2024 Capacity Assessment of Tsunami Preparedness in the Indian Ocean – Results from survey data analysis

Capacity Assessment Validation Workshop
2024 Tsunami Preparedness Capacity Assessment in Indian and Pacific Oceans Project
Bangkok, Thailand, 4-6 September 2024

Professor Richard Haigh
Professor Dilanthi Amaratunga

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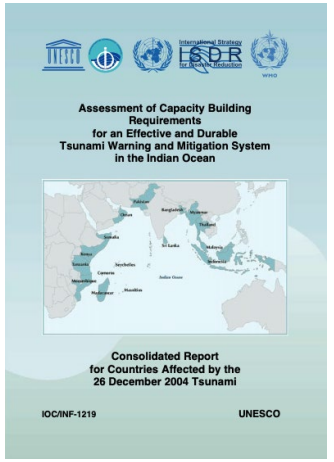
Background to Capacity Assessment

2005 Assessment of capacity building requirements for an effective and durable tsunami warning and mitigation system in the Indian Ocean (IOC/INF-1219)

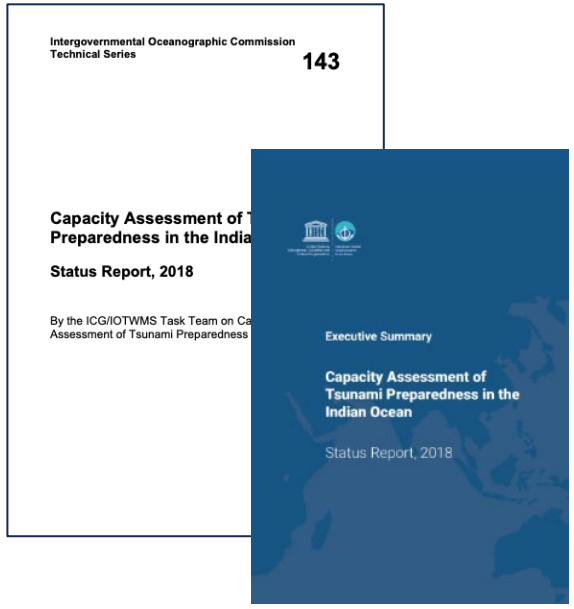
National Reporting Template coordinated by IOTWMS Secretariat



2015 ICG/IOTWMS at its 10th Session (Muscat) identified the need to conduct a reassessment of the state of tsunami preparedness

2017 ICG/IOTWMS established the inter-sessional "Task Team on Capacity Assessment of Tsunami Preparedness" (TT-CATP), led by Dr Harkunti Rahayu

2018 TT-CATP (IOC/2020/TS/143) provided a new baseline of the status of tsunami preparedness capacity in the region. It also identified specific gaps and prioritised capacity development requirements at both regional and national levels



2022 ICG/IOTWMS as its 13th Session (Bali, 2022) decided it was timely to conduct the next reassessment of the state of tsunami preparedness in ICG/IOTWMS Member States, reflect on progress made, identify remaining gaps, and prioritise capacity development requirements

2024 2024 reassessment being undertaken by the UNESCO-IOC through the ICG/IOTWMS Working Group 3 Tsunami Ready Implementation, with oversight and contributions by the ICG/IOTWMS Steering Group, and support from the UNESCO-IOC ICG/IOTWMS Secretariat. Further support by UN Economic and Social Commission for Asia and the Pacific (UNESCAP) and Global Disaster Resilience Centre. Funding is being provided by the Asian Development Bank (ADB) and the Government of Switzerland.

2024 Capacity Assessment of Tsunami Preparedness in the Indian Ocean

- Conduct the next reassessment of the state of tsunami preparedness in ICG/IOTWMS Member States
  - Reflect on progress made
  - Identify remaining gaps
  - Prioritise capacity development requirements
- The results will be presented to the 14th Session of the ICG/IOTWMS (Indonesia, 2024)

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ESCAP Trust Fund for Tsunami, Disaster and Climate Preparedness

ADB
ASIAN DEVELOPMENT BANK

Timeline of 2024 capacity assessment survey

January - March	Planning Meetings for 2024 IOTWMS Capacity Assessment Project
April - May	Updating of 2018 survey instrument and testing with IOTWMS WG leaders
15th May	Letter sent to TNCs inviting them to complete survey
2nd July	Survey closed to member states
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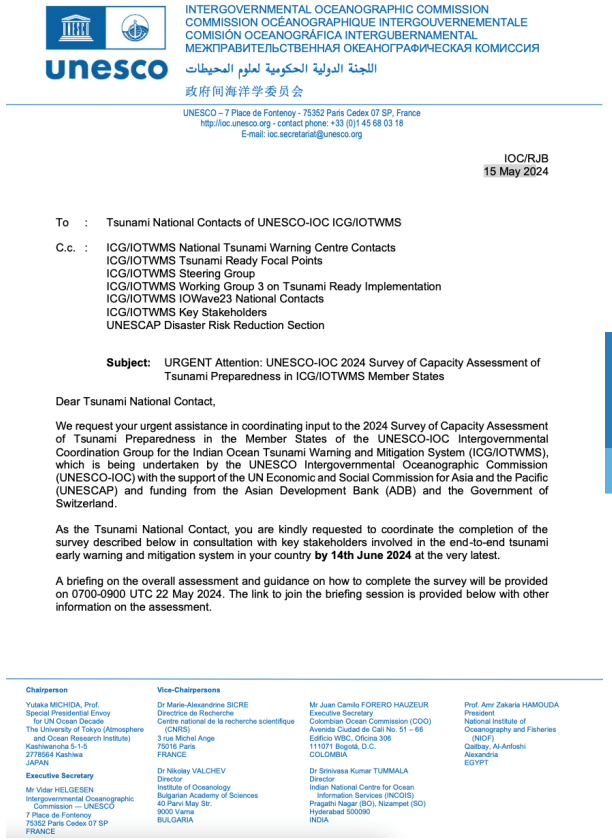
September	Draft Executive Summary by 16 September for subsequent review and endorsement by ICG/IOTWMS Steering Group
October	Final Executive Summary by 14 October (ie considering ICG/IOTWMS Steering Group review and endorsement) for publishing and also guidance for report being developed by UNESCAP for Policy-Makers and Donors
November	Draft full Summary Report by 31 October 2024 for ICG/IOTWMS review and endorsement in November 2024.

Who completed the survey?

Responses to the survey were coordinated, compiled, and submitted by Tsunami National Contact (TNC) of each Member State. The survey had six distinct parts (I-VI). Each part may have needed inputs from different stakeholders based on their national responsibility in the end-to-end tsunami warning and mitigation system.



INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
COMMISSION OCÉANOGRAPHIQUE INTERGOUVERNEMENTALE
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МЕЖПРАВИТЕЛЬСТВЕННАЯ ОКЕАНОГРАФИЧЕСКАЯ КОМИССИЯ
اللجنة الدولية الحكومية لعلوم المحيطات
政府间海洋学委员会

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IOC/RJB
15 May 2024

To : Tsunami National Contacts of UNESCO-IOC ICG/IOTWMS

C.c. : ICG/IOTWMS National Tsunami Warning Centre Contacts
ICG/IOTWMS Tsunami Ready Focal Points
ICG/IOTWMS Steering Group
ICG/IOTWMS Working Group 3 on Tsunami Ready Implementation
ICG/IOTWMS IOWave23 National Contacts
ICG/IOTWMS Key Stakeholders
UNESCAP Disaster Risk Reduction Section

Subject: URGENT Attention: UNESCO-IOC 2024 Survey of Capacity Assessment of Tsunami Preparedness in ICG/IOTWMS Member States

Dear Tsunami National Contact,

We request your urgent assistance in coordinating input to the 2024 Survey of Capacity Assessment of Tsunami Preparedness in the Member States of the UNESCO-IOC Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS), which is being undertaken by the UNESCO Intergovernmental Oceanographic Commission (UNESCO-IOC) with the support of the UN Economic and Social Commission for Asia and the Pacific (UNESCAP) and funding from the Asian Development Bank (ADB) and the Government of Switzerland.

As the Tsunami National Contact, you are kindly requested to coordinate the completion of the survey described below in consultation with key stakeholders involved in the end-to-end tsunami early warning and mitigation system in your country **by 14th June 2024** at the very latest.

A briefing on the overall assessment and guidance on how to complete the survey will be provided on 0700-0900 UTC 22 May 2024. The link to join the briefing session is provided below with other information on the assessment.

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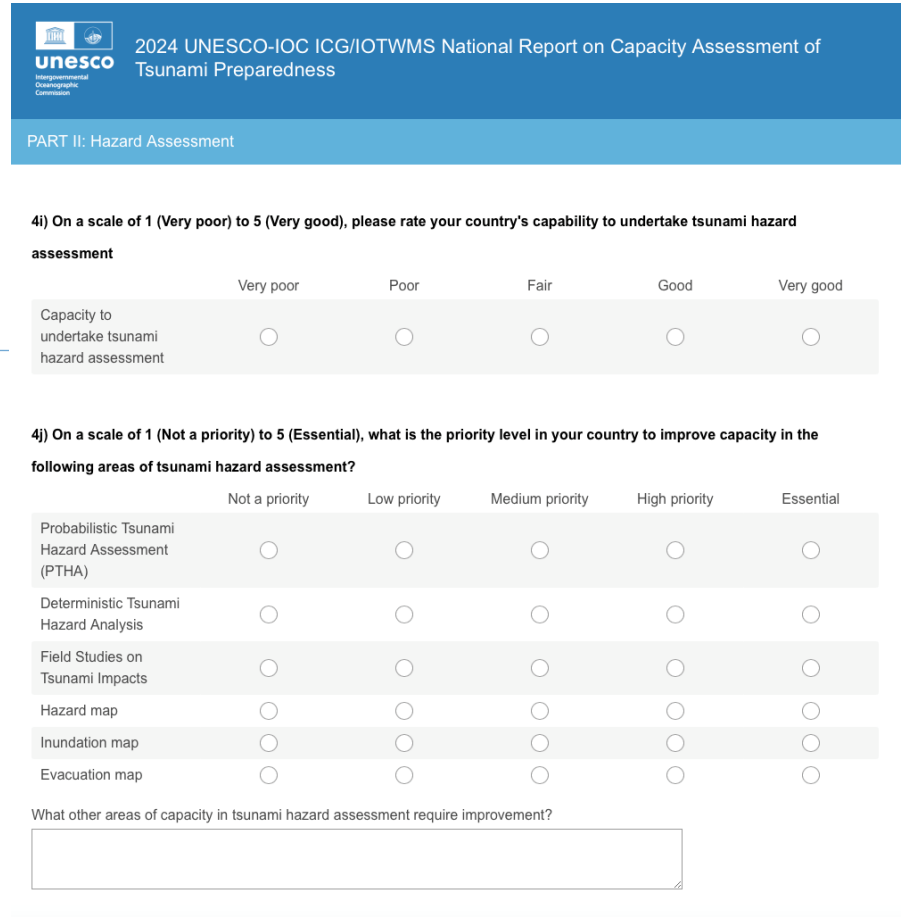

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2024 UNESCO-IOC ICG/IOTWMS National Report on Capacity Assessment of Tsunami Preparedness

PART II: Hazard Assessment

4i) On a scale of 1 (Very poor) to 5 (Very good), please rate your country's capability to undertake tsunami hazard assessment

	Very poor	Poor	Fair	Good	Very good
Capacity to undertake tsunami hazard assessment	○	○	○	○	○

4j) On a scale of 1 (Not a priority) to 5 (Essential), what is the priority level in your country to improve capacity in the following areas of tsunami hazard assessment?

	Not a priority	Low priority	Medium priority	High priority	Essential
Probabilistic Tsunami Hazard Assessment (PTHA)	○	○	○	○	○
Deterministic Tsunami Hazard Analysis	○	○	○	○	○
Field Studies on Tsunami Impacts	○	○	○	○	○
Hazard map	○	○	○	○	○
Inundation map	○	○	○	○	○
Evacuation map	○	○	○	○	○

What other areas of capacity in tsunami hazard assessment require improvement?

Structure of the survey

I Basic Information about TNC/NTWC/TWFP
II Risk Assessment and Reduction
III Detection, Warning and Dissemination
IV Public Awareness, Preparedness and Response
V Tsunami Ready Recognition Programme (TRRP)
VI Narrative

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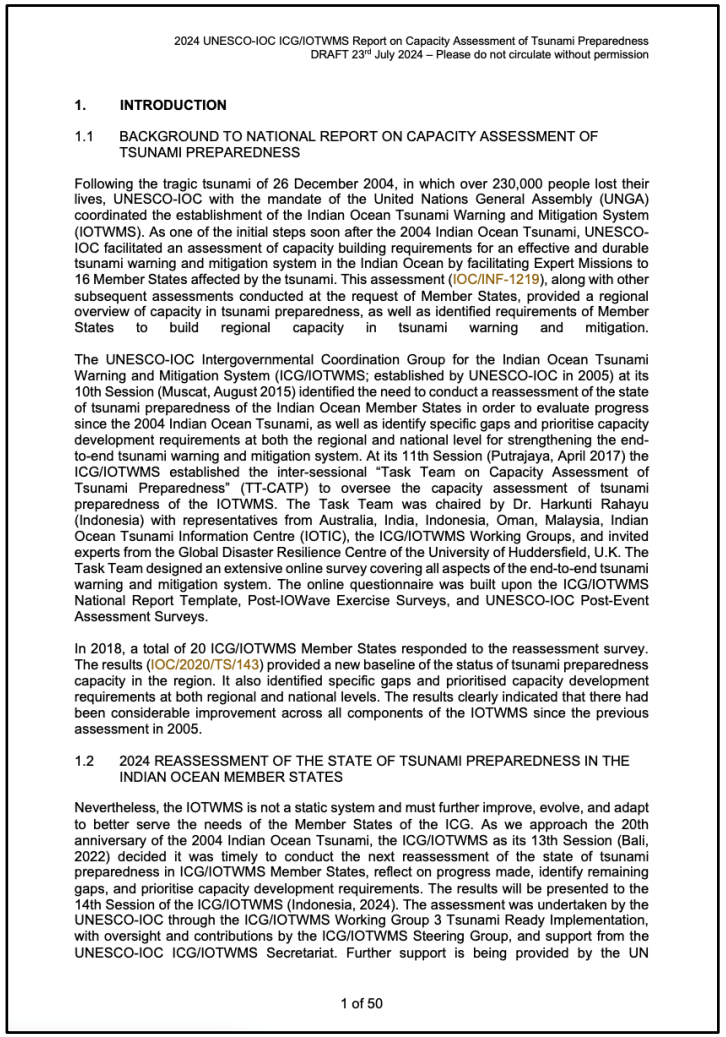
Two documents were circulated

Draft analysis
V1 15th July
V2 2nd August



1. INTRODUCTION

1.1 BACKGROUND TO NATIONAL REPORT ON CAPACITY ASSESSMENT OF TSUNAMI PREPAREDNESS

Following the tragic tsunami of 26 December 2004, in which over 230,000 people lost their lives, UNESCO-IOC with the mandate of the United Nations General Assembly (UNGA) coordinated the establishment of the Indian Ocean Tsunami Warning and Mitigation System (IOTWMS). As one of the initial steps soon after the 2004 Indian Ocean Tsunami, UNESCO-IOC facilitated an assessment of capacity building requirements for an effective and durable tsunami warning and mitigation system in the Indian Ocean by facilitating Expert Missions to 16 Member States affected by the tsunami. This assessment (IOC/INF-1219), along with other subsequent assessments conducted at the request of Member States, provided a regional overview of capacity in tsunami preparedness, as well as identified requirements of Member States to build regional capacity in tsunami warning and mitigation.

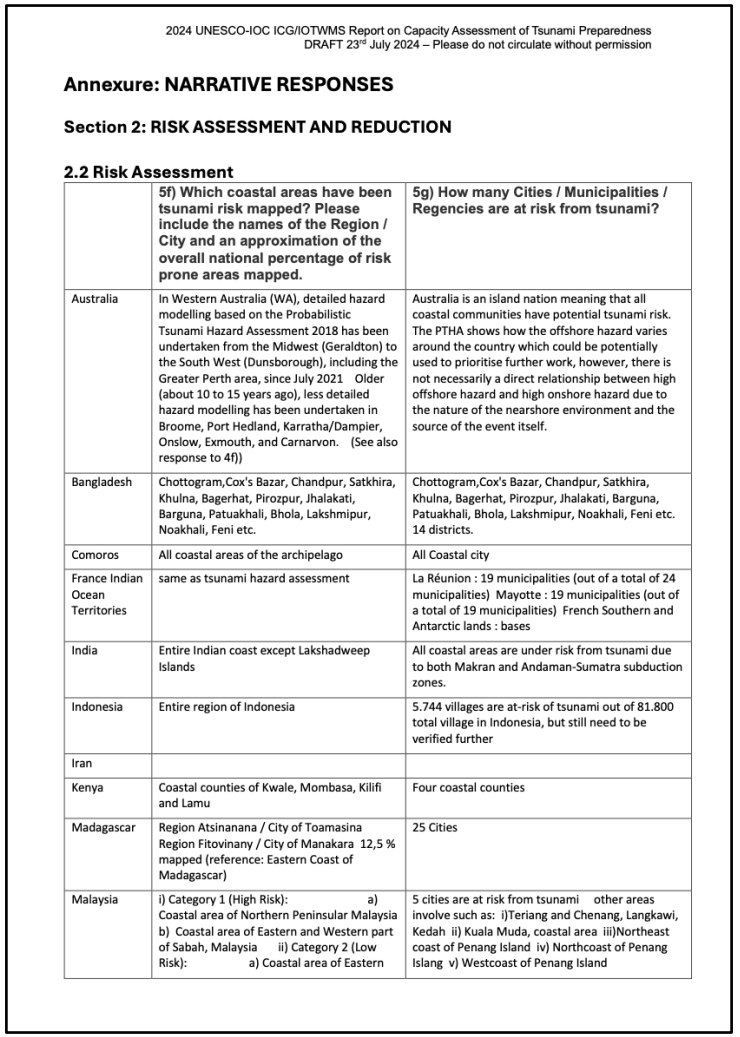
The UNESCO-IOC Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS; established by UNESCO-IOC in 2005) at its 10th Session (Muscat, August 2015) identified the need to conduct a reassessment of the state of tsunami preparedness of the Indian Ocean Member States in order to evaluate progress since the 2004 Indian Ocean Tsunami, as well as identify specific gaps and prioritise capacity development requirements at both the regional and national level for strengthening the end-to-end tsunami warning and mitigation system. At its 11th Session (Putrajaya, April 2017) the ICG/IOTWMS established the inter-sessional "Task Team on Capacity Assessment of Tsunami Preparedness" (TT-CATP) to oversee the capacity assessment of tsunami preparedness of the IOTWMS. The Task Team was chaired by Dr. Harkunti Rahayu (Indonesia) with representatives from Australia, India, Indonesia, Oman, Malaysia, Indian Ocean Tsunami Information Centre (IOTIC), the ICG/IOTWMS Working Groups, and invited experts from the Global Disaster Resilience Centre of the University of Huddersfield, U.K. The Task Team designed an extensive online survey covering all aspects of the end-to-end tsunami warning and mitigation system. The online questionnaire was built upon the ICG/IOTWMS National Report Template, Post-IOWave Exercise Surveys, and UNESCO-IOC Post-Event Assessment Surveys.

In 2018, a total of 20 ICG/IOTWMS Member States responded to the reassessment survey. The results (IOC/2020/TS/143) provided a new baseline of the status of tsunami preparedness capacity in the region. It also identified specific gaps and prioritised capacity development requirements at both regional and national levels. The results clearly indicated that there had been considerable improvement across all components of the IOTWMS since the previous assessment in 2005.

1.2 2024 REASSESSMENT OF THE STATE OF TSUNAMI PREPAREDNESS IN THE INDIAN OCEAN MEMBER STATES

Nevertheless, the IOTWMS is not a static system and must further improve, evolve, and adapt to better serve the needs of the Member States of the ICG. As we approach the 20th anniversary of the 2004 Indian Ocean Tsunami, the ICG/IOTWMS as its 13th Session (Bali, 2022) decided it was timely to conduct the next reassessment of the state of tsunami preparedness in ICG/IOTWMS Member States, reflect on progress made, identify remaining gaps, and prioritise capacity development requirements. The results will be presented to the 14th Session of the ICG/IOTWMS (Indonesia, 2024). The assessment was undertaken by the UNESCO-IOC through the ICG/IOTWMS Working Group 3 Tsunami Ready Implementation, with oversight and contributions by the ICG/IOTWMS Steering Group, and support from the UNESCO-IOC ICG/IOTWMS Secretariat. Further support is being provided by the UN

Selected narrative responses
2nd August



Annexure: NARRATIVE RESPONSES

Section 2: RISK ASSESSMENT AND REDUCTION

2.2 Risk Assessment

	5f) Which coastal areas have been tsunami risk mapped? Please include the names of the Region / City and an approximation of the overall national percentage of risk prone areas mapped.	5g) How many Cities / Municipalities / Regencies are at risk from tsunami?
Australia	In Western Australia (WA), detailed hazard modelling based on the Probabilistic Tsunami Hazard Assessment 2018 has been undertaken from the Midwest (Geraldton) to the South West (Dunsborough), including the Greater Perth area, since July 2021 Older (about 10 to 15 years ago), less detailed hazard modelling has been undertaken in Broome, Port Hedland, Karratha/Dampier, Onslow, Exmouth, and Carnarvon. (See also response to 4f))	Australia is an island nation meaning that all coastal communities have potential tsunami risk. The PTHA shows how the offshore hazard varies around the country which could be potentially used to prioritise further work, however, there is not necessarily a direct relationship between high offshore hazard and high onshore hazard due to the nature of the nearshore environment and the source of the event itself.
Bangladesh	Chottogram,Cox's Bazar, Chandpur, Satkhira, Khulna, Bagerhat, Pirozpur, Jhalakati, Barguna, Patuakhali, Bhola, Lakshmipur, Noakhali, Feni etc.	Chottogram,Cox's Bazar, Chandpur, Satkhira, Khulna, Bagerhat, Pirozpur, Jhalakati, Barguna, Patuakhali, Bhola, Lakshmipur, Noakhali, Feni etc. 14 districts.
Comoros	All coastal areas of the archipelago	All Coastal city
France Indian Ocean Territories	same as tsunami hazard assessment	La Réunion : 19 municipalities (out of a total of 24 municipalities) Mayotte : 19 municipalities (out of a total of 19 municipalities) French Southern and Antarctic lands : bases
India	Entire Indian coast except Lakshadweep Islands	All coastal areas are under risk from tsunami due to both Makran and Andaman-Sumatra subduction zones.
Indonesia	Entire region of Indonesia	5.744 villages are at-risk of tsunami out of 81.800 total village in Indonesia, but still need to be verified further
Iran		
Kenya	Coastal counties of Kwale, Mombasa, Kilifi and Lamu	Four coastal counties
Madagascar	Region Atsinanana / City of Toamasina Region Fitovinany / City of Manakara 12,5 % mapped (reference: Eastern Coast of Madagascar)	25 Cities
Malaysia	i) Category 1 (High Risk): a) Coastal area of Northern Peninsular Malaysia b) Coastal area of Eastern and Western part of Sabah, Malaysia ii) Category 2 (Low Risk): a) Coastal area of Eastern	5 cities are at risk from tsunami other areas involve such as: i)Teriang and Chenang, Langkawi, Kedah ii) Kuala Muda, coastal area iii)Northeast coast of Penang Island iv) Northcoast of Penang Islang v) Westcoast of Penang Island

Sample

22 responses in 2024, an increase from 20 in 2022

- Australia, Bangladesh, Comoros, France (Indian Ocean Territories), India, Indonesia, Iran, Kenya, Madagascar, Malaysia, Maldives, Mauritius, Mozambique, Myanmar, Oman, Pakistan, Seychelles, Singapore, South Africa, Sri Lanka, Thailand, United Arab Emirates

NOTE:

- Four countries who did not complete the 2018 survey, responded to the 2024 survey (Maldives, Seyshelles, South Africa, United Arab Emirates)
- Two countries that completed the 2018 survey did not respond to the 2024 survey (Tanzania and Timor-Leste)

Limitations

- Where possible, summary data from the 2018 survey is displayed alongside the 2024 results to aid comparisons.
- Caution should be used when drawing direct comparisons between the results.
  - Differences in the composition of countries responding to the 2018 and 2024 surveys
  - Changes to the personnel who completed the survey on behalf of each country

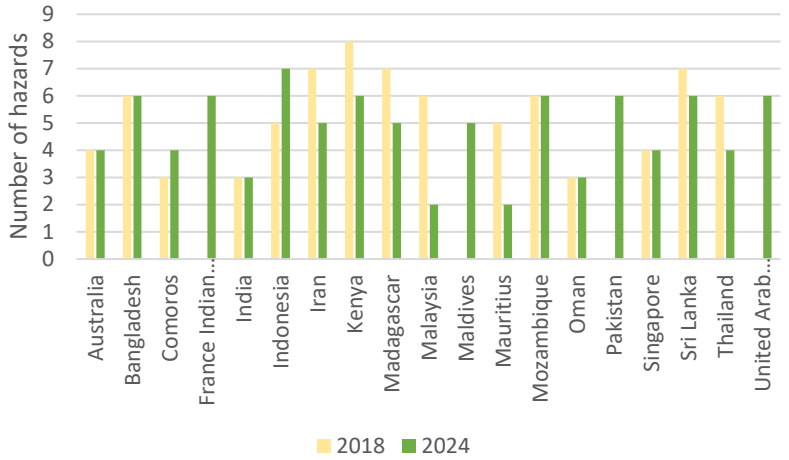


Figure 2: Number of hazards included in a multi-hazard assessment

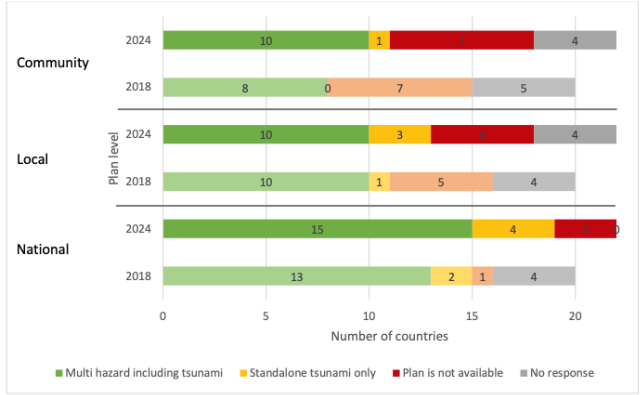
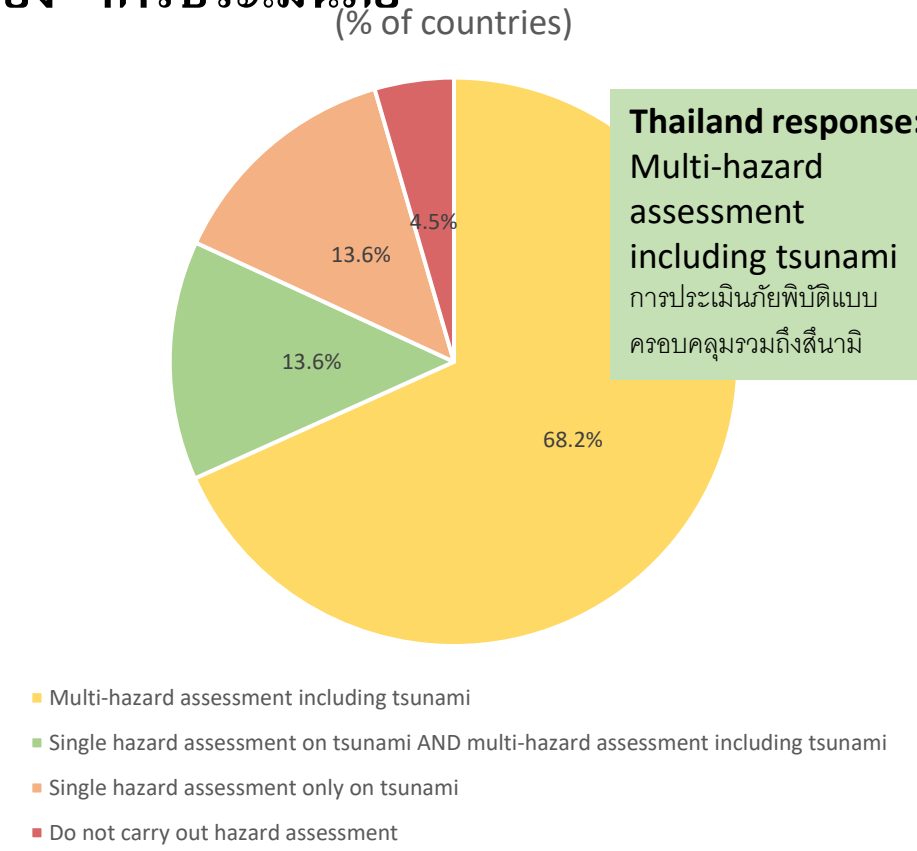


Figure 22: Availability of national, local and community level tsunami disaster risk reduction plans during emergency response phase

Table 1: Ranking of priority areas for capacity improvement in tsunami hazard assessment

Areas of tsunami hazard assessment	RII	2024 Rank (2018 Rank)
Evacuation map	0.85	1 (1)
Hazard map	0.81	2 (2)
Inundation map	0.81	2 (3)
Deterministic tsunami hazard analysis	0.76	4 (4)
Probabilistic tsunami hazard assessment (PTHA)	0.75	5 (6)
Field studies on tsunami impacts	0.67	6 (5)

2. RISK ASSESSMENT AND REDUCTION - HAZARD ASSESSMENT การประเมินและลดความเสี่ยง - การประเมินภัย



Thailand response:
Multi-hazard assessment including tsunami
การประเมินภัยพิบัติแบบครอบคลุมรวมถึงสึนามิ

Figure 1: Type of hazard assessment
ภาพที่ 1: ประเภทของประเภทของการประเมินภัย

Thailand response:
Tsunami; Drought; Flooding; Landslides
สึนามิ; ภัยแล้ง; อุทกภัย; ดินถล่ม

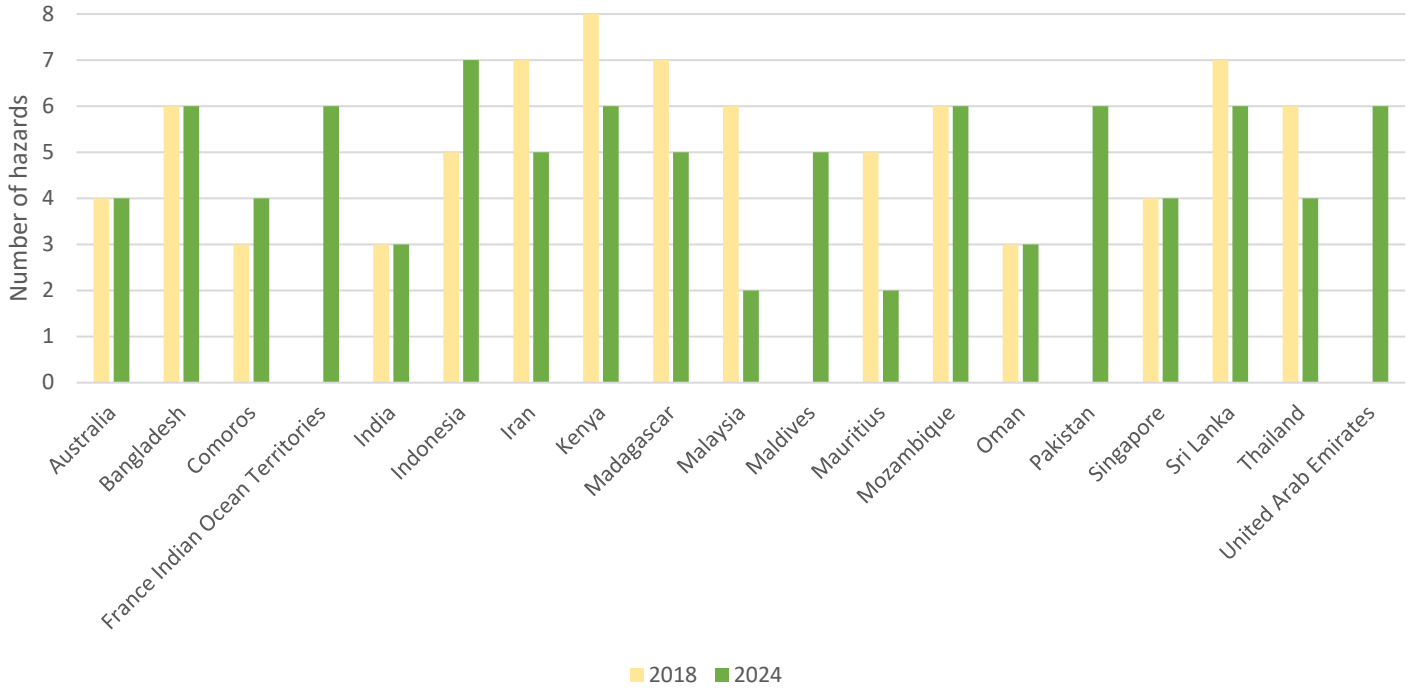


Figure 2: Number of hazards included in a multi-hazard assessment
ภาพที่ 2: จำนวนของภัยที่รวมอยู่ในการประเมินภัยพิบัติแบบครอบคลุม

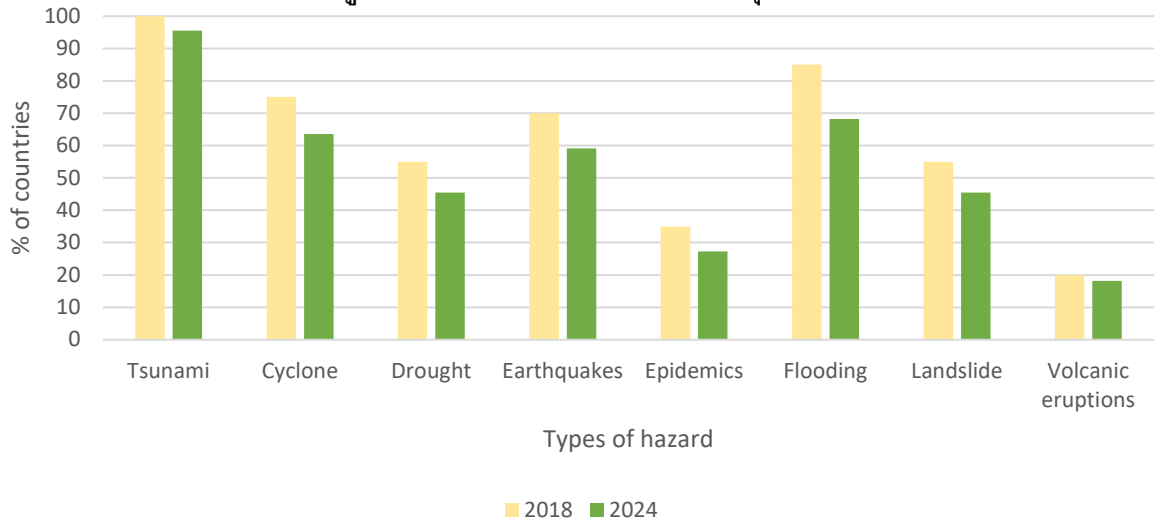


Figure 3: Type of hazard(s) included in multi-hazard assessment
ภาพที่ 3: ประเภทของภัยที่รวมอยู่ในการประเมินภัยพิบัติแบบครอบคลุม

2. RISK ASSESSMENT AND REDUCTION –
HAZARD ASSESSMENT

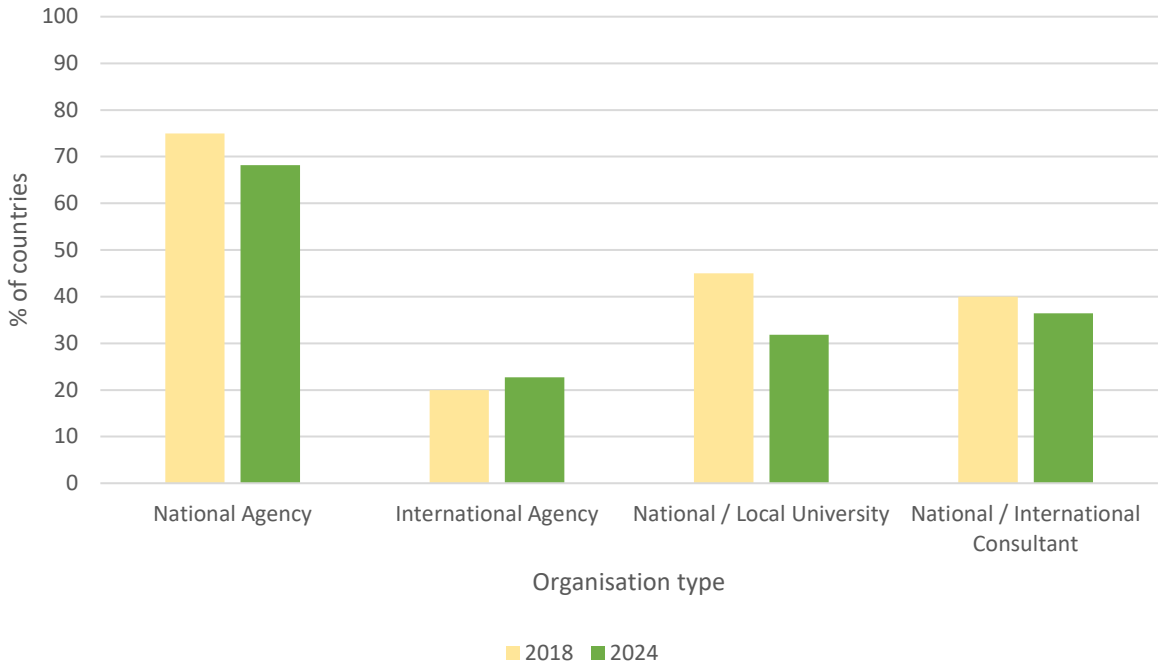


Figure 4: Organisation(s) responsible for the tsunami hazard assessment

ภาพที่ 4: องค์กรที่รับผิดชอบเรื่องการประเมินสึนามิ

Thailand response:
National agency; International agency; National / local university; National / international consultant
หน่วยงานระดับประเทศ; หน่วยงานนานาชาติ; มหาวิทยาลัยระดับชาติและท้องถิ่น; ที่ปรึกษาระดับชาติและนานาชาติ

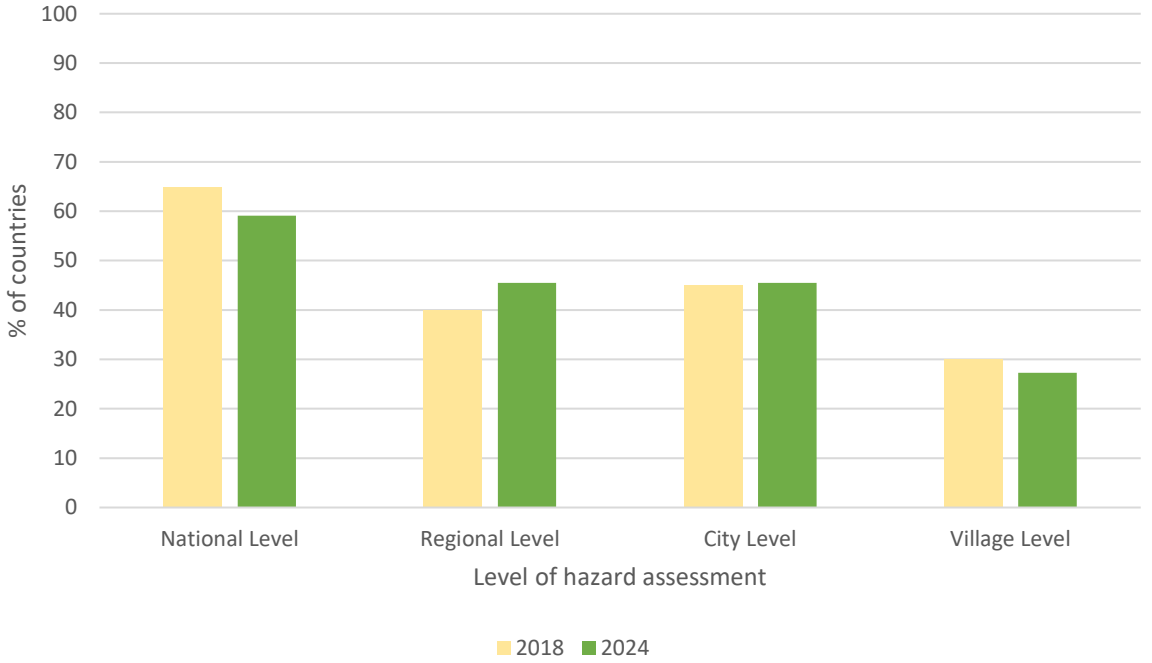


Figure 5: Level at which tsunami hazard assessment is carried out

ภาพที่ 5: ระดับที่ดำเนินการประเมินอันตรายจากสึนามิ

Thailand response:
National; City; Village
There are 509 tsunami hazard place in 6 provinces along Andaman sea 102 sub-districts and 27 Districts
มีพื้นที่เสี่ยงภัยสึนามิ 509 แห่งใน 6 จังหวัด ตามแนวทะเลอันดามัน 102 ตำบล และ 27 อำเภอ

2. RISK ASSESSMENT AND REDUCTION –
HAZARD ASSESSMENT

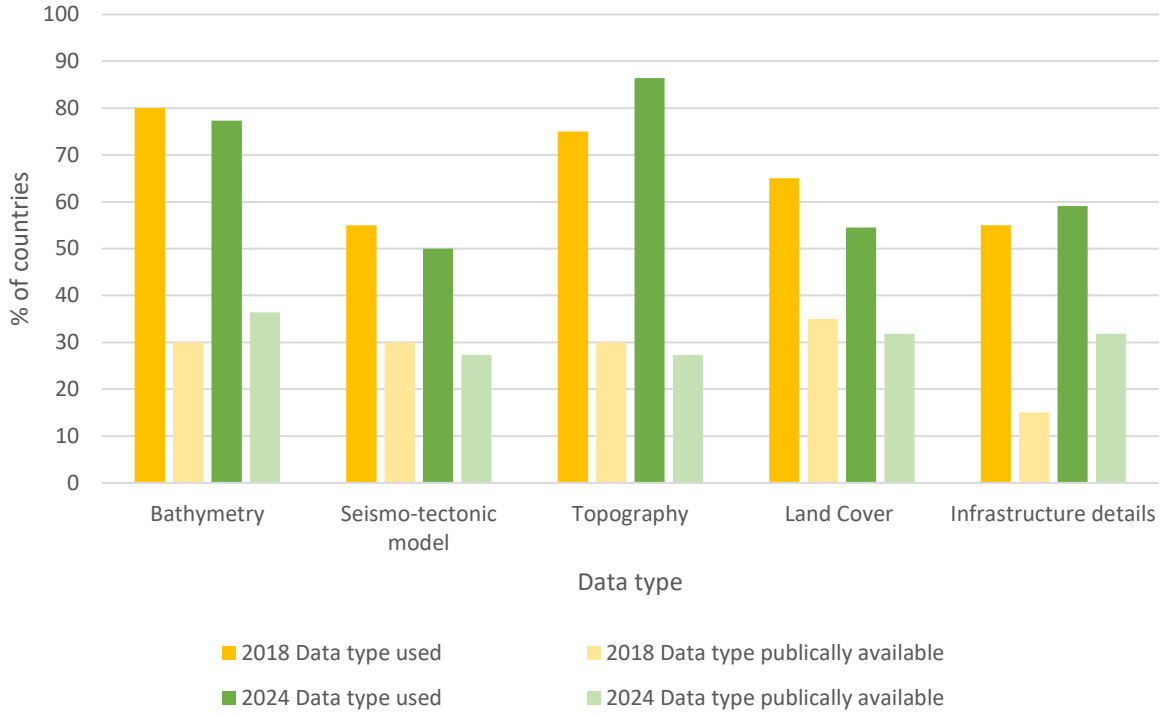


Figure 6: Data types used for tsunami hazard assessment
ภาพที่ 6 : ชนิดของข้อมูลที่ใช้ในการประเมินสึนามิ

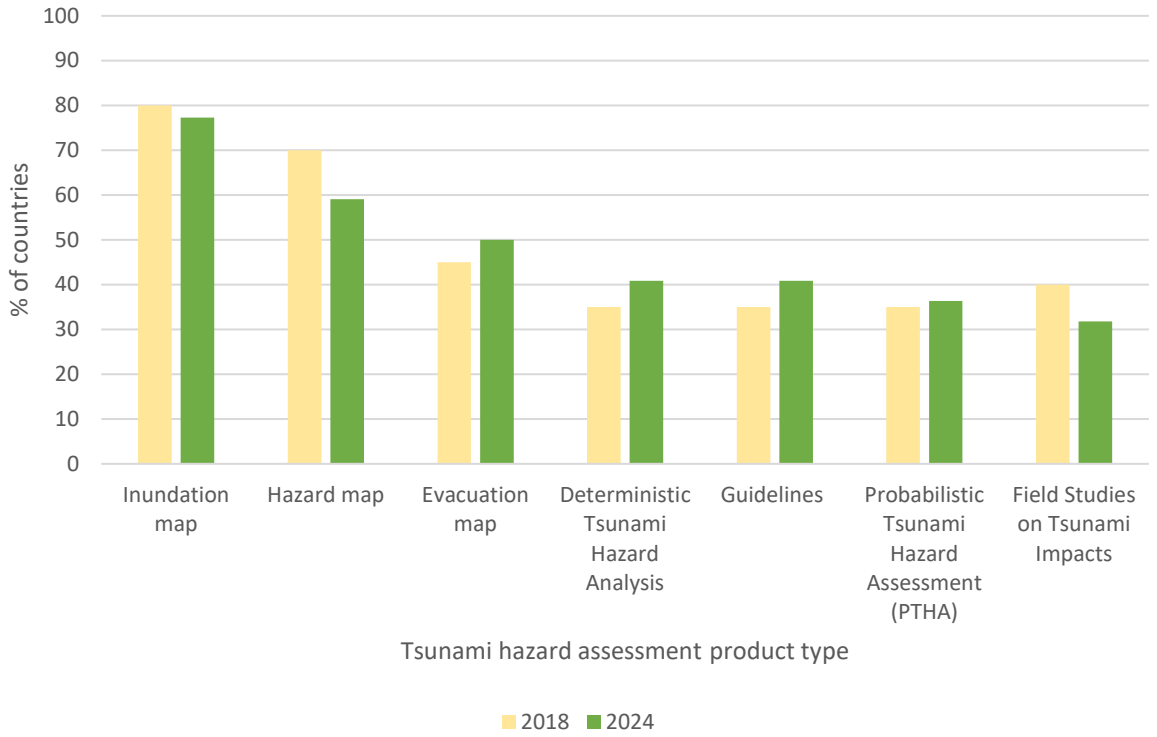


Figure 7: Products from tsunami hazard assessment
ภาพที่ 7: ผลที่ได้จากการประเมินสึนามิ

Thailand response:
Bathymetry (Not public); Seismo-techtonic (Not public); Topography (Not public); Land cover (Public); Infrastructure (Public)

Thailand response:
All products listed above

2. RISK ASSESSMENT AND REDUCTION –
HAZARD ASSESSMENT

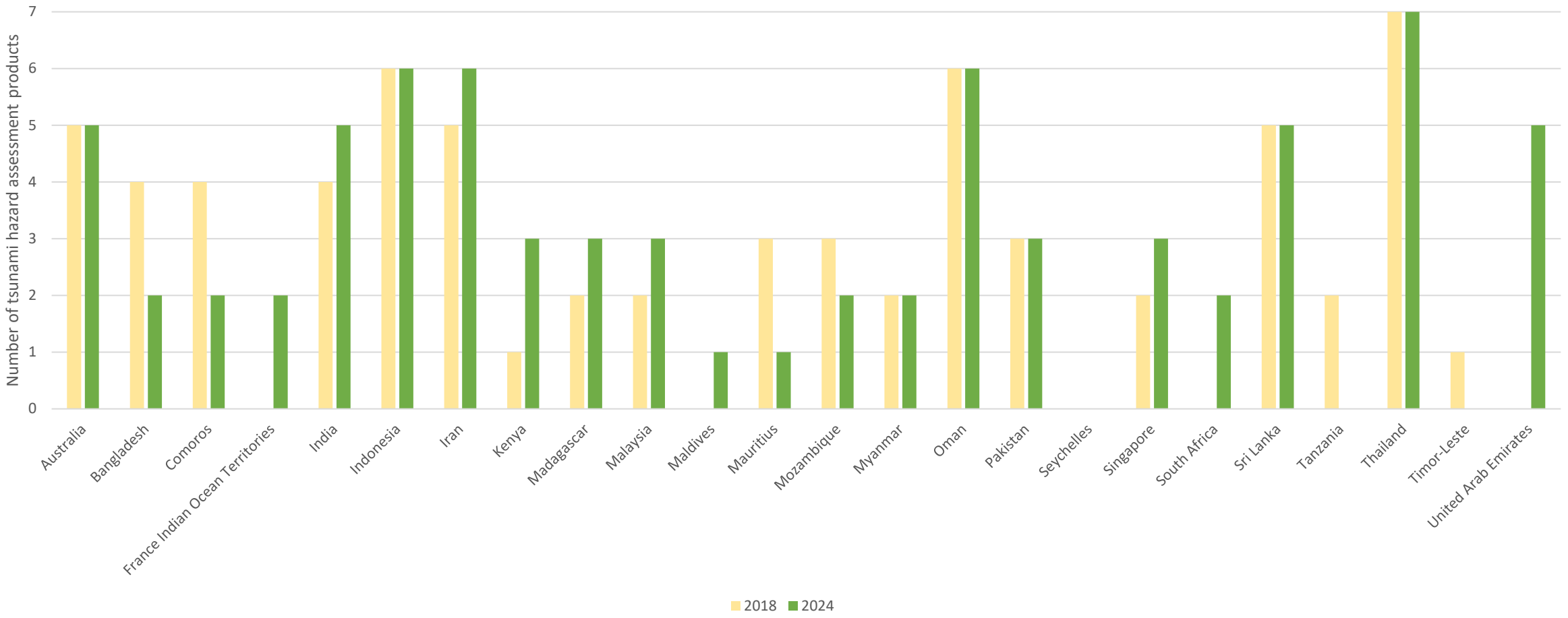
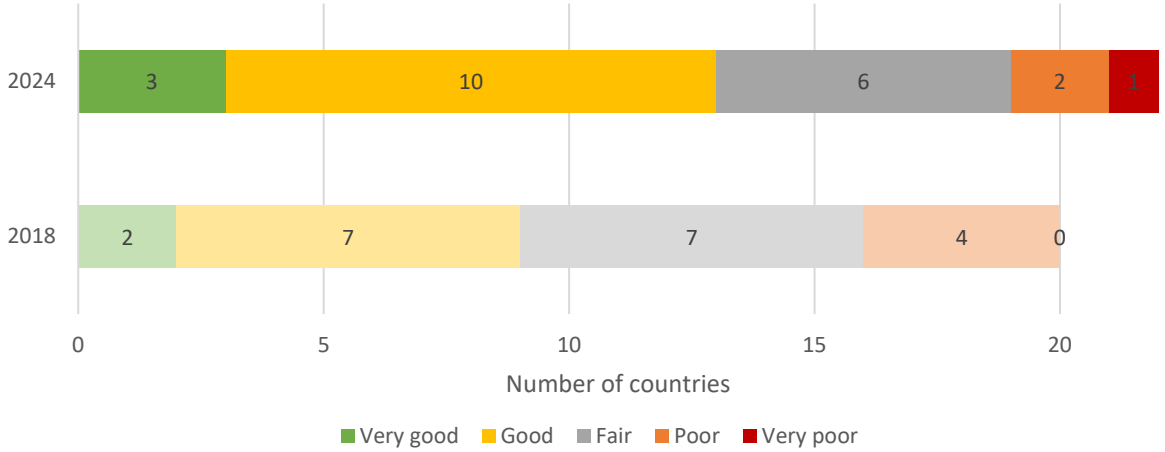


Figure 8: Number of tsunami hazard assessment products
ภาพที่ 8: จำนวนผลลัพธ์ที่ได้จากการประเมินความเสี่ยงจากสึนามิ

2. RISK ASSESSMENT AND REDUCTION –
HAZARD ASSESSMENT



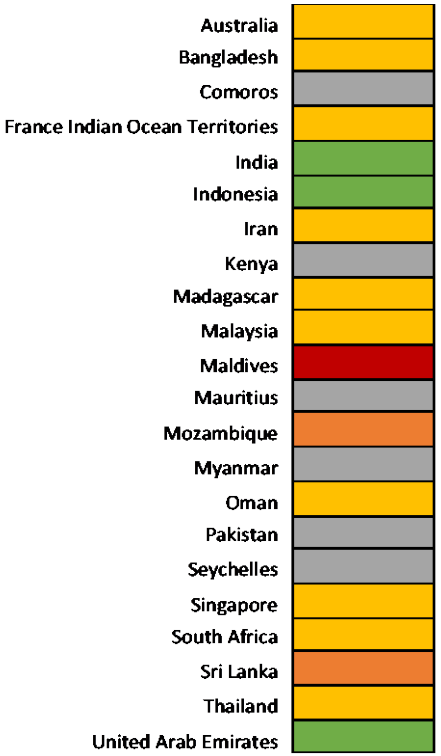


Figure 9: Capacity to undertake tsunami hazard assessments

ภาพที่ 9: ความสามารถในการดำเนินการประเมินอันตรายจากสึนามิ

Areas of tsunami hazard assessment	RII	2024 Rank (2018 Rank)
Evacuation map	0.85	1 (1)
Hazard map	0.81	2 (2)
Inundation map	0.81	2 (3)
Deterministic tsunami hazard analysis	0.76	4 (4)
Probabilistic tsunami hazard assessment (PTHA)	0.75	5 (6)
Field studies on tsunami impacts	0.67	6 (5)

Table 1: Ranking of priority areas for capacity improvement in tsunami hazard assessment

ตารางที่ 1: การจัดลำดับความสำคัญของพื้นที่ในการพัฒนาศักยภาพด้านการประเมินอันตรายจากสึนามิ

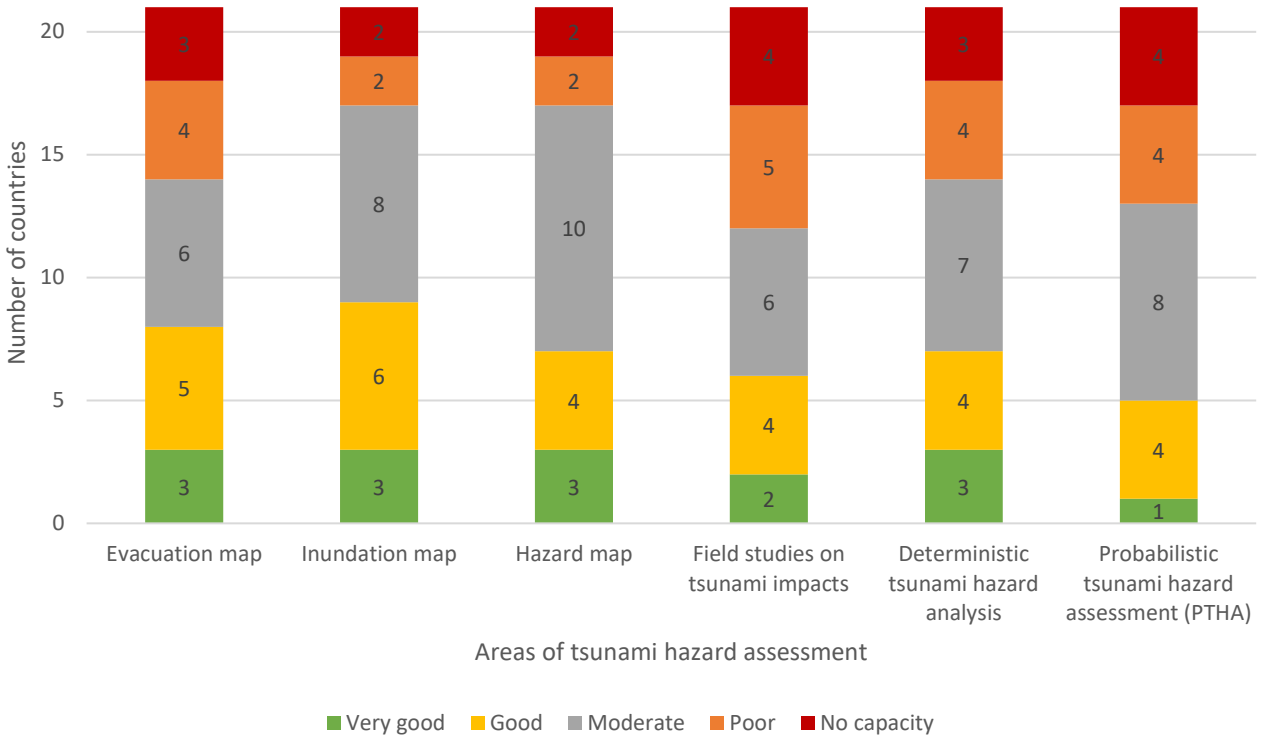
Thailand response:

1. Evacuation (Essential) การอพยพ (จำเป็น)
2. Hazard mapping (High) การทำแผนที่ภัยพิบัติ (สูง)
3. Inundation (Medium) แผนอุทกภัย (ปานกลาง)
4. Deterministic (High) แบบจำลองเชิงกำหนด (สูง)
5. Probabilistic (High) แบบจำลองเชิงสุ่ม (สูง)
6. Field studies (High) การศึกษาภาคสนาม (สูง)

Other: Wave height and inundation map อื่นๆ: แผนที่ความสูงของคลื่นและแผนอุทกภัย

Capacity improvement provided by: Geoinformatic Center, Asian Institute of Technology(AIT) 2.School of Engineering & Technology,AIT 3.Civil Engineering,Chulalongkorn University 4.Climate Change and Disaster, Rangsit University 5.The Andaman Coast Research Station for Development, Kasetsart University 6.Faculty of science,Kasetsart University 7.Faculty of science, Chulalongkorn University

2. RISK ASSESSMENT AND REDUCTION –
HAZARD ASSESSMENT



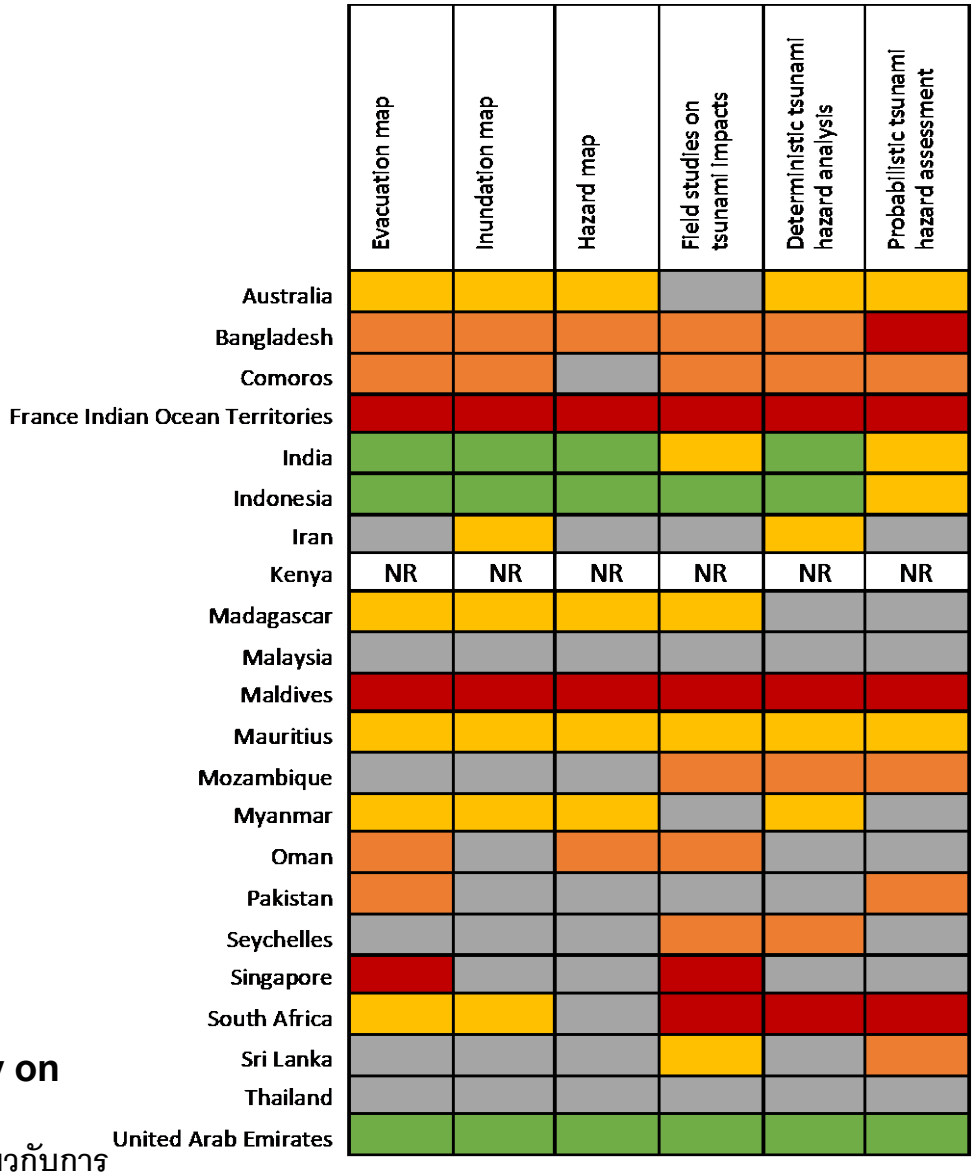


Figure 10: Capacity to give training and/or consultancy on tsunami hazard assessment to other countries

ภาพที่ 10: ความสามารถในการให้การฝึกอบรมและ/หรือการให้คำปรึกษาเกี่ยวกับการประเมินอันตรายจากสึนามิแก่ประเทศอื่น ๆ

2. RISK ASSESSMENT AND REDUCTION – RISK ASSESSMENT การประเมินและลดความเสี่ยง - การประเมินความเสี่ยง

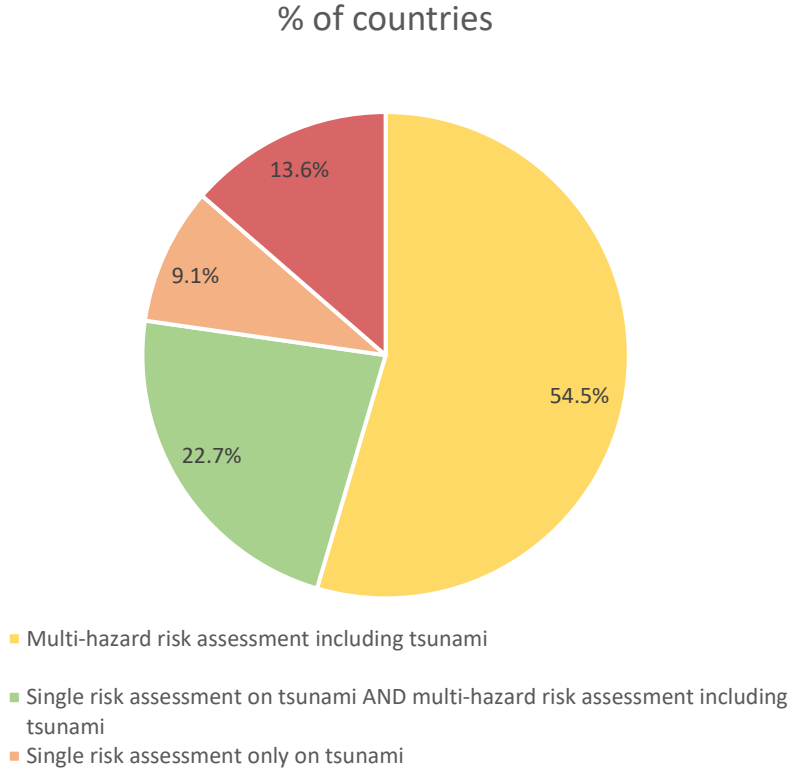


Figure 11: Type of risk assessment
ภาพที่ 11: ประเภทของการประเมินความเสี่ยง

Thailand response:
Single risk assessment on tsunami AND multi hazard risk assessment including tsunami
การประเมินความเสี่ยงจากสึนามิแบบเฉพาะเจาะจง และการประเมินความเสี่ยงจากภัยพิบัติแบบครอบคลุม รวมถึงภัยสึนามิ

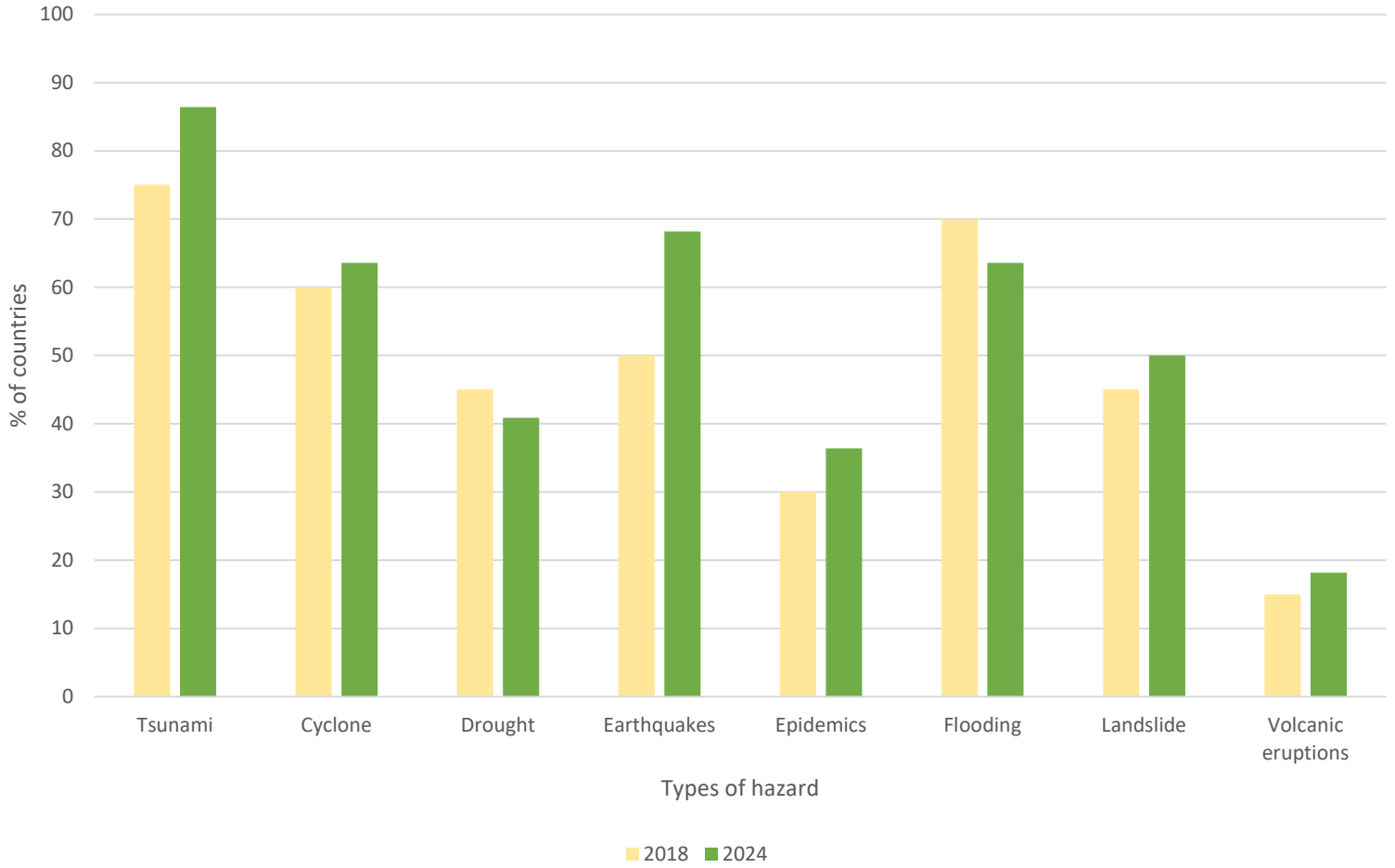


Figure 12: Types of hazard included in the multi-hazard risk assessment
ภาพที่ 12: ประเภทของภัยรวมถึงการประเมินความเสี่ยงภัยแบบครอบคลุม

Thailand response:
Tsunami; Cyclone; Drought; Earthquakes; Epidemics; Flooding; Landslides
สึนามิ; ไซโคลน; ภัยแล้ง; แผ่นดินไหว; โรคระบาด; อุทกภัย; ดินถล่ม

2. RISK ASSESSMENT AND REDUCTION –
RISK ASSESSMENT

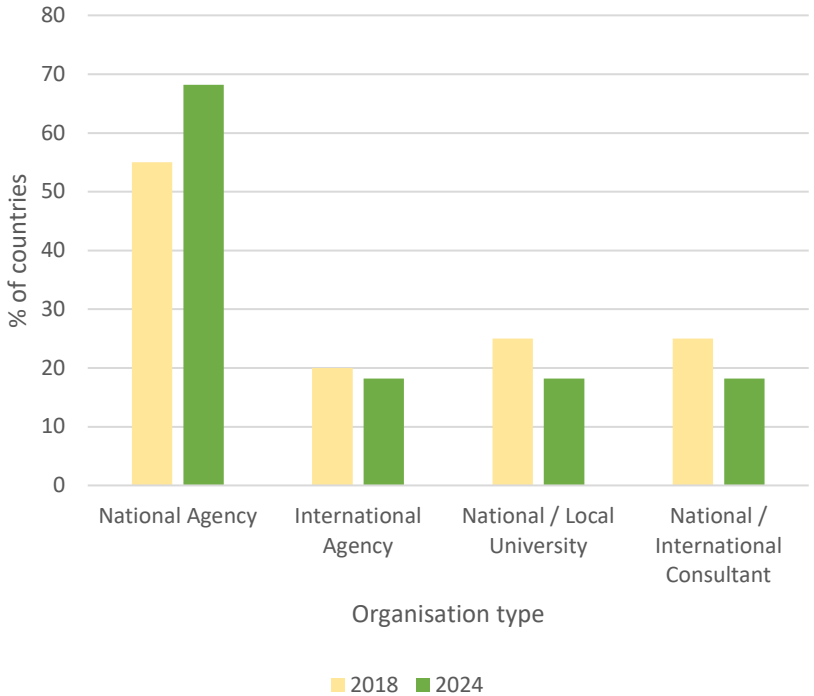


Figure 13: Organisation(s) responsible for the tsunami risk assessment

ภาพที่ 13: องค์กรที่รับผิดชอบการประเมินความเสี่ยงสึนามิ

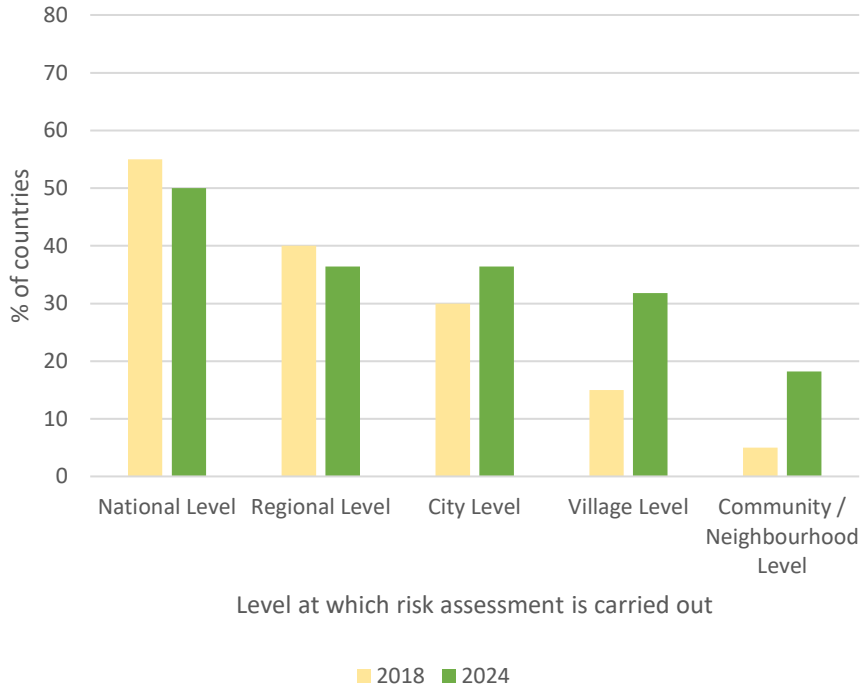


Figure 14: Level at which tsunami risk assessment is carried out

ภาพที่ 14: ระดับที่ดำเนินการประเมินความเสี่ยงจากสึนามิ

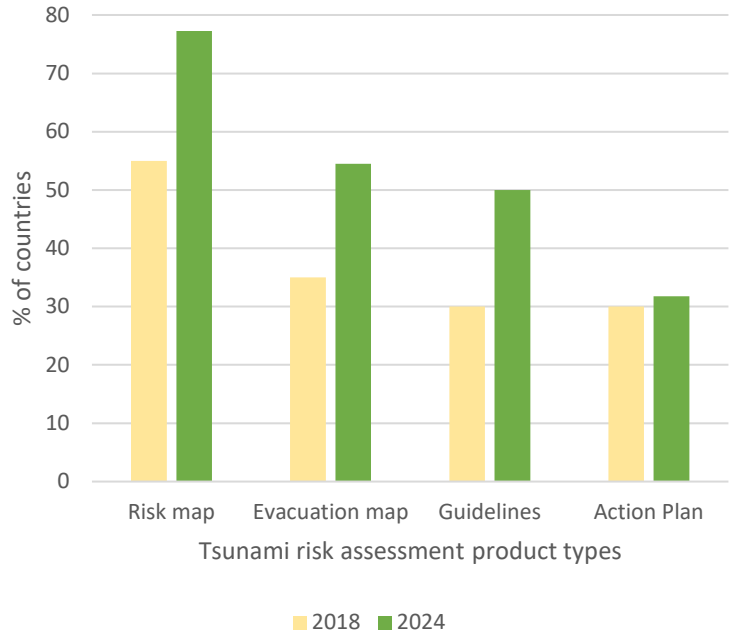


Figure 15: Types of product to emerge from the tsunami risk assessment

ภาพที่ 15: ประเภทของผลลัพธ์ที่เกิดขึ้นจากการประเมินความเสี่ยงจากสึนามิ

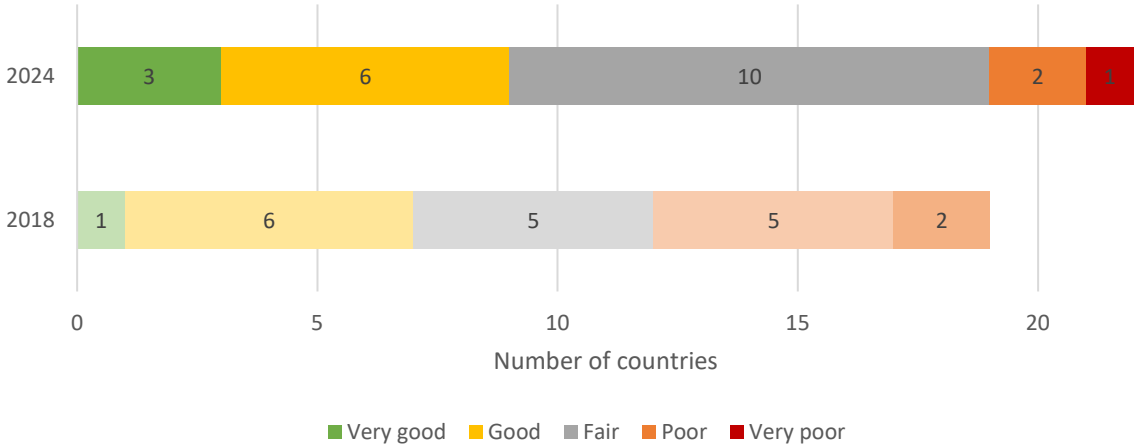
Thailand response:
National agency;
International agency;
National / local university;
National / international consultant

Thailand response:
National; Regional; City; Village; Community / Neighbourhood
1.Krabi Province 5 Districts below 1)Ao Luk 2)Muang Krabi 3)Nuea Khlong 4)Khlong Thom 5)Muang krabi 2.Trang Province 5 Districts below 1)Yan Takhao 2)Si Kao 3)Kantang 4)Pa Lian 5)Hat Samran 3.Phang Nga Province 7 Districts below 1)Khura Buri 2)Ta Kua Pa 3)Ta Kua Thung 4)Thai Muang 5)Thap Put 6)Muang Phang Nga 7)Ko Yao 4.Phuket Province 3 Districts below 1)Tha Lang 2)Muang Phuket 3)Krathu 5.Ranong Province 3 Districts below 1)Kapoe 2)Suk Samran 3)Muang Ranong 6.Satun Province 4 Districts below 1)Tha Phae 2)Thung Wa 3)Langu 4)Muang Satun

Thailand response:
Risk maps; Evacuation maps; Guidelines; Action Plans

Others: Guidelines for Andaman Province on Andaman Sea coastal area

2. RISK ASSESSMENT AND REDUCTION –
RISK ASSESSMENT



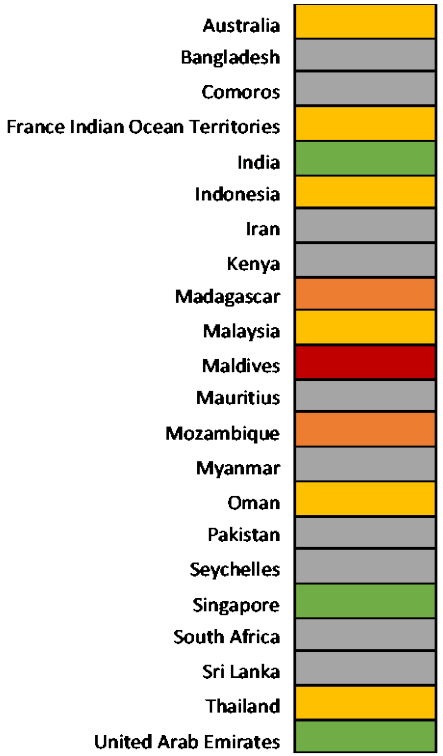


Figure 16: Capacity to undertake tsunami risk assessment

ภาพที่ 16: ความสามารถในการดำเนินการประเมินความเสี่ยงจากสึนามิ

Priority level	RII	2024 Rank (2018 Rank)
Tsunami risk assessment at city level	0.82	1 (1)
Tsunami risk assessment at national level	0.79	2 (4)
Tsunami risk assessment at regional level	0.78	3 (5)
Tsunami risk assessment at village level	0.75	4 (2)
Tsunami risk assessment at community / neighbourhood level	0.74	5 (3)

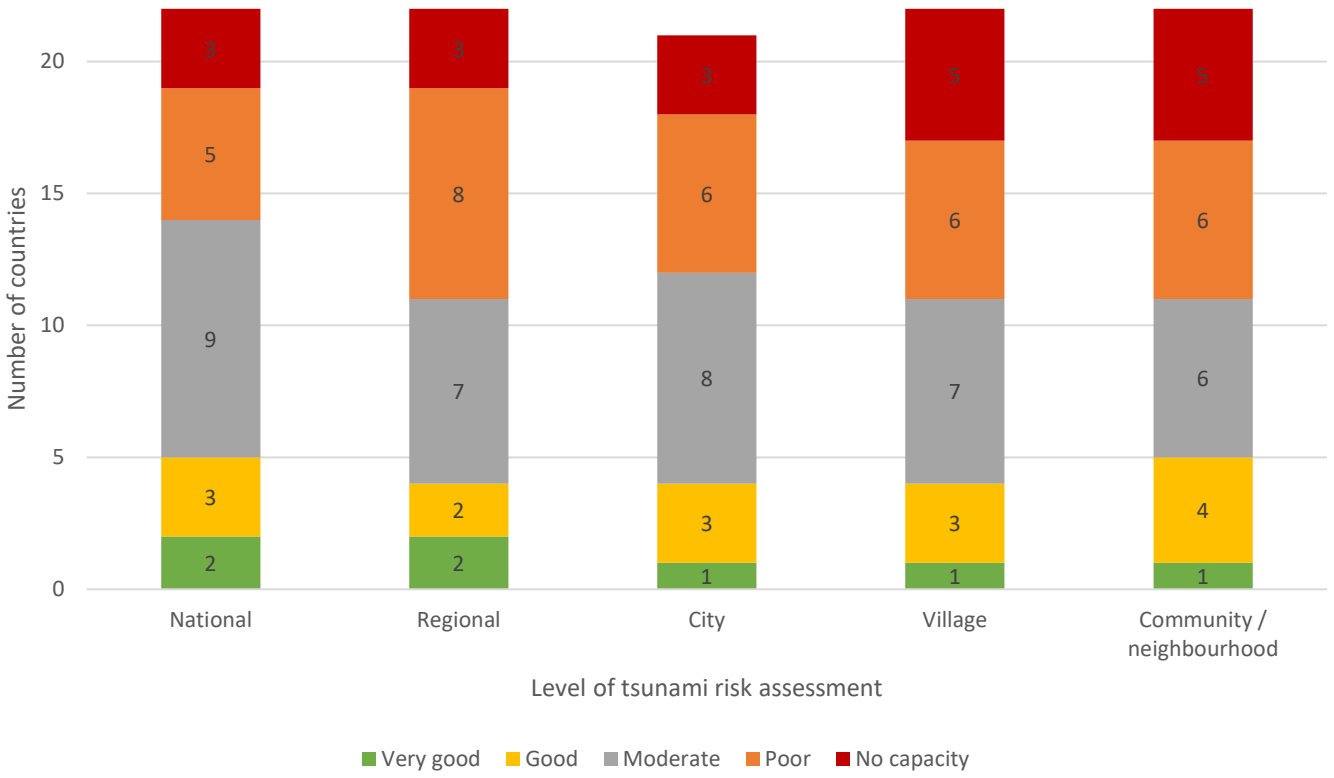
Table 2: Ranking of priority areas for capacity improvement in tsunami risk assessment

ตารางที่ 2: การจัดลำดับความสำคัญของพื้นที่ในการพัฒนาศักยภาพด้านการประเมินความเสี่ยงจากสึนามิ

Thailand response:

1. City (Essential)
2. National (Essential)
3. Regional (High)
4. Village (Essential)
5. Community (Essential)

2. RISK ASSESSMENT AND REDUCTION –
RISK ASSESSMENT



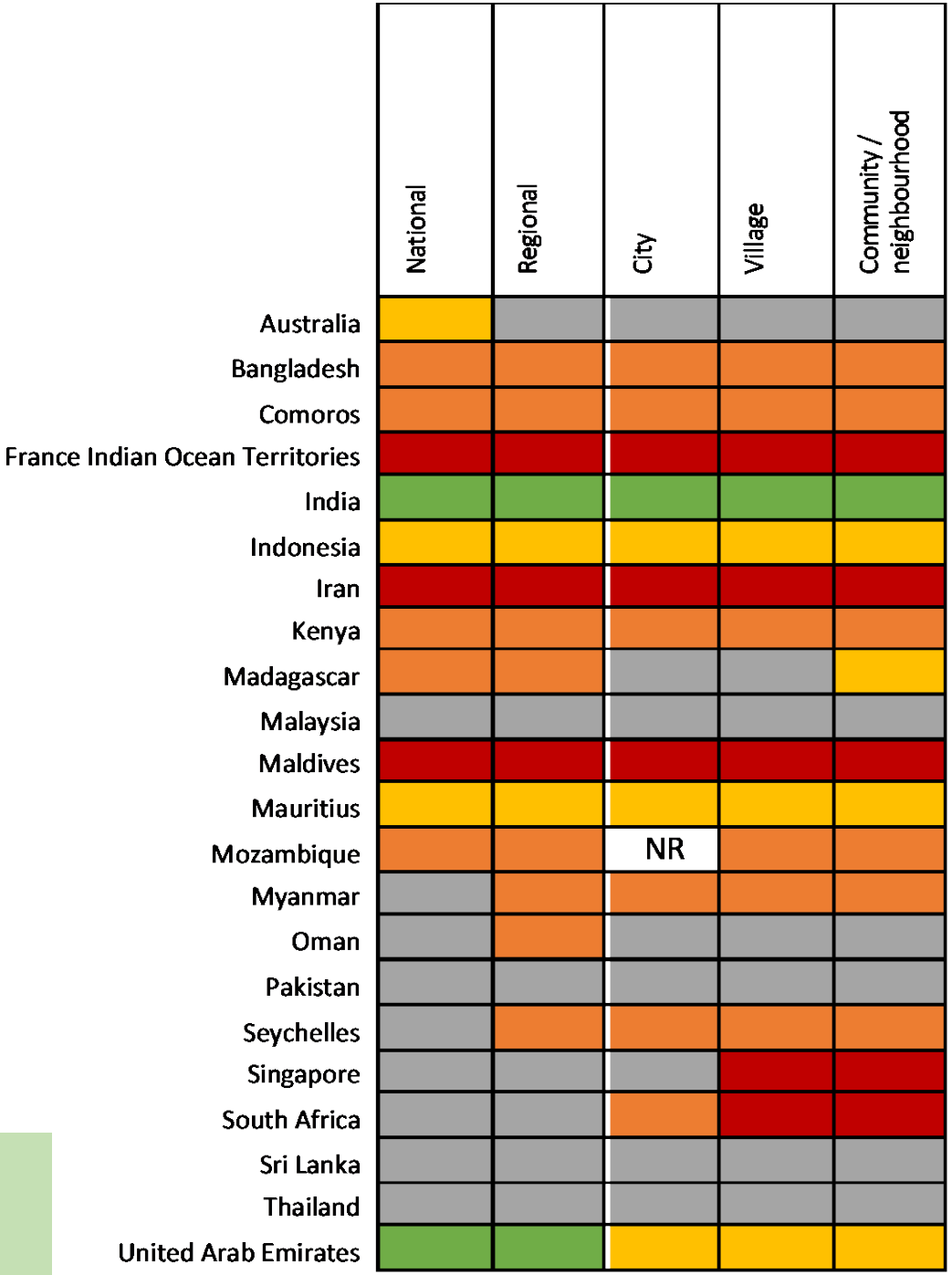


Figure 17: Capacity to give training on tsunami risk assessment
ภาพที่ 17:ความสามารถในการจัดฝึกอบรมเกี่ยวกับการประเมินความเสี่ยงจากสึนามิ

Thailand response:
Other training providers: ADPC

2. RISK ASSESSMENT AND REDUCTION – POLICIES

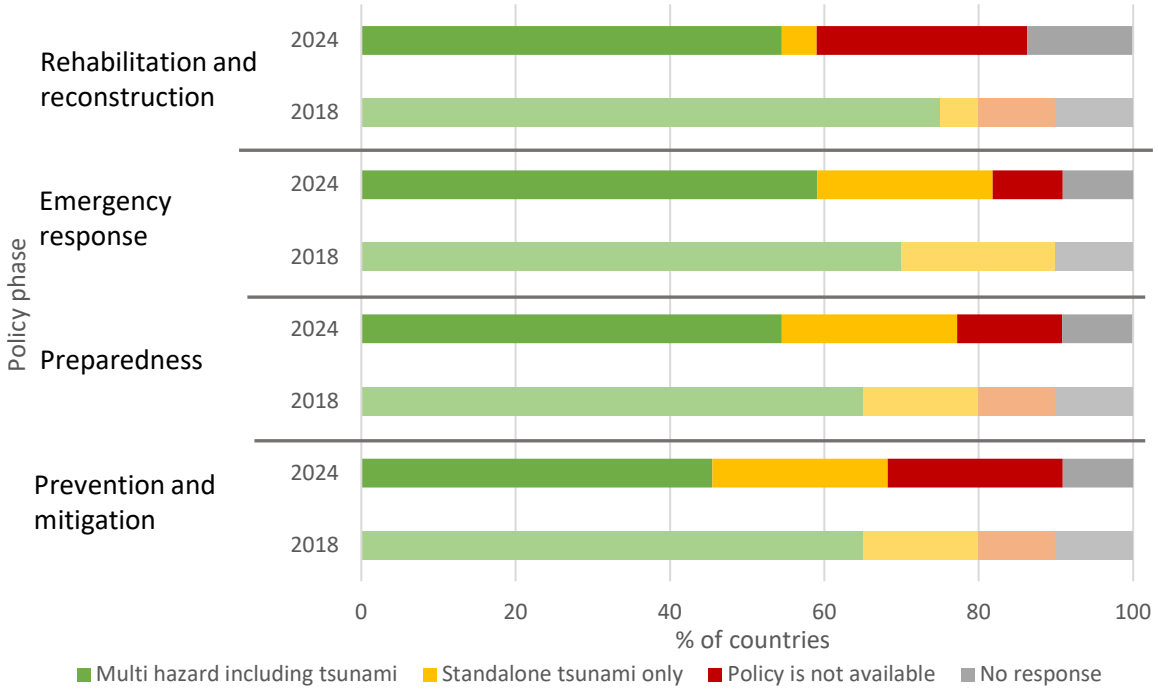


Figure 18: Types and phases of national tsunami policy

ภาพที่ 18: ประเภทและระยะของนโยบายสึนามิระดับชาติ

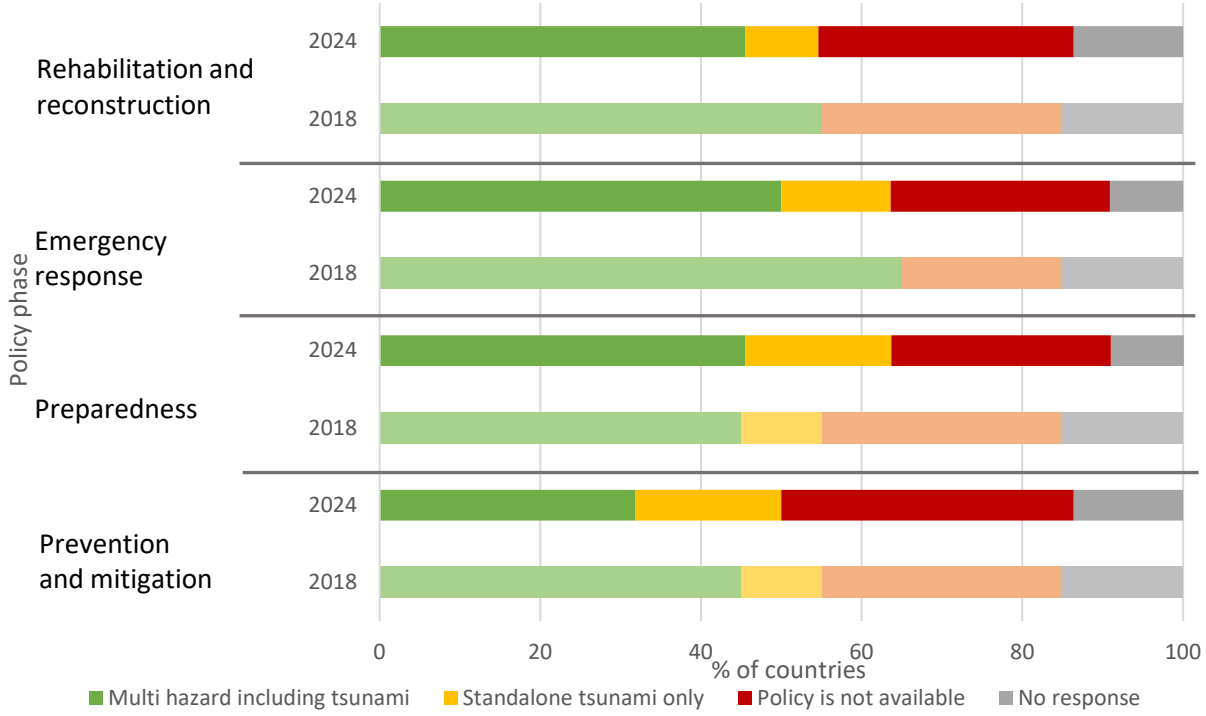


Figure 19: Types and phases of local tsunami policy

ภาพที่ 19: ประเภทและระยะของนโยบายสึนามิระดับท้องถิ่น

Thailand response:	
Rehabilitation	
Emergency	
Preparedness	
Prevention	

Name of policy: Tsunami Prevention and Mitigation Master Plan 2021-2027

Thailand response:	
Rehabilitation	
Emergency	
Preparedness	
Prevention	

2. RISK ASSESSMENT AND REDUCTION – PLANS

Figure 20: Prevention and mitigation phase

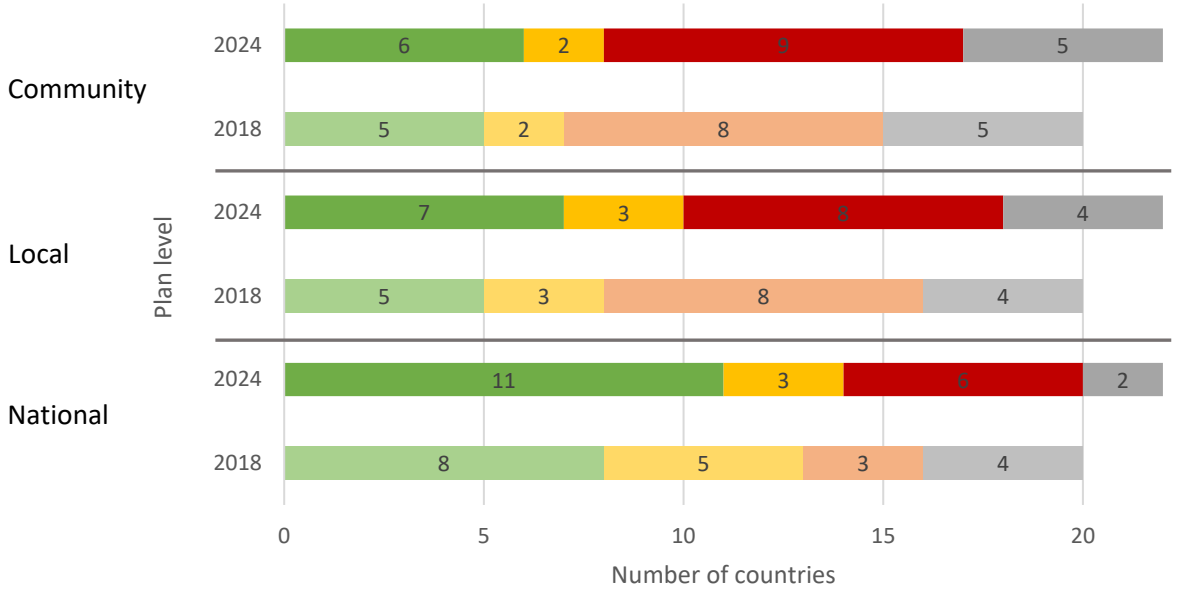


Figure 21: Preparedness phase

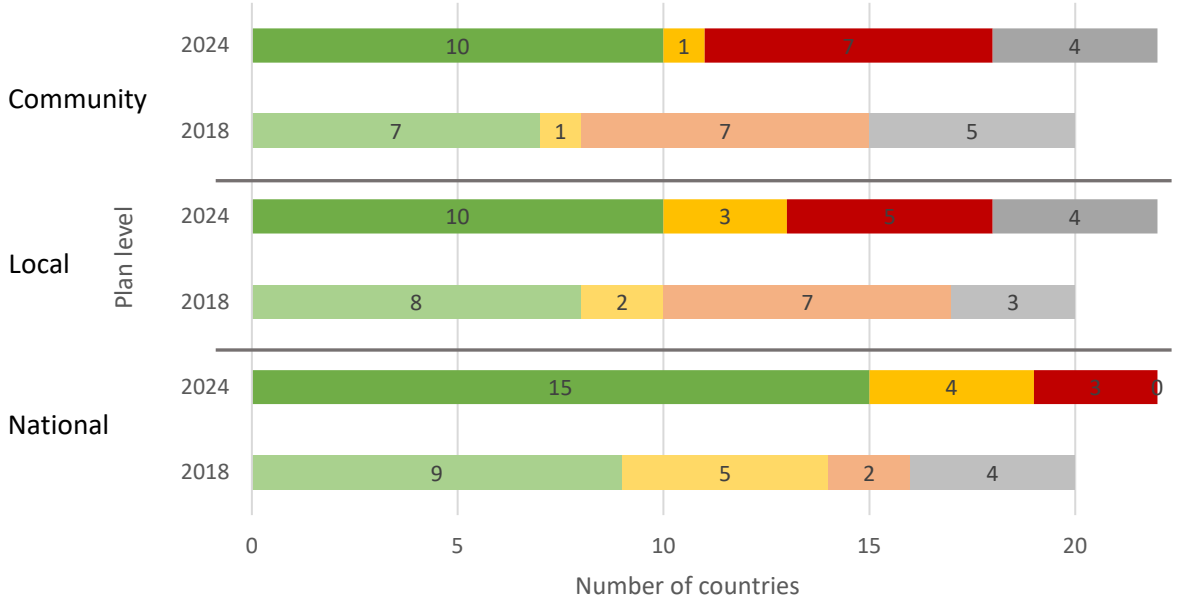


Figure 22: Emergency response phase

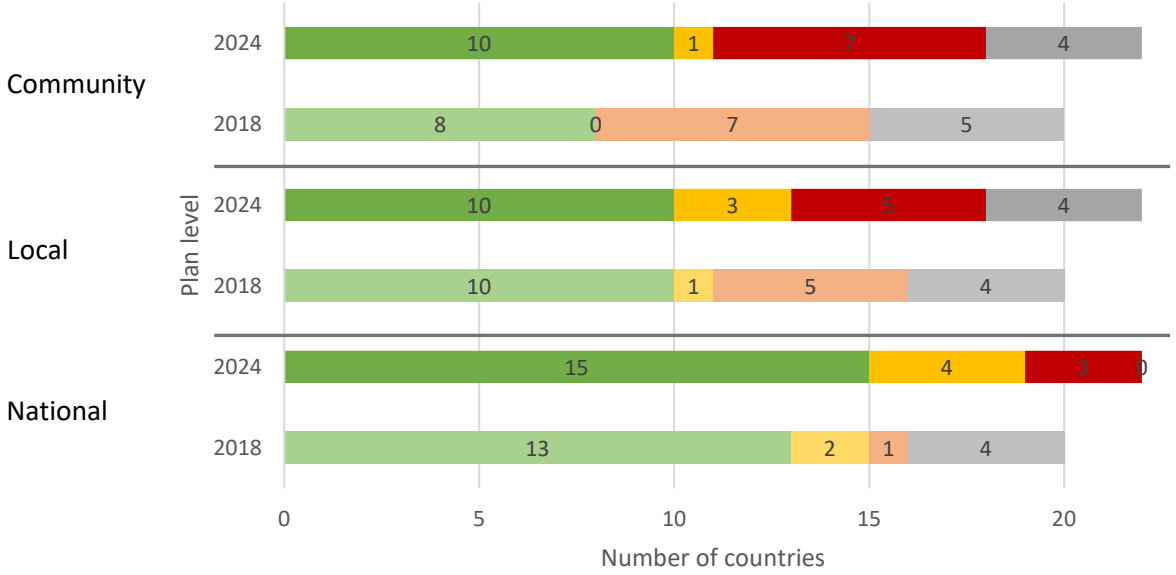
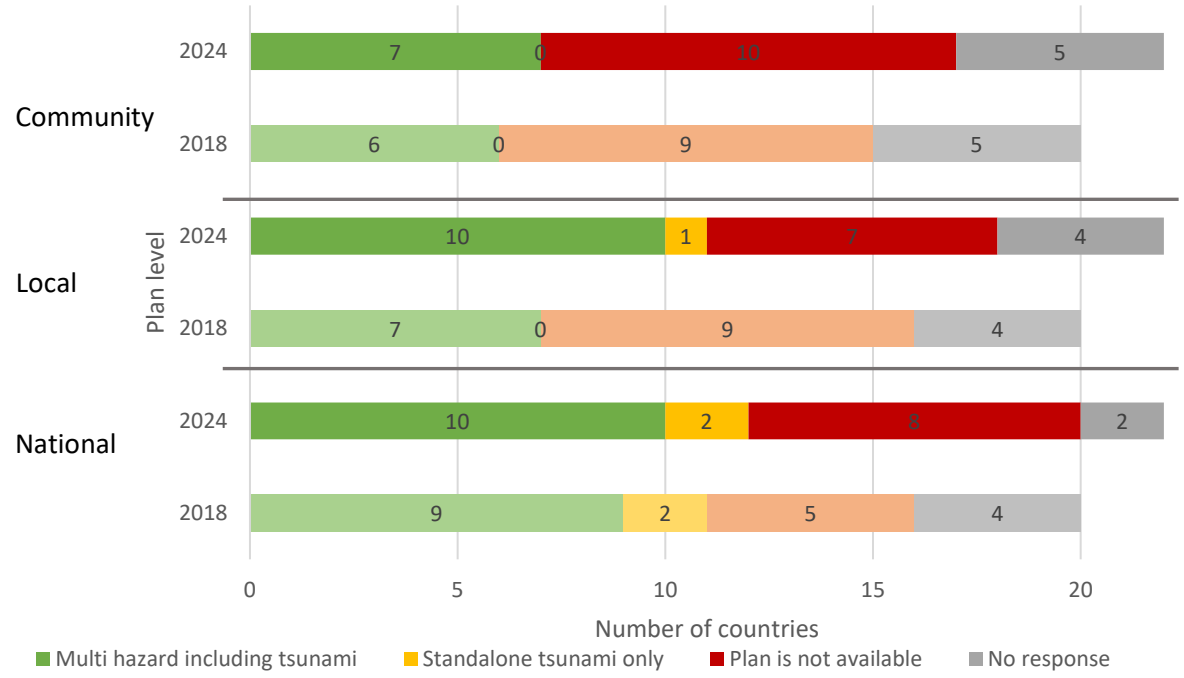
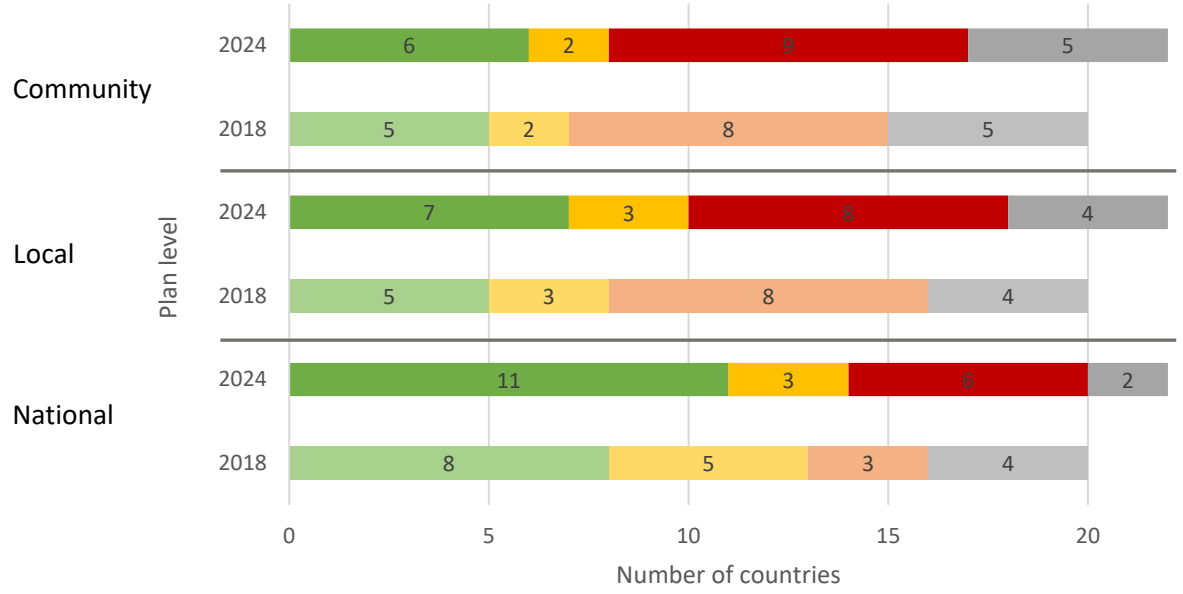


Figure 23: rehabilitation and reconstruction phase



2. RISK ASSESSMENT AND REDUCTION – PLANS

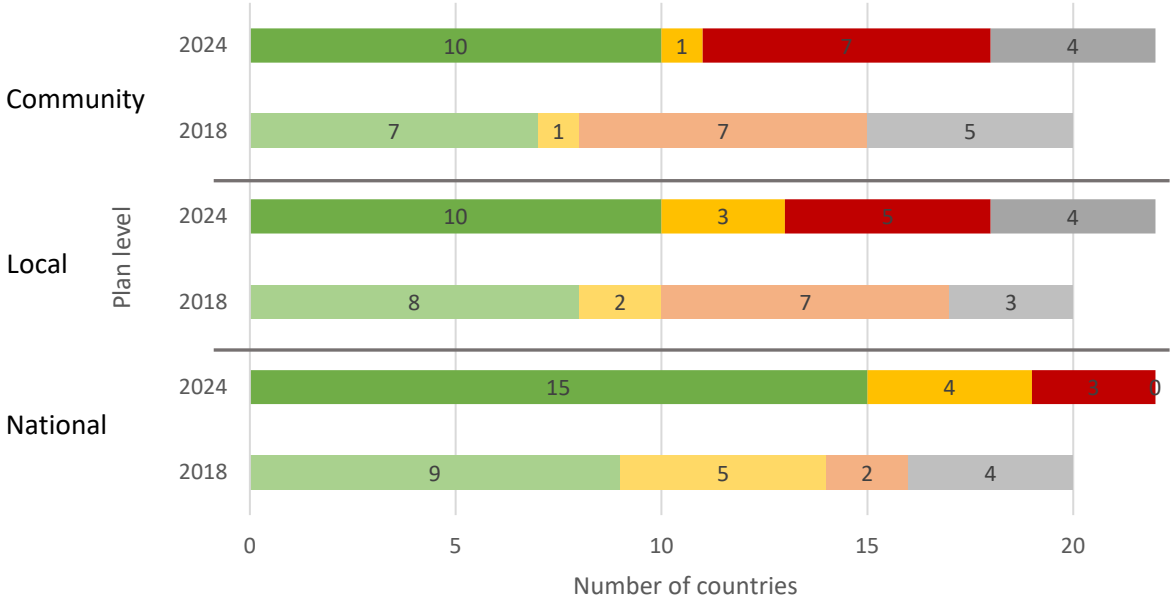
Figure 20: Prevention and mitigation phase



Thailand response:	
Community	
Local	
National	

Availability of national, local and community level tsunami disaster risk reduction plans during different phases

Figure 21: Preparedness phase



Thailand response:	
Community	
Local	
National	

2. RISK ASSESSMENT AND REDUCTION – PLANS

Availability of national, local and community level tsunami disaster risk reduction plans during different phases

Figure 20: Prevention and mitigation phase

Specified plans:
1.Tsunami Disaster Risk Management Plan 2021-2027
2.Provincal Tsunami Risk Management Plan
3.District/Sub District Tsunami Risk Management Plan

Thailand's tsunami disaster risk reduction plans based on hazards and risk assessments

Thailand response:

Community	
Local	
National	

Figure 22: Emergency response phase

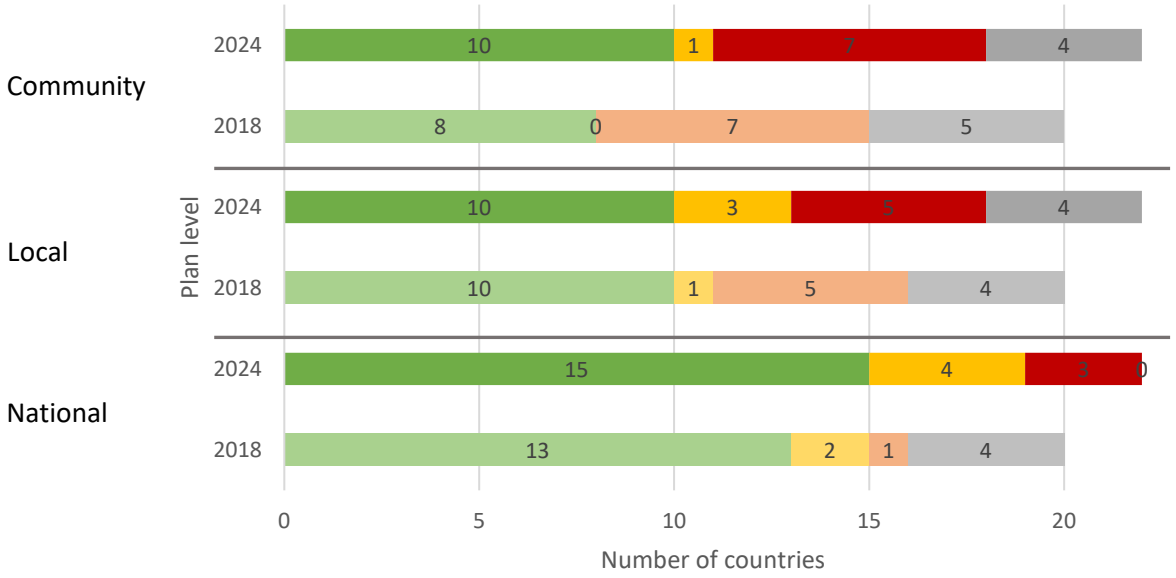
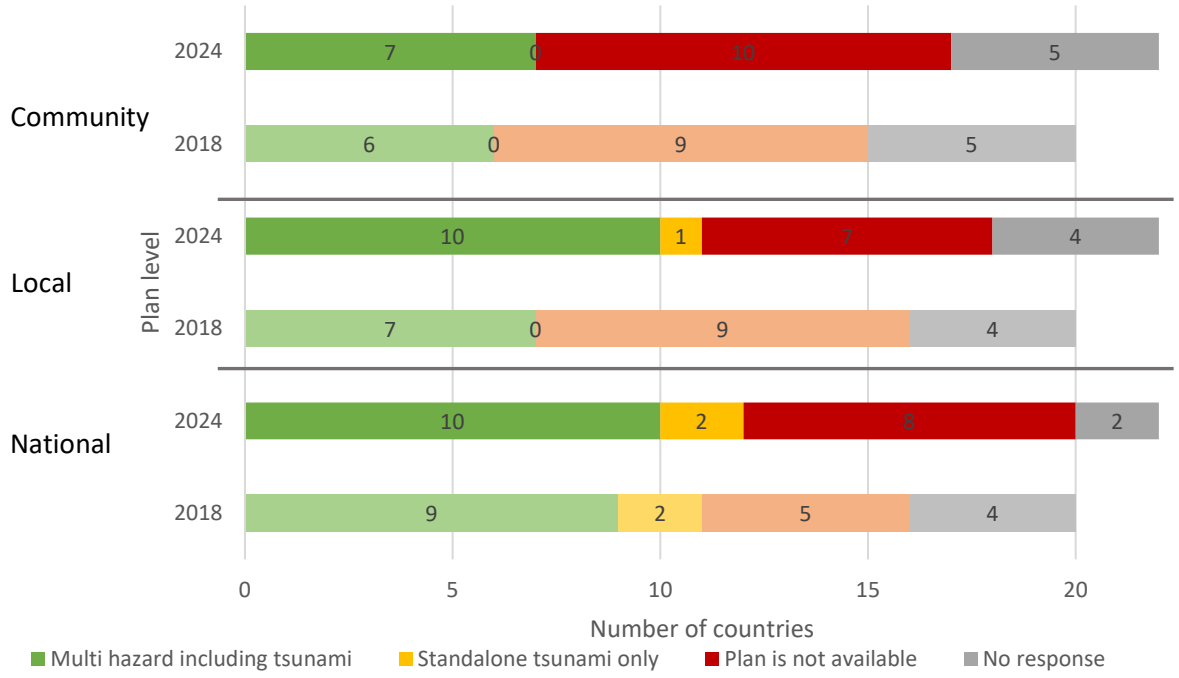


Figure 23: rehabilitation and reconstruction phase



2. RISK ASSESSMENT AND REDUCTION – GUIDELINES

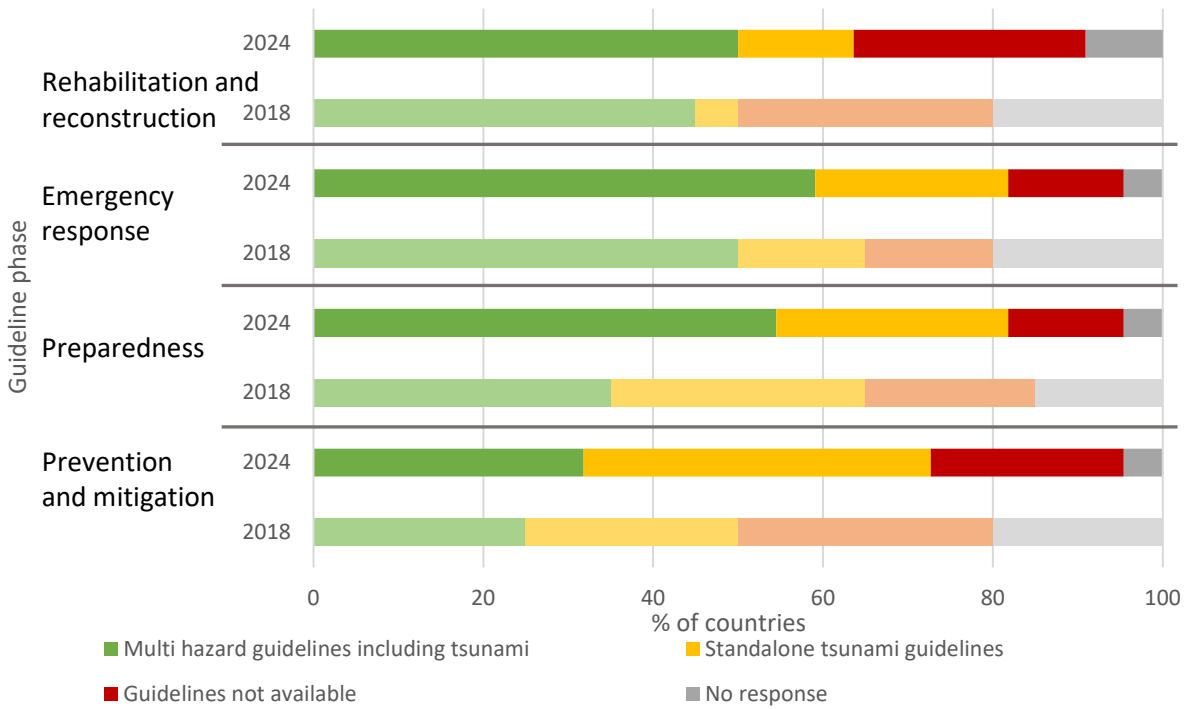


Figure 24: Types and phases of national tsunami guidelines

ภาพที่ 24: ประเภทและระยะของแนวทางปฏิบัติสึนามิระดับชาติ

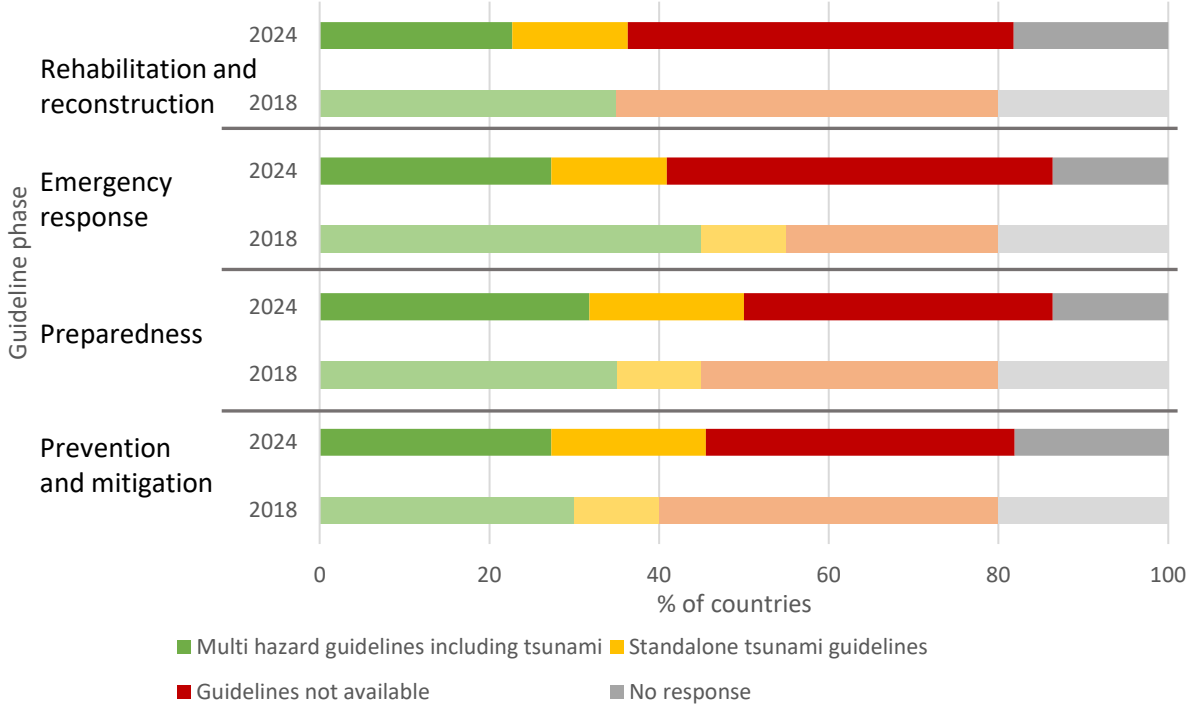


Figure 25: Types and phases of local tsunami guidelines

ภาพที่ 25: ประเภทและระยะของแนวทางปฏิบัติสึนามิระดับท้องถิ่น

Thailand response:	
Rehabilitation	
Emergency	
Preparedness	
Prevention	

Specified guidelines:
Guidelines for tsunami preparedness

Thailand response:	
Rehabilitation	
Emergency	
Preparedness	
Prevention	

3. การตรวจจับ, การเตือนภัย, และการเผยแพร่ - การระบุภัยพิบัติและการเตือนภัย

Thailand response:
Use TSP data AND own threat assessment data
ใช้ข้อมูลจากระบบ TSP มาประกอบกับข้อมูลที่หน่วยงานได้ประเมินเอง

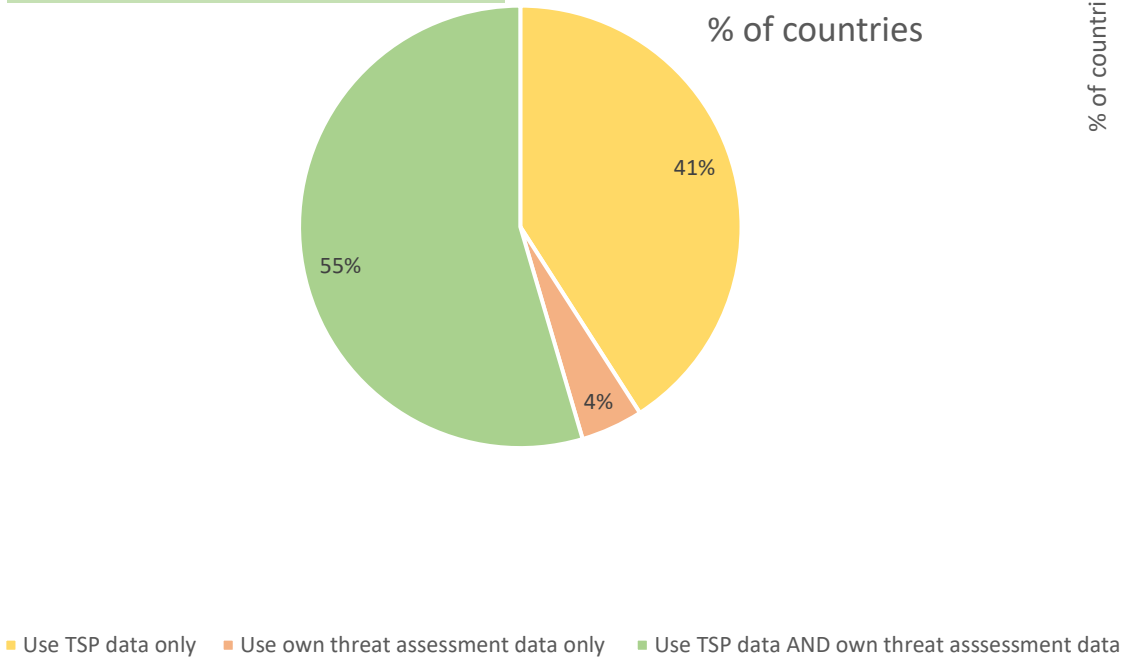


Figure 26: Data use for the Coastal Forecast Zones (CFZ) of a country's coastline to determine national threats
ภาพที่ 26: การนำข้อมูลจากเขตพยากรณ์ชายฝั่งมาวิเคราะห์เพื่อระบุภัยคุกคามระดับชาติ

Thailand response:
Use all of above but Satellite and VSAT
ใช้ข้อมูลทั้งหมดข้างต้น ยกเว้นดาวเทียมและ VSAT

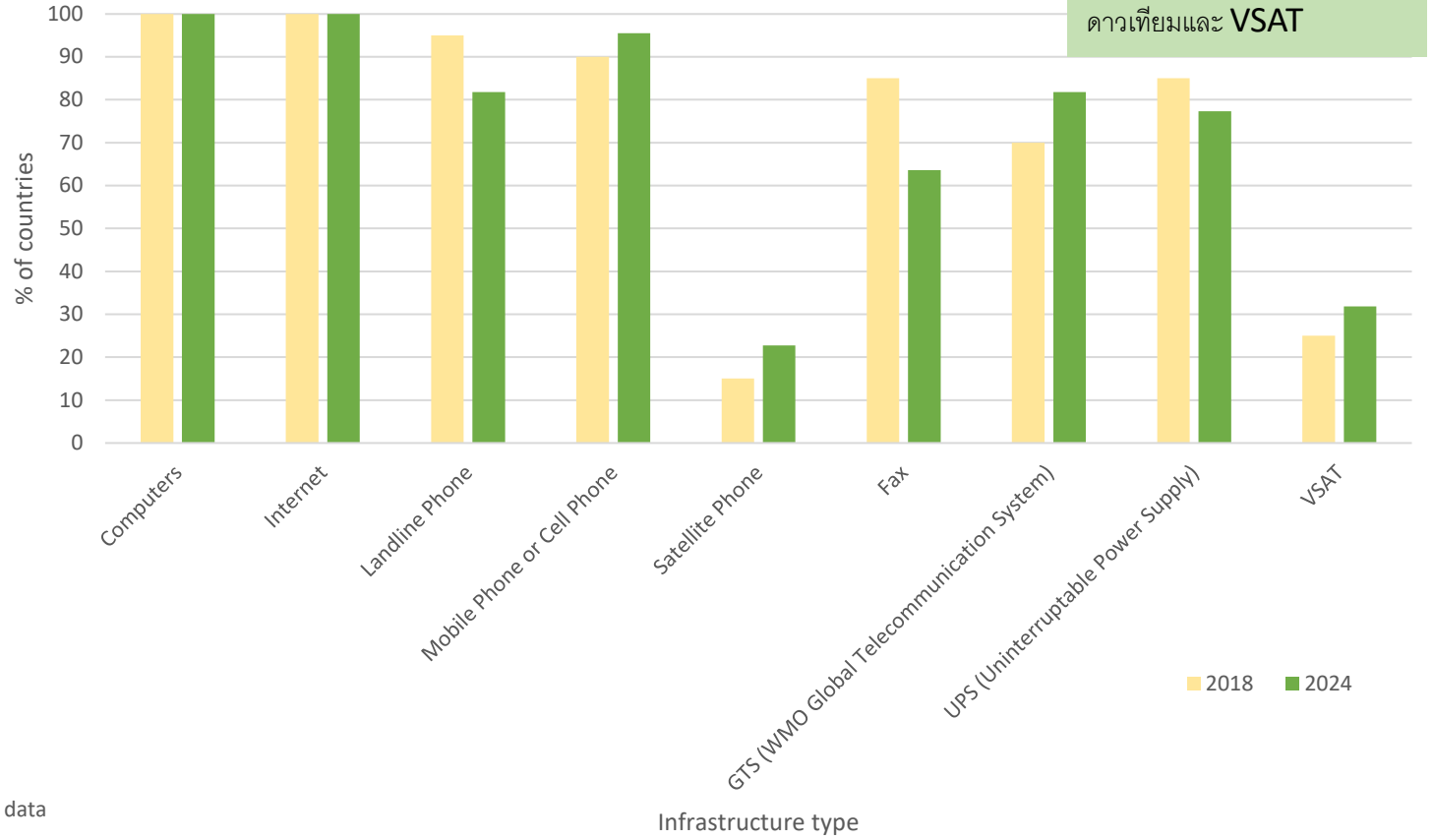


Figure 27: Infrastructure availability to support 24x7 operations
ภาพที่ 27: ความพร้อมของโครงสร้างพื้นฐานเพื่อสนับสนุนการดำเนินงานตลอด 24 ชั่วโมงทุกวัน

3. DETECTION, WARNING AND DISSEMINATION – DETECTION AND WARNING

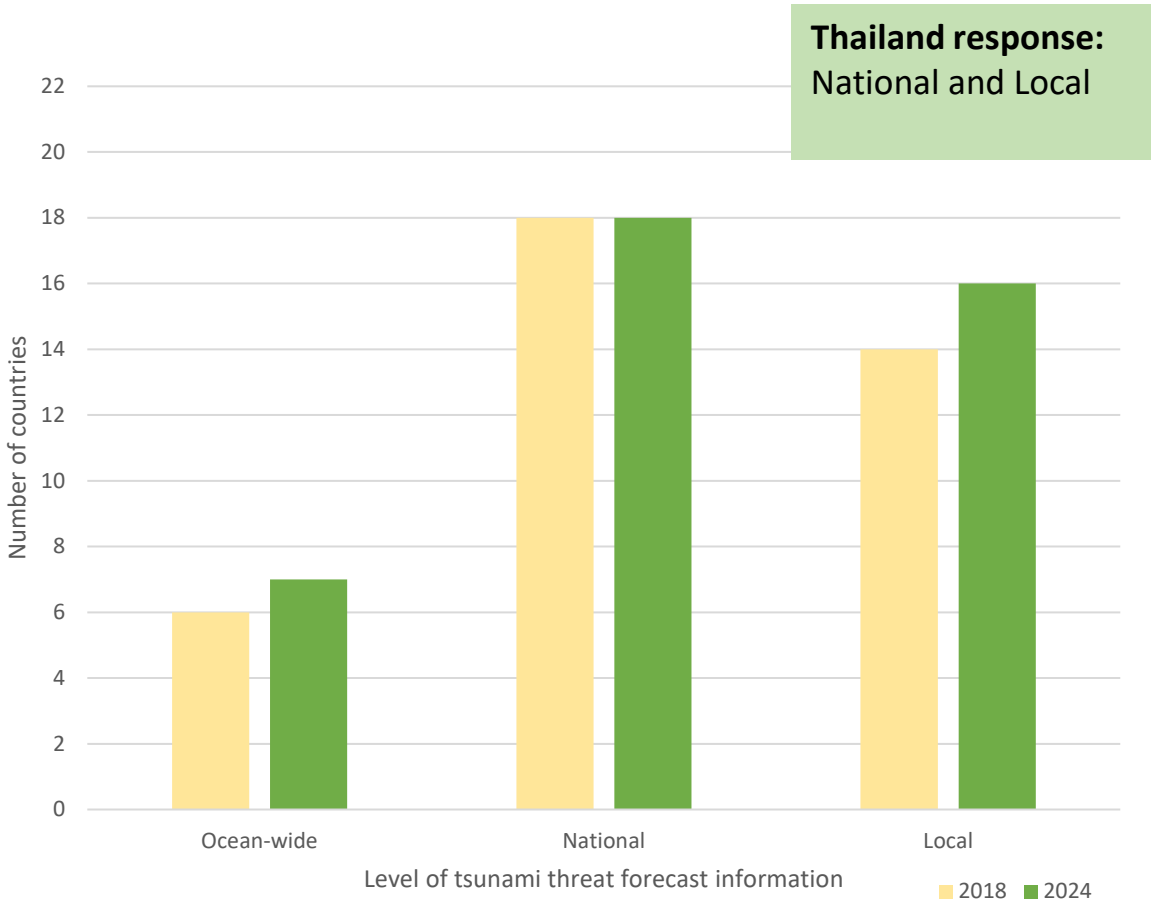


Figure 28: Level of tsunami threat forecast information is produced by the responsible organisation

ภาพที่ 28: ระดับของข้อมูลการพยากรณ์ภัยคุกคามจากสึนามิที่ผลิตโดยองค์กรที่รับผิดชอบ

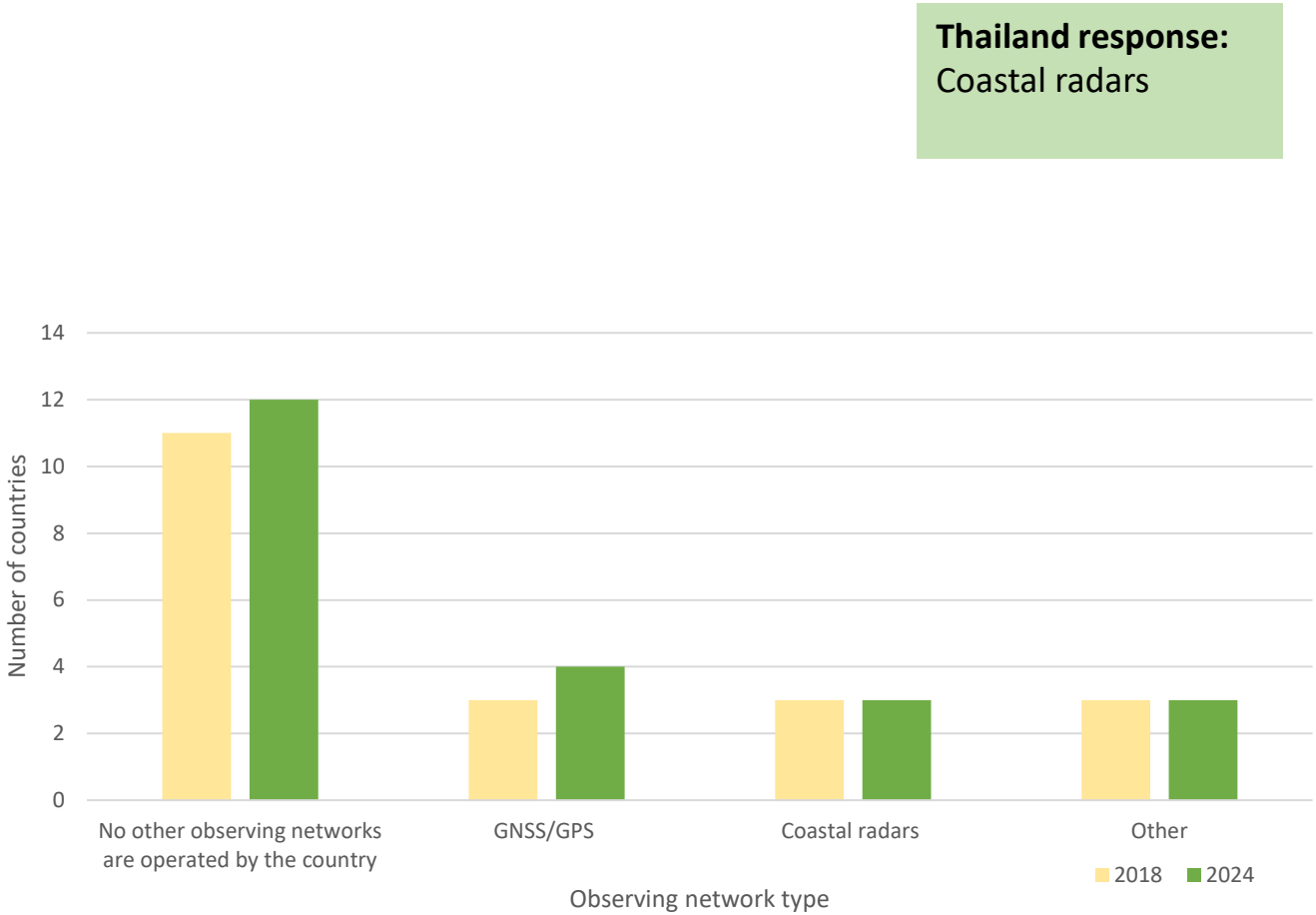


Figure 29: Other observing networks operated and used for tsunami early warning

ภาพที่ 29: เครือข่ายการสังเกตการณ์อื่น ๆ ที่ดำเนินการและใช้สำหรับการเตือนภัยสึนามิ

3. DETECTION, WARNING AND DISSEMINATION –
DETECTION AND WARNING

- 20 countries have access to national or international seismic networks, 19 of them to both (มี 20 ประเทศที่สามารถเข้าถึงเครือข่ายตรวจวัดแผ่นดินไหวระดับชาติหรือระดับนานาชาติ และมี 19 ประเทศที่มีการเข้าถึงได้ทั้งสองระดับ)
- 9 reported that all national seismic data is shared in real time, while 10 reported that some is (มี 9 ประเทศที่รายงานว่าข้อมูลแผ่นดินไหวระดับชาติทั้งหมดถูกแชร์แบบเรียลไทม์ ในขณะที่มี 10 ประเทศรายงานว่ามีการแชร์เพียงบางส่วน)
- 11 countries reported having access to GNSS data (มี 11 ประเทศที่รายงานว่าสามารถเข้าถึงข้อมูล GNSSได้)
- 13 countries reported that the list of broadband seismometers operated by their country is listed accurately in the IOTWMS database (มี 13 ประเทศที่รายงานว่ารายชื่อเครื่องวัดแผ่นดินไหวคาบกว้างที่ประเทศของตนดำเนินการนั้นถูกระบุอย่างถูกต้องในฐานข้อมูล IOTWMS)
- 15 countries reported that they have access to national or international sea level networks, with 13 to both (มี 15 ประเทศที่รายงานว่าสามารถเข้าถึงเครือข่ายระดับชาติหรือระดับนานาชาติสำหรับการตรวจวัดระดับน้ำทะเลได้ โดยมี 13 ประเทศที่เข้าถึงได้ทั้งสองระดับ)
- 8 countries share all their national sea level data in real time, while 4 countries share some sea level data in real time (มี 8 ประเทศที่แชร์ข้อมูลระดับน้ำทะเลระดับชาติทั้งหมดแบบเรียลไทม์ ในขณะที่มี 4 ประเทศที่แชร์ข้อมูลระดับน้ำทะเลบางส่วนแบบเรียลไทม์)
- 15 countries reported that the list of sea level stations operated by their country is listed accurately in the IOTWMS sea level database (มี 15 ประเทศที่รายงานว่ารายชื่อสถานีวัดระดับน้ำทะเลที่ประเทศของตนดำเนินการนั้นถูกระบุอย่างถูกต้องในฐานข้อมูลระดับน้ำทะเลของ IOTWMS)

Thailand response:

National and international seismic

All seismic data is shared in real time: TMD Website

No access to GNSS data

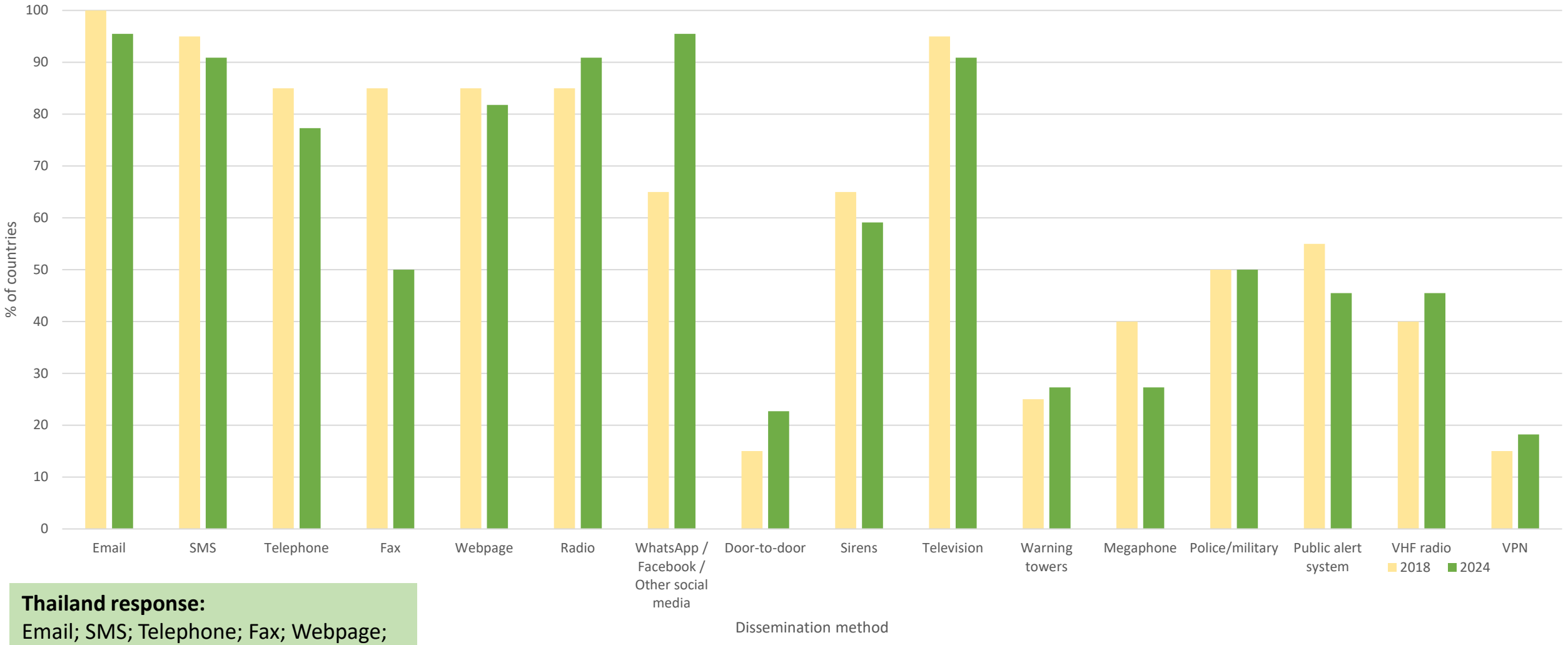
Yes, but some seismometers have been added (including private not shared)

National and international sea level. Hydrographics Department, Royal Thai Navy

All national sea level data is shared in real time - ETA ,wave height

No, stations are not accurately listed

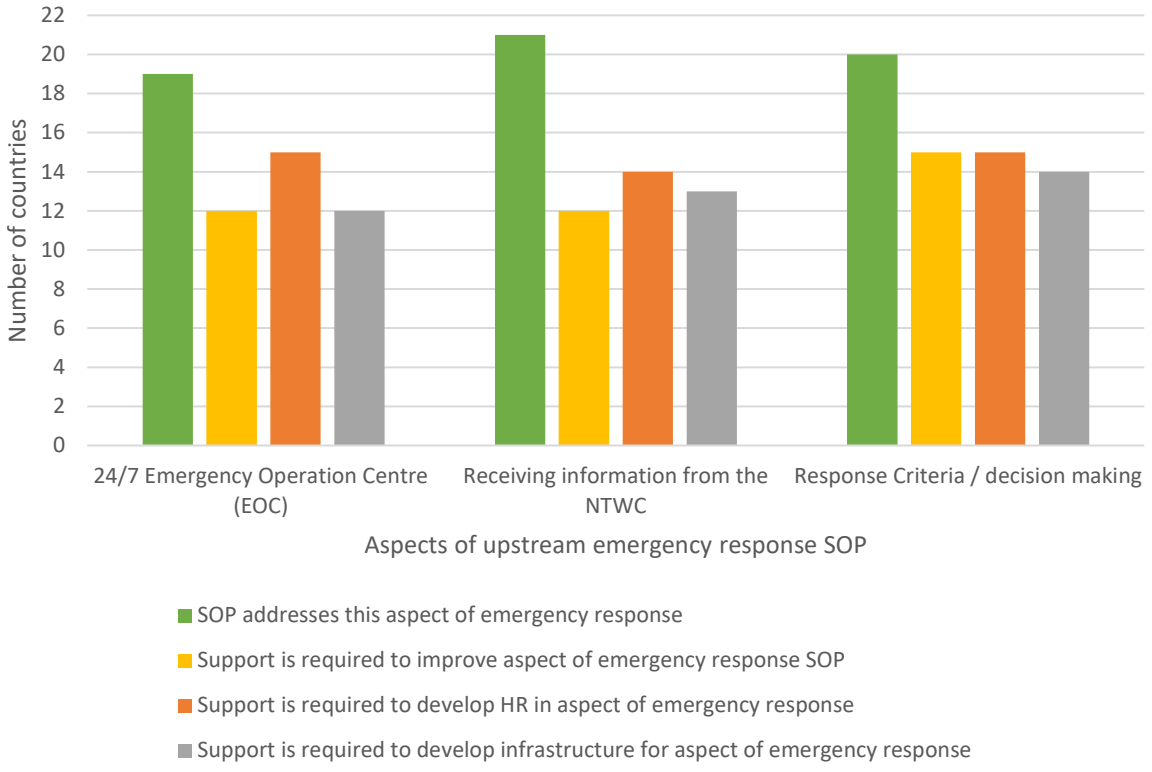
3. DETECTION, WARNING AND DISSEMINATION – DISSEMINATION



Thailand response:
Email; SMS; Telephone; Fax; Webpage; Radio; WhatsApp / Social media; Sirens; Television; Warning towers

Figure 30: How tsunami information is disseminated
ภาพที่ 30: ข้อมูลเกี่ยวกับสึนามิถูกเผยแพร่อย่างไร?

4. PUBLIC AWARENESS, PREPAREDNESS AND RESPONSE
– STANDARD OPERATING PROCEDURES



	ASPECT OF UPSTREAM EMERGENCY RESPONSE SOP											
	24/7 Emergency Operation Centre (EOC)				Receiving information from the NTWC				Response criteria / decision making			
	SOP addresses this aspect	Support required to develop/improve SOP	Support required to develop human resources	Support required to develop infrastructure	SOP addresses this aspect	Support required to develop/improve SOP	Support required to develop human resources	Support required to develop infrastructure	SOP addresses this aspect	Support required to develop/improve SOP	Support required to develop human resources	Support required to develop infrastructure
Australia	●	○	○	○	●	○	○	○	●	○	○	○
Bangladesh	●	●	●	●	●	●	●	●	●	●	●	●
Comoros												
France Indian Ocean Territories	●	○	○	○	●	○	○	○	●	●	●	●
India	●	○	●	○	●	○	○	○	●	○	○	○
Indonesia	●	●	●	●	●	●	●	●	●	●	●	●
Iran	○	●	●	●	●	●	○	○	●	●	●	●
Kenya	●	●	●	●	●	●	●	●	●	●	●	●
Madagascar	●	●	●	●	●	●	●	●	●	●	●	●
Malaysia	●	○	●	○	●	○	●	○	●	●	●	○
Maldives	●	●	●	●	●	●	●	●	●	●	●	●
Mauritius	●	○	○	○	●	○	○	○	●	○	○	○
Mozambique	●	●	●	●	●	●	●	●	●	●	●	●
Myanmar					●	●	●	●				
Oman	●	●	●	●	●	●	●	●	●	●	●	●
Pakistan	●	○	●	●	●	○	●	●	●	●	●	●
Seychelles	●	●	●	●	●	●	●	●	●	●	●	●
Singapore	●	○	○	●	●	○	○	○	●	○	○	○
South Africa	●	●	●	●	●	○	●	●	●	●	●	●
Sri Lanka	●	●	●	●	●	●	●	●	●	●	●	●
Thailand	●	●	●	●	●	●	●	●	●	●	●	●
United Arab Emirates	●	○	○	○	●	○	○	○	●	○	○	○

● = Yes ○ = No Blank = No Response

Figure 31: Availability of, and support required to develop upstream emergency response SOP

ภาพที่ 31: ความพร้อมและการสนับสนุนที่จำเป็นในการพัฒนา ขั้นตอนการปฏิบัติงานมาตรฐาน สำหรับการตอบสนองฉุกเฉินในระดับต้นน้ำ

4. PUBLIC AWARENESS, PREPAREDNESS AND RESPONSE
– STANDARD OPERATING PROCEDURES

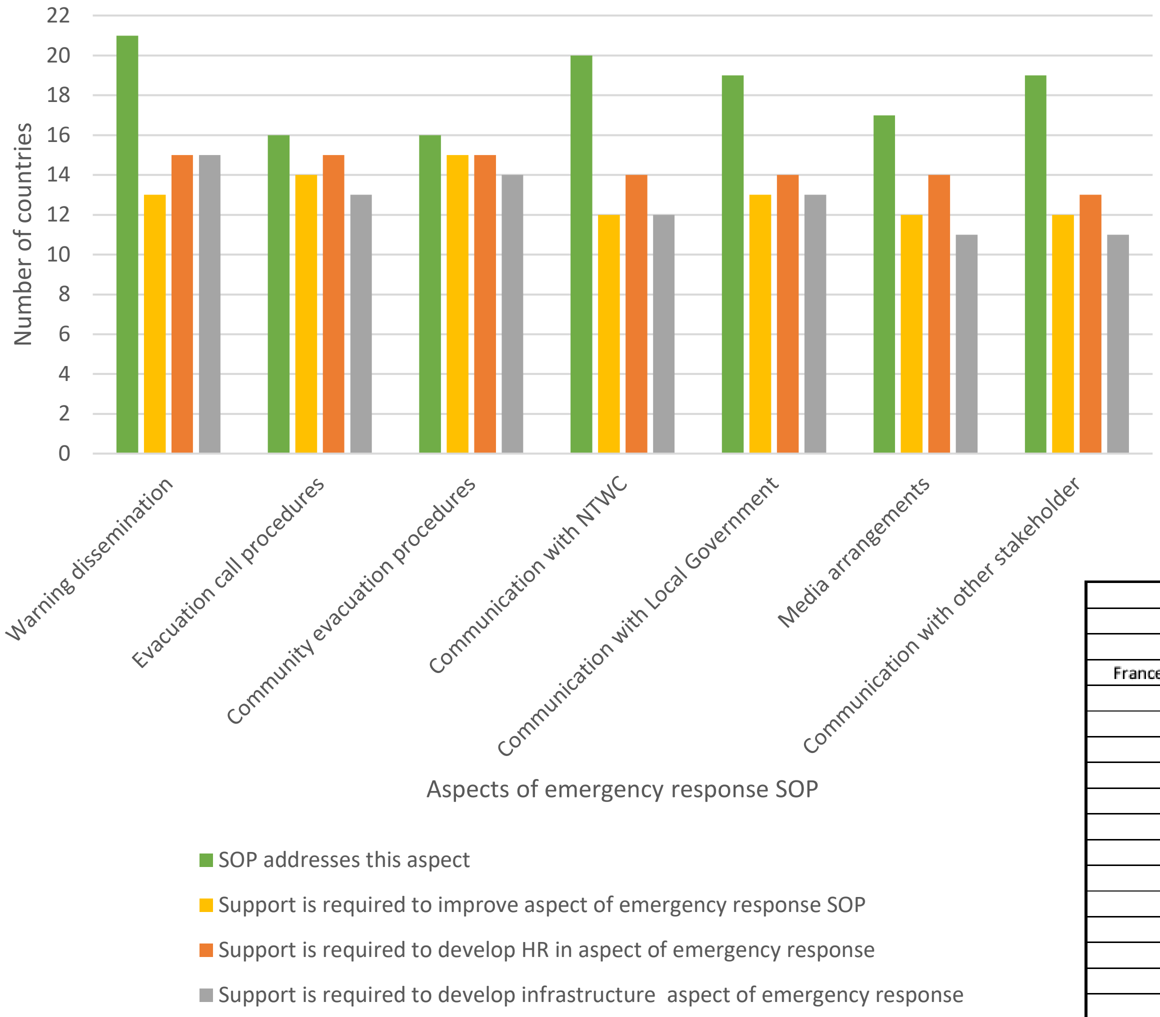


Figure 32: Availability of, and support required to develop downstream emergency response SOP

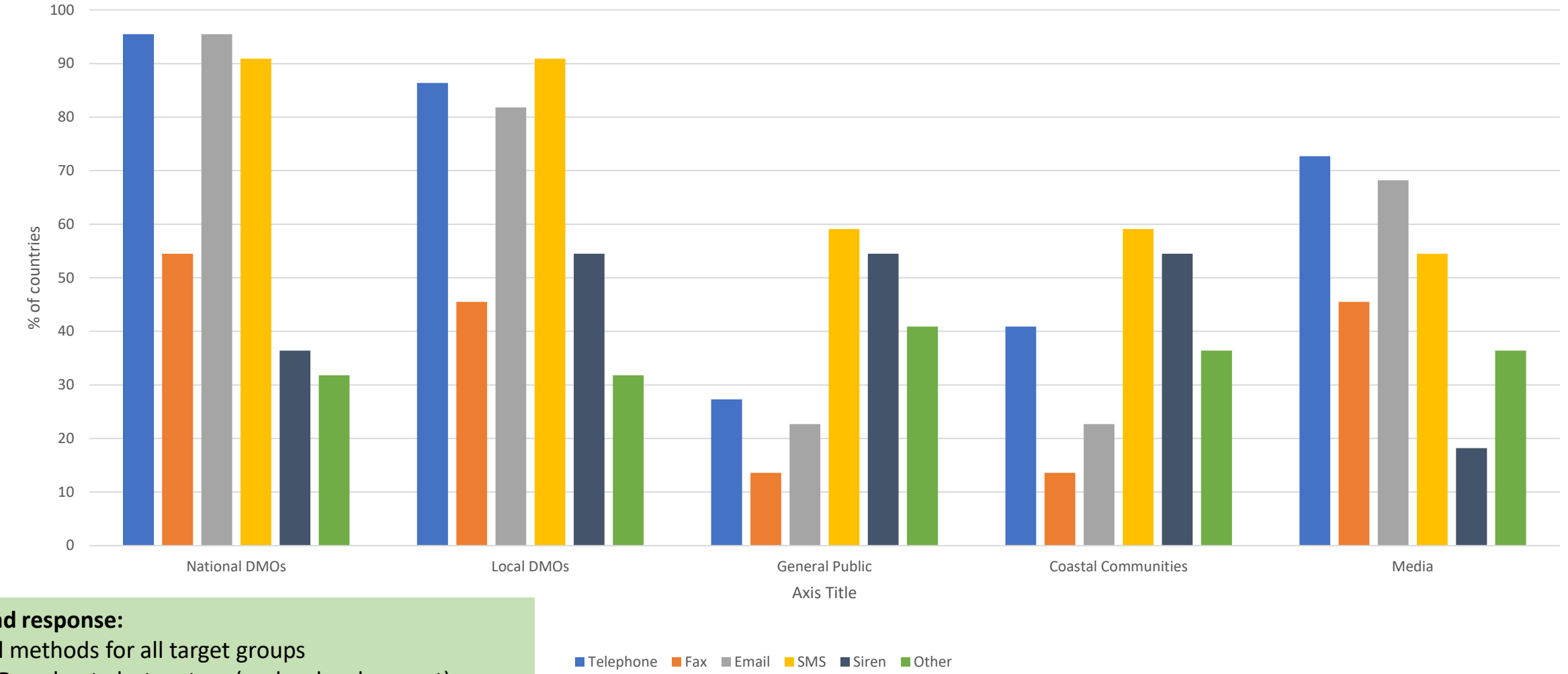
ภาพที่ 32: ภาพที่ 31: ความพร้อมและการสนับสนุนที่จำเป็นในการพัฒนาขั้นตอนการปฏิบัติงานมาตรฐาน สำหรับการตอบสนองฉุกเฉินในระดับปลายทาง

	ASPECT OF DOWNSTREAM EMERGENCY RESPONSE SOP																											
	Warning dissemination				Evacuation call procedures				Community evacuation				Communication with NTWC				Communicaton with local government				Media arrangements				Communication with other stakeholders			
	SOP addresses this aspect	Support required to develop/improve SOP	Support required to develop human resources	Support required to develop infrastructure	SOP addresses this aspect	Support required to develop/improve SOP	Support required to develop human resources	Support required to develop infrastructure	SOP addresses this aspect	Support required to develop/improve SOP	Support required to develop human resources	Support required to develop infrastructure	SOP addresses this aspect	Support required to develop/improve SOP	Support required to develop human resources	Support required to develop infrastructure	SOP addresses this aspect	Support required to develop/improve SOP	Support required to develop human resources	Support required to develop infrastructure	SOP addresses this aspect	Support required to develop/improve SOP	Support required to develop human resources	Support required to develop infrastructure	SOP addresses this aspect	Support required to develop/improve SOP	Support required to develop human resources	Support required to develop infrastructure
Australia	●	●	●	○	●	●	●	○	●	●	●	●	●	●	●	○	●	●	●	○	●	●	●	○	●	●	●	○
Bangladesh	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Comoros																												
France Indian Ocean Territories	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○
India	●	○	○	○	●	○	●	○	●	○	●	○	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○
Indonesia	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Iran	●	○	●	●	●	○	○	○	●	●	○	○	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○
Kenya	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Madagascar	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Malaysia	●	○	●	●	●	○	●	○	●	○	●	○	●	○	●	○	●	○	●	○	●	○	●	○	●	○	●	○
Maldives	●	●	●	●	○	●	●	●	○	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●
Mauritius	●	○	○	○	●	●	○	●	●	●	○	●	●	○	○	○	●	○	○	●	●	○	○	○	●	○	○	○
Mozambique	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Myanmar	●	●	●	●																								
Oman	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Pakistan	●	●	●	●	○	●	●	●	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	○
Seychelles	●	●	●	●	○	●	●	●	○	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●
Singapore	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○
South Africa	●	○	○	●	○	●	●	●	○	●	●	●	●	○	●	●	●	●	●	●	○	●	●		○	●	●	●
Sri Lanka	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●
Thailand	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
United Arab Emirates	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○	●	○	○	○

● = Yes ○ = No Blank = No Response

4. PUBLIC AWARENESS, PREPAREDNESS AND RESPONSE

– STANDARD OPERATING PROCEDURES



Thailand response:

Uses all methods for all target groups

Other: Broadcast alert system (under development)

ใช้ทุกวิธีการสำหรับทุกกลุ่มเป้าหมาย

อื่น ๆ: ระบบแจ้งเตือนการกระจายสัญญาณ (อยู่ระหว่างการพัฒนา)

Figure 33: Communication methods for emergency response

ภาพที่ 33: การสื่อสารสำหรับการตอบสนองฉุกเฉิน

4. PUBