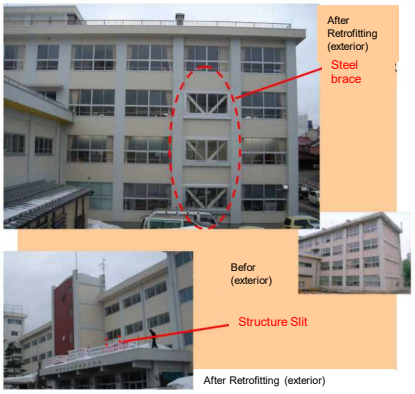
Seismic Retrofitting Method Examples (School)

Steel brace + Earthquake resisting wall	
Built: 1965, 1967	592 students
Structure: Reinforced Concrete	3FL, 3196㎡
Is-index Improvement	
Isx=0.30 ⇒ Isx=1.01	Isy=0.69 ⇒ Isy=0.88

Steel brace + Structure slit	
Built: 1974,1975,1980	939 students
Structure: Reinforced Concrete	4FL, 5843㎡
Is-index Improvement	
Isx=0.42 ⇒ Isx=0.80	Isy=0.39 ⇒ Isy=0.75



Source: Ministry of Education, Culture, Sports, Science and Technology

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appendix

Responsible Authority for the Seismic Resistance of Public Building

Responsible Authority	Building Type
Ministry of Land, Infrastructure, Transport and Tourism: MLIT	Government building*
Ministry of Education, Culture, Sports, Science and Technology: MEXT	Public Elementary/Middle Schools*
	National University Facilities*
	Private School (Elementary/Middle/University)
	Public Gymnasium Facilities used as evacuation centers*
Ministry of Health, Labor and Welfare	Social welfare facility*
	Hospital*
Ministry of Justice	Ministry of Justice related facility
	Correctional institution (jails)
National Police Agency	Prefectural Police Department Building and police station
Ministry of Internal Affairs and Communications	Fire Department building
	Public buildings used as Disaster Management Facility*

***Disaster Management Facility**

Government buildings, evacuation shelters(local school facilities, community center, etc.), and hospitals that are expected be serve as a base for disaster relief and rescue activities in disaster stricken areas.

Functions at the Community Level
- Information collection and guidance
- Alert on secondary disaster
- Planning and implementing disaster recovery measures

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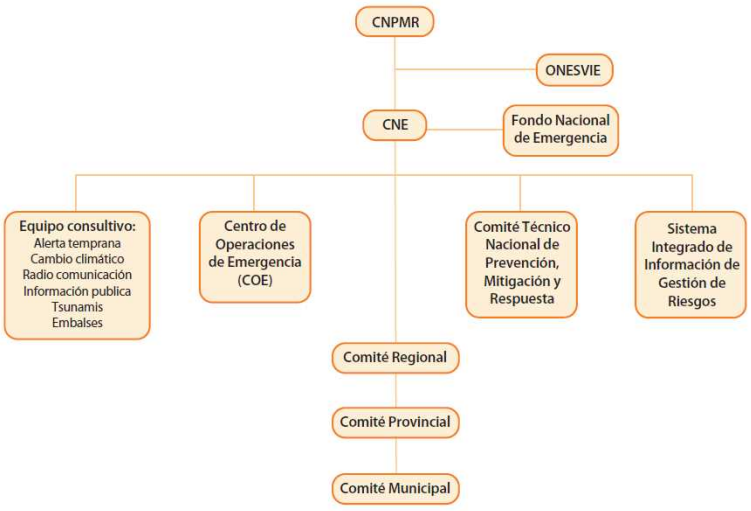
appendix

Outline of the Disaster Management System in DR



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6.　ロードマップ発表スライド

Survey Findings and Roadmap

2022.03.08

JICA Project Team

Outline

1. Preparation of Roadmap
   1. Structure of Roadmap
   2. How the Roadmap is Prepared
2. Survey Findings
   1. Earthquake Disaster Risk Reduction (DRR)
   2. Seismic Resistance of Buildings
   3. Seismic Resistance of Infrastructures
3. Roadmap
   1. Earthquake Disaster Risk Reduction (DRR)
   2. Seismic Resistance of Buildings
   3. Seismic Resistance of Infrastructures

1. Preparation of Roadmap

1.1 Structure of Roadmap

Category	Sub-Category
Earthquake Disaster Risk Reduction (DRR)	Laws and Regulations
	Institutional Setup
	DRR Plans
	Risk Assessment
	DRR Budgeting
Seismic Resistance of Buildings	Building Standards and Code
	Building Permission
	Seismic Resistance of Important Buildings
	Seismic Retrofitting of Important Buildings
	Informal Construction
	Seismic Resistance of Residential Buildings
Seismic Resistance of Infrastructures	Infrastructure Regulations
	Seismic Resistance of Infrastructure and Lifeline
	Seismic Retrofitting of Infrastructure and Lifeline

1.2 How the Roadmap is Prepared

1. Survey Findings and Direction of Improvement

Category	Indicators for evaluating the current status of DRR	Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
❶ Survey Topics			❷ Survey Findings		❸ Measures	

2. Roadmap

Category	Sub-Category	Policy Number (No.)	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
						Short Term (-2025)	Mid Term (2025-2030)	Long Term (2030-2035)	A: High B: Med C: Low
Earthquake Disaster Risk Reduction (DRR)	Laws and Regulations	D-1	Clarification of policies and roles of each organization regarding earthquake disaster prevention and control and seismic retrofitting in accordance with DRR-related laws	Addition of a policy to promote seismic resistance of important buildings to the revised law	MEPyI, relevant ministries and agencies				

❹ Implementation Strategy

2. Survey Findings and Direction of Improvement

Earthquake DRR | Buildings | Infrastructure

2.1.1 Status of law formulation

← Indicators for evaluating the current status of DRR

Survey Findings

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Formulate specific descriptions of DRR laws and bylaws	• The Disaster Risk Management Law has been enacted (2002) • The present Disaster Risk Management Law provides basic policies, such as disaster risk assessment and ensuring safety of infrastructure • Currently, the Disaster Risk Management Law is being revised to be in line with the Sendai Framework for Disaster Risk Reduction	• Clarification of policies and roles of each organization regarding earthquake disaster prevention and mitigation and seismic retrofitting in DRR-related laws	• The revised content includes policies to promote the seismic resistance of important buildings, as much as possible	• The Basic Act on Disaster Management : Designation of facilities (evacuation centers) to be constructed/retrofitted on a priority basis • Procedure to revise the Basic Act on Disaster Management according to the issues identified after the event

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2.1.1 Status of law formulation

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
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2.1.2 Status of plans and strategies based on the law ①

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Incorporate DRR (especially promotion of earthquake resistance) into comprehensive development plans and strategies.	• Safety assurance and/or resilience is not mentioned in the "long-term vision" of the National Development Strategy • Specific initiatives include prioritizing the construction of public infrastructure for safety and the development of relevant regulations and awareness-raising to promote earthquake risk reduction • The strategy sets out the implementation of priority construction for DRR of public infrastructure and the adoption of relevant regulations to promote DRR	Deployment of earthquake disaster prevention and seismic retrofitting to development strategies of relevant agencies and local governments	Provide guidance on the introduction of earthquake DRR measures into the development strategy of the organization, and conduct monitoring of the plan.	Contents of Basic Disaster Management Plan (National Disaster Management Plan in Japan)

Earthquake DRR | Buildings | Infrastructure

2.1.3 Status of plans and strategies based on the law ②

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Plan formulation by central government level agencies	• National Disaster Risk Reduction Plans (2001, 2011, 2022) and National Earthquake Risk Reduction Plans (2013, 2022) have been prepared • The revised National Disaster Risk Reduction Plan includes the following; ✓ review of regulations and standards for building permits and infrastructure construction and reconstruction ✓ promotion of disaster resilience of critical infrastructure ✓ clarification of implementation processes, indicators, and responsible organizations, although some projects have unclear indicators.	Establishment of clear indicators for the revised National Disaster Risk Reduction Plan Establishment of mechanisms (monitoring system, budget, framework) for implementation of the plan	• Set numerical targets for achievement ✓ Add to the list of indicators the names of reports and studies that can evaluate the progress of achievement ✓ Implementation of status surveys and data preparation for regular monitoring and review of progress. ✓ Implementation of regular monitoring and revision of the National Disaster Risk Reduction Plan and National Earthquake Risk Reduction Plan	Planning system and mechanism for promoting earthquake-resistant construction in Japan: Implementation of surveys on the status of earthquake-resistant construction of facilities by competent authorities and local governments, and their reflection to the plans

Earthquake DRR | Buildings | Infrastructure

2.1.4 Plan formulation by local government

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Local DRR plans have been developed only in a few municipalities	• Formulation of local disaster risk reduction plans in local governments • Even where the plans have been developed, technical and financial capacity needs to be improved to implement it • Earthquake DRR measures have not yet been introduced enough at the local government level	Introduce system for supporting and monitoring the planning of local governments to the central government	• System for the central government to support the formulation of local disaster reduction plans • Implementation and continuation of guidelines and guidance to support planning by local governments • Implementation of planning and monitoring by local governments	• Plan formulation by local government • Local government seismic retrofit promotion plans to promote earthquake resistance

Earthquake DRR | Buildings | Infrastructure

2.1.5 Status of framework for implementation ①

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Clarification of the roles among organizations and establishment of a cooperation system	• The following roles are assigned for the promotion of seismic reinforcement and seismic retrofitting; ✓ ONESVIE: Building evaluation ✓ MOPC: Revision of building codes for public facilities and infrastructure, infrastructure design and management ✓ MIVHED: Design and construction management of buildings ✓ MINERD: Vulnerability assessment of school facilities ✓ MSP: Vulnerability assessment of hospital facilities • There is no organization to secure and implement the budget for seismic retrofitting of public facilities, and the budget for seismic design and retrofitting is being requested along with capacity building of staff. • There are organizations such as Seismic Table, which promote efforts in cooperation with related ministries and agencies, and regular meetings are held.	Clarification of the roles of each disaster prevention-related organization for earthquake-resistant construction of important buildings, as well as recognition and coordination within related organizations (The duplication of functions and authorities among organizations was mentioned as one of the main issues)	• Organization of the Seismic Table within the legal framework ✓ Clarification of organizational structure, goals, and roles related to earthquake prevention measures ✓ Define its position in laws and regulations such as the Risk Management Law	Organizational Structure of Japan's **Basic Disaster Management Plan**

2.1.6 Status of framework for implementation ②

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Establishment of Earthquake DRR department within each organization	• Many ministries and agencies have established departments related to disaster prevention, and the number of personnel to carry out disaster prevention tasks has increased • In local governments, disaster risk reduction and urban planning offices have been established within the mayor's office.	Secure technical, financial, and human resources for disaster reduction organizations in local governments.	Guidance from the central government to local governments on the establishment of DRR organizations and capacity building of local government officials	Organizational structure of **Local Disaster Management Plans** in local governments in Japan

2.1.7 Status of framework for implementation ③

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Promote private sector collaboration and initiatives	• The Disaster Management Law and related plans emphasize the participation of residents and the private sector, and define the promotion of disaster reduction efforts to citizens as a necessary activity • There are no guidelines, subsidies, or incentives for the private sector to promote earthquake resistance. • Lack of financial support from the government to the private sector	Establishment of mechanisms (subsidies, incentives, guidelines) to promote seismic retrofitting of private-sector buildings and earthquake disaster prevention efforts	• Promote private-sector cooperation and initiatives by preparing and distributing guidelines for earthquake disaster prevention for the private sector. • Establish systems and incentives such as financial assistance and earthquake insurance.	• Measures to raise awareness of disaster prevention (disaster awareness materials) and mechanisms to support residents' efforts (incentives and subsidies for earthquake-proofing, earthquake insurance, etc.) • Examples of disaster prevention education and training for schools and communities

Earthquake DRR | Buildings | Infrastructure

2.1.8 Status of risk assessment ①

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Conducting earthquake risk assessment and creating earthquake hazard maps	• The Disaster Management Law and related plans include provisions on the implementation of disaster risk assessment • In certain areas, seismic intensity distribution maps have been created, earthquake simulations and earthquake disaster assumptions (frequency and scale of disasters) have been implemented. • Local governments have limited technical, financial, and physical resources and have not yet conducted detailed seismic risk assessments.	Conduct nationwide seismic risk assessment and create seismic intensity distribution maps	• Establishment of methods and policies for seismic risk assessment and seismic intensity distribution mapping (risk analysis methods) • Preparation of information for nationwide implementation of earthquake risk assessment • Implementation of nationwide seismic risk assessment • Preparation and distribution of guidelines for detailed seismic risk assessment by local governments and implementation of training for staff • Implementation of detailed seismic risk assessment by each local government	Methods and mechanisms for conducting earthquake risk assessment in Japan

Earthquake DRR | Buildings | Infrastructure

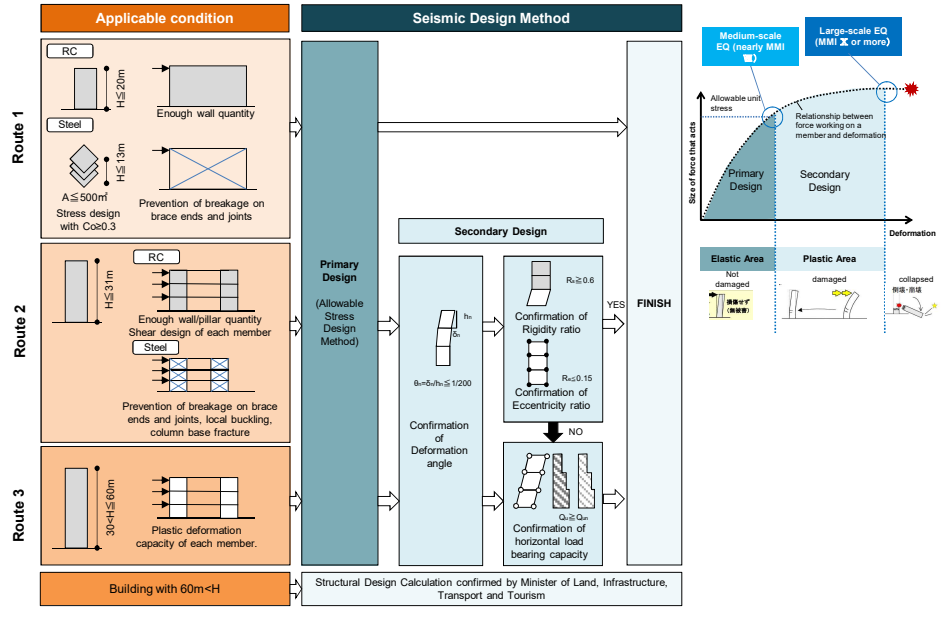
2.1.9 Status of risk assessment ②

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Utilization of earthquake disaster assessment and maps	• The result of Seismic microzonation map for some areas are used to identify priority areas for earthquake DRR measures, promote seismic retrofitting, regulate land use, and raise awareness of earthquake disaster prevention • The National Seismic Risk Reduction Plan does not include the results of the seismic risk assessment and the countermeasures against the expected damage	Reflect the results of earthquake risk assessment in the National Earthquake Risk Reduction Plans, Local DRR Plans, and land use plans.	• Formulate DRR plans and land use plans that take into account the results of seismic risk assessment • Preparation and distribution of disaster awareness materials including earthquake hazard maps to residents.	• Development of earthquake damage estimates into local DRR plans • Methods to prepare and disseminate earthquake hazard maps at the local government level

2.1.10 Status of budget securing and execution

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Securing and executing the national budget	• Each organization related to disaster reduction has only a basic budget for organizational operations and does not have sufficient financial resources to implement initiatives to strengthen buildings and infrastructure, including seismic reinforcement • No ministry or agency has a budget for seismic reinforcement or seismic design. • Lack of information on the budgets for disaster reduction in each ministry and agency, making it difficult to manage budgets for projects • Local governments does not have budgets to promote disaster prevention measures.	• Securing budgets at the ministries and agencies for projects involving seismic retrofitting and reinforcement work of public facilities • Maintaining information on DRR budgets of each ministry and agency and managing the project budgets • Secure DRR budgets of local governments	• Clarification of earthquake-resistance projects and responsible organizations, in various plans and strategies that form the basis for budget setting • Collect and maintain information on disaster reduction budgets of each ministry and agency, and visualize the budget status • Incorporate measures to promote earthquake-resistance into local development strategies and plans, and secure budget	Explanation of the effects of pre-disaster investment in Japan

2.3.0 Seismic Design Flow and Routes



2.2.1 Status of Building Code

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Framework of standards for assuring the seismic resistance of buildings	• Standards on seismic resistance are about to be centralized in R-001. • The current revision process is within MOPC and the draft is almost finished. Once finished, it will be passed to MIVHED. • Discussions on the revision of the standard include advanced issues on structural dynamics as well as other issues	• Lack of a clear seismic design system • Engineers' understanding of building standards is insufficient • The need for an introductory textbook is not shared (ex. "additional application guide of the code", "introductory textbook of concepts to apply the code", and "supporting software")	• Compile an introductory textbook (preferably in the form of a committee is recommended) • Utilize the knowledge of the load tests conducted at Japanese PWRI (Public Works Research Institute) • Development of analysis methods for earthquake resistant design	• The lesson learned from the Great Hanshin-Awaji Earthquake of 1995 is that buildings must be prepared for large seismic motions that are rare but have the potential to occur. (Equivalent to "Rare" or "Very Rare" in SEAOC's VISION 2000) • Avoid "shear failure" and "loss of restraint of main reinforcement" which can lead to sudden failure. To achieve this, it is essential to specify the structural details (e.g. density of hoop bars). • Design methods should reflect the behavior of structural members after some of them exceed their yield strength. Structural analysis methods that take nonlinear behavior into account are essential (e.x., Ultimate limit state design(ULSD)). • Seismic design methods in Japan • Clarify the position of structural analysis in seismic design • Introduce "Route of design" • Standard Specifications for Building Construction, "Structural Calculation Standards", "Load Guidelines", and other manuals prepared by the Architectural Institute of Japan.

2.2.2 Status of the Building Permit Procedures and its implementation

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Development of an effective inspection framework	The central office for building permits is MIVHED, but there is a misconception that notification to the local government is the only necessary procedure	• Building permit applications, supervision and approval systems are not properly recognized. • The supervising body is in the process of being transferred from MOPC to MIVHED. • The position of the building official who issues building permits is not clarified.	An approach to structural issues and a non-structural issues are needed. • Establishment of a qualification examination system for the Chief Building Official to examine applications for confirmation and completion inspections. • Establishment of the Architects Act and mandatory periodic training for architects at regular intervals. • Follow-up training	Architect/Engineer License Creditation System and Periodic Training System

Earthquake DRR | **Buildings** | Infrastructure

2.2.3 Status of code compliance for important structures *

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
A framework that enforces buildings to have seismic performance beyond the minimum standards (required for privately owned buildings)	Currently, it is unclear whether the responsible administrative agency for important structures is MOPC or MIVHED.	• Lack of understanding that "public structures should be considered separately (to private buildings)" • No prioritization of seismic retrofitting of existing important structures	Share the concept of requiring important public structures to have seismic performance higher than "the minimum requirement" Enact law to promote seismic retrofitting of public buildings.	• Designation of "Specified Buildings (buildings that do not conform to the new seismic standards) • The Act on Promotion of Seismic Retrofitting of Buildings: requires owners of certain buildings, such as schools, offices, hospitals, and department stores, where unspecified large numbers of people gather (specified existing seismically unqualified buildings), that do not conform to the current seismic regulations to conduct seismic diagnosis and, if necessary, make efforts to make seismic retrofitting • Concept of seismic resistance grade

*Important structures=government buildings, hospitals, schools, etc.

Earthquake DRR | **Buildings** | Infrastructure

2.2.4 Implementation of seismic diagnosis and seismic reinforcement of important structures

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Assuring the safety of existing public buildings	ONESVIE evaluates and diagnoses existing buildings and proposes renovation designs. The renovation work depends on each institution. In the case of hospitals, the division of responsibilities is as follows • Structure: MOPC, SNS • Owner of the hospital: SNS • Construction: MIVHED	• Lack of recognition of cost-effectiveness towards seismic-resistance methods • Not much of the budget can be spent on disaster management • Lack of awareness of where pre-investment efforts are effective and where it is not	• Seismic diagnosis: Introduction of a diagnosis method for cases where "as-built drawings" are not available. • Seismic reinforcement: Introduction of methods (ranging from construction methods that expect toughness to reinforcement methods for traditional masonry) • Implementation of vibration control structures.	• Methods of seismic diagnosis • Examples of seismic retrofitting of school buildings and other series of seismic retrofitting efforts • Concept of the Act on Promotion of Seismic Retrofitting of Building • Energy-absorbing dampers • Buckling-control braces

Earthquake DRR | **Buildings** | Infrastructure

2.2.5 Informal Construction

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Building permit application and confirmation	The distinction between "existing non-conforming buildings" and "illegal building" is not clear	Legal basis is an issue in how to deal with the situation	Ensure that building permits and applications are required, in addition to notifications to the local government.	Architect license system with qualification exam

Earthquake DRR | **Buildings** | Infrastructure

2.2.6 Earthquake resistance of residential housing

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Ensure that the buildings meet the minimum standards for building sites, facilities, structures, and uses, in order to protect the people's lives, health, and property.	• Level of earthquake resistance of privately owned houses is not always clear • While some meet a certain standard, others are unsatisfactory.	Public understanding of earthquake damage has not yet been fostered	Raising the awareness and motivation towards earthquake resistance of housing owners	• "Guidelines for Promoting Earthquake Resistance" • "Excellent Building Improvement Project System (incentive system implemented in Japan.It provides guidance and subsidies for actual building planning)

2.3.1 Status of Earthquake Resistance Standards and Design Standards

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Standardization of design criteria for infrastructure facilities	The code for earthquake resistance (seismic intensity level) is R-001, and except for roads and bridges, the standards for detailed analysis and design are prepared independently by private companies.	The performance of structures during and after earthquakes is not clear, which makes it difficult to consider comprehensive earthquake countermeasures	Define standards and guidelines for each industry(lifeline), and clarify the seismic performance of each industry (lifeline) by comparing them with one another.	In Japan, even for structures owned by private companies, design guidelines are compiled by the relevant government agencies and academic associations. For example, guidelines and explanations for earthquake-resistant construction methods for water supply facilities, and technical regulations/guidelines for earthquake-resistant design of nuclear power plants.

2.3.2 Status of Earthquake Resistance Diagnosis Standards

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Establishment of methods for earthquake resistance diagnosis and vulnerability assessment	• For bridges, diagnosis is conducted for the purpose of maintenance and management, but it does not directly evaluate seismic resistance. • For other infrastructure/lifeline facilities, there are no standards for seismic detailed diagnosis and no diagnosis has been carried out, that is not visual	• For infrastructure facilities, problems are dealt with when they become apparent. • As a result of the above, disaster preparedness is inadequate, and it is also difficult to estimate damage in order to conduct preliminary studies for reconstruction work.	• Seismic evaluation should be divided into individual structures and linear structures. • Individual structures should be evaluated based on the current design standards, and simple evaluation methods should be developed and adopted for facilities for which various characteristics are not yet available, for example, in seismic diagnosis of buildings. • Linear structures cannot be evaluated at individual points. For such facilities, the damage rate per unit length is calculated for each regional mesh, and vulnerable areas are assumed. • Establish damage function based on the characteristics of the ground and facilities in the Dominican Republic	• In Japan, Damage Functions have been developed and evaluated based on past earthquake damages. • It is possible to establish a damage function based on the Japanese damage function taking into account the characteristics of the ground and facilities in the Dominican Republic.

2.3.3 Status of seismic reinforcement technology

Required Response	Current Status	Issues	Direction of improvement measures and countermeasures	Examples of Relevant Japanese Technologies and Experience
Raise awareness of the necessity and advantages of seismic retrofitting	• The Dominican Republic has no experience in seismic retrofitting of infrastructure facilities. • As a result of the above, not only does the country lack the technology for seismic retrofitting, but it also has insufficient accumulated knowledge on the subject.	• It is realistic to use technologies and materials that can be adopted in the country for seismic reinforcement, but the lack of construction experience limits the range of the options • There is a tendency to prioritize new construction because of the lack of knowledge on the economic advantages of seismic retrofitting. • It is necessary to accumulate technical knowledge that seismic reinforcement can provide sufficient seismic resistance, knowledge that seismic reinforcement can achieve seismic retrofitting at low cost, and to raise awareness of seismic reinforcement.	• Examine the applicability of seismic retrofitting technologies (rettofitting design, retrowitting work) and materials (new materials, new technologies) for existing infrastructure. • Demonstrate economic advantages by examining costs based on trial design and construction simulation	• In Japan, seismic retrofitting work, such as strengthening of bridge pier, prevention of bridge girder falling down, and, adoption of felexible joint for piping, have been conducted. • Resarch papers on economical evaluation method for seismig retrofitting for infrastructures are available.

3. Roadmap

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3.1.1 Laws and Regulations

← Sub-Category

Policy Number (No.) -------- D: DRR general measure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025 - 2030	Long-term 2030 - 2035	A: High B: Medium C: Low
D-1	Clarification of policies and roles of each organization regarding earthquake disaster prevention and control and seismic retrofitting in accordance with DRR-related laws	Addition of a policy to promote seismic resistance of important buildings to the revised law	MEPyD and relevant ministries and agencies	✓			A

How the "Priority" is decided

A) Measures related to the construction and seismic reinforcement of **public buildings and infrastructures for disaster prevention that support disaster response after an event**

B) Measures related to the construction of **public buildings and infrastructure other than above / Other policies and plans related to DRR.**

C) Measures related to **private buildings**

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3.1.1 Laws and Regulations

Policy Number (No.) -------- D: DRR general measure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025 - 2030	Long-term 2030 - 2035	A: High B: Medium C: Low
D-1	Clarification of policies and roles of each organization regarding earthquake disaster prevention and control and seismic retrofitting in accordance with DRR-related laws	Addition of a policy to promote seismic resistance of important buildings to the revised law	MEPyD and relevant ministries and agencies	✓			A

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3.1.2 Institutional Setup

Policy Number (No.) -------- D: DRR general measure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025 - 2030	Long-term 2030 - 2035	A: High B: Medium C: Low
D-2	Clarification of the roles of each disaster prevention organization for earthquake-resistant construction of important buildings, and recognition and coordination among related organizations.	Establish legal framework for the Seismic Table (clarification of the role of the organization in the Risk Management Law and various plans).	ONESVIE	✓			A
D-3	Secure technical, financial, and human resources for disaster reduction organizations in local governments.	Guidance from the central government to local governments on the establishment of disaster reduction organizations and capacity building of local government officials.	OCD		✓		B

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3.1.3 DRR Plans ①

Policy Number (No.) -------- D: DRR general measure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025 - 2030	Long-term 2030 - 2035	A: High B: Medium C: Low
D-4	Deployment of earthquake disaster prevention and earthquake resistance in the development strategies of relevant agencies and local governments	Guidance on the introduction of earthquake disaster prevention measures into the development strategies of each organization and monitoring of the plans.	MEPyD and relevant ministries and agencies	✓			B
D-5	Establishment of clear indicators in the revised National DRR Plan	Establishment of effective targets and indicators for seismic risk assessment and implementation of seismic retrofitting (setting of numerical targets, clarification of surveys and reports to help check progress)	MEPyD	✓			A
D-6	Establishment of mechanisms (monitoring system, budget and framework) for implementation of the plan	Periodic monitoring and revision of the National Disaster Risk Reduction Plan and the National Seismic Risk Reduction Plan.	MEPyD	✓	✓	✓	A

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3.1.4 DRR Plans ②

Policy Number (No.) -------- D: DRR general measure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025 - 2030	Long-term 2030 - 2035	A: High B: Medium C: Low
D-7	Development of local disaster risk reduction plans in local governments	Introduce to the central government a mechanism to support local governments in planning and monitoring.	MEPyD、OCD	✓			A
D-8		Preperation of guidelines and guidance to support planning by local governments	MEPyD、OCD	✓			B
D-9		Implementation of planning and monitoring by the local governments	Local government		✓		B

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3.1.5 Risk Assessment ①

Policy Number (No.) -------- D: DRR general measure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025 - 2030	Long-term 2030 - 2035	A: High B: Medium C: Low
D-10	Implementing nationwide seismic risk assessments and preparing seismic intensity distribution maps	Establishment of a nationwide seismic risk assessment method and seismic intensity distribution mapping method, setting of policies, and preparation of information for risk assessment	SGN	✓			A
D-11		Implementation of nationwide earthquake risk assessment	SGN		✓		A

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3.1.5 Risk Assessment ②

Policy Number (No.) -------- D: DRR general measure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025 - 2030	Long-term 2030 - 2035	A: High B: Medium C: Low
D-12	Prepare and implement detailed seismic risk assessment and seismic intensity distribution maps for local governments	Preparation and distribution of guidelines for detailed seismic risk assessment by local governments and training for staff	SGN		✓		B
D-13		Implementation of detailed seismic risk assessment by each local government	Local government		✓		B

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3.1.6 Risk Assessment ③

Policy Number (No.) -------- D: DRR general measure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025 - 2030	Long-term 2030 - 2035	A: High B: Medium C: Low
D-14	Reflect the results of seismic risk assessment in disaster prevention plans and land use plans, and set effective targets	Formulate disaster prevention plans and land use plans that take into account the results of earthquake risk assessment	MEPyD、Local government		✓		B
D-15		Preparation and distribution of disaster awareness materials, including seismic hazard maps, to local residents.	Local government		✓		C

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3.1.7 DRR Budgeting

Policy Number (No.) -------- D: DRR general measure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025 - 2030	Long-term 2030 - 2035	A: High B: Medium C: Low
D-16	Securing budgets for earthquake-resistant construction in ministries and agencies with jurisdiction over public buildings	Clarification of earthquake-resistant projects and organizations in charge in various plans and strategies as a basis for budget setting	MEPyD	✓	✓	✓	A
D-17	Maintain information on disaster risk reduction budgets of ministries and agencies and manage project budgets	Collection and maintenance of information on disaster risk reduction budgets of each ministry and agency, and visualization of budget status	MEPyD	✓			B
D-18	Securing disaster risk reduction budgets for local governments	Incorporate measures to promote earthquake-resistance into local development strategies and plans, and secure budgets.	Local government	✓	✓	✓	B

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3.2.1 Building Standards and Code

Policy Number (No.) -------- B: Buildings	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025-2030	Long-term 2030-2035	A: High B: Medium C: Low
B-1	Establishment of earthquake-resistant design system that identifies the required structural calculation method depending on the building to be designed.	Systemizing earthquake resistance standards	ONESVIE, MOPC, MIVHED and local government		✓	✓	A
B-2		Development of structural calculation methods	ONESVIE, MOPC, MIVHED and local government		✓	✓	A
B-3		Dissemination of building technology education	ONESVIE, MOPC, MIVHED and local government		✓		A

3.2.2 Building Permission

Policy Number (No.) -------- B: Buildings	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025-2030	Long-term 2030-2035	A: High B: Medium C: Low
B-4	Verification of requirements for building permits	Introduction of the Architecture/Engineer Review Board System. The board may request the review of building permissions to ensure the fair execution of building administration	MIVHED			✓	B
B-5	Positioning of the building official to issue building permits	Introduction of an examination system and a training system to be implemented when qualifications are renewed	MIVHED		✓		B

3.2.3 Seismic Resistance of Important Buildings

Policy Number (No.) -------- B: Buildings	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025-2030	Long-term 2030-2035	A: High B: Medium C: Low
B-6	Systematic diagnosis and evaluation of existing important buildings	Establishment of seismic evaluation standards for existing buildings	ONESVIE		✓		B
B-7	Prioritizing of existing important buildings	Creation of an inventory of seismic strength of public buildings	ONESVIE		✓		B

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3.2.4 Seismic Retrofitting of Important Buildings

Policy Number (No.) -------- B: Buildings	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025-2030	Long-term 2030-2035	A: High B: Medium C: Low
B-8	Clarification of seismic retrofit technology	Formulate standards for seismic retrofitting of existing buildings	ONESVIE		✓		B
B-9	Ensure earthquake resistance of important buldings (government buildings, hospitals, etc.)	Implementation of projects for seismic retrofitting (or reconstruction) of important buildings (government buildings, hospitals, etc.)	ONESVIE and relevant ministries and agencies		✓	✓	A

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3.2.5 Informal Construction

Policy Number (No.) -------- B: Buildings	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025-2030	Long-term 2030-2035	A: High B: Medium C: Low
B-10	Clarification of the definition for "existing un-confirmed" and "illegal" building	Implementation of building certification system seminars	MIVHED			✓	C
B-11	Establish requirements for the qualifications of building engineers	Establish an architect system based on qualification exam	MIVHED			✓	B

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3.2.6 Seismic Resistance of Residential Building

Policy Number (No.) -------- B: Buildings	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025-2030	Long-term 2030-2035	A: High B: Medium C: Low
B-12	Establishment of mechanisms (subsidies, incentives, guidelines) to promote seismic retrofitting of private-sector buildings and earthquake DRR efforts	Prepare and distribute guidelines for earthquake disaster prevention and seismic retrofitting for the private sector	ONESVIE		✓		C
B-13		Establish systems and incentives such as financial assistance and earthquake insurance.	ONESVIE			✓	C

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3.3.1 Infrastructure Regulations

Policy Number (No.) -------- I: Infrastructure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025-2030	Long-term 2030-2035	A: High B: Medium C: Low
I-1	Examination of comprehensive earthquake countermeasures for infrastructure	Establishment of standards and guidelines to be followed by each lifeline industry	MOPC and related companies	✓			A
I-2	Clarification of the required performance of structures during and after earthquakes	Clarification of seismic performance by comparing developed standards	MOPC and related companies	✓			A

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3.3.2 Seismic Resistance of Infrastructure and Lifeline

Policy Number (No.) -------- I: Infrastructure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025-2030	Long-term 2030-2035	A: High B: Medium C: Low
I-3	Conducting structural vulnerability assessment and seismic risk assessment for the preparation of reconstruction plans	Development of seismic diagnosis method for individual structures	MOPC and related companies	✓			A
I-4		Development of damage functions for linear structures (piping, etc.)	MOPC and related companies	✓			A
I-5	Establishment and dissemination of earthquake resistance evaluation technology	Conduct training on the seismic evaluation method developed.	MOPC and ONESVIE		✓		B
I-6		Establish a certification system for seismic resistance evaluation.	MOPC and ONESVIE		✓		B

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3.3.3 Seismic Retrofitting of Infrastructure and Lifeline①

Policy Number (No.) -------- I: Infrastructure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025-2030	Long-term 2030-2035	A: High B: Medium C: Low
I-7	Providing more options for earthquake-resistant retrofitting methods	Examine the applicability of seismic retrofitting technologies (retrofitting design, retrofitting work) and materials (new materials, new technologies)	MOPC and relevant ministries and agencies	✓			A
I-8	Preparation of technical materials to ensure and facilitate seismic retrofitting work	Formulation of standard construction specifications for retrofitting work	MOPC and related companies	✓			A

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3.3.4 Seismic Resistance of Infrastructure and Lifeline②

Policy Number (No.) -------- I: Infrastructure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025-2030	Long-term 2030-2035	A: High B: Medium C: Low
I-9	Establishment and dissemination of earthquake-resistant retrofitting technology	Conduct technical training for retrofitting design and work	MOPC		✓		B
I-10		Implementation of related technology development	MOPC and related companies		✓		B
I-11		Introduction of incentives to promote the acquisition of technologies	MOPC		✓		B

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3.3.5 Seismic Resistance of Infrastructure and Lifeline③

Policy Number (No.) -------- I: Infrastructure	Issues to be addressed	Implementation Measures	Responsible Agency	Target Year			Priority
				Short-Term -2025	Mid-Term 2025-2030	Long-term 2030-2035	A: High B: Medium C: Low
I-12	Raise awareness of the advantages of seismic retrofitting work and promoting seismic retrofitting	Study economic advantages by examining costs based on trial design (design sumulation for model strcture) and construction simulation	MOPC		✓		B
I-13	Assure earthquake resistance of important infrastructure	Implementation of seismic retrofitting projects for important infrastructure	MOPC and related companies		✓	✓	A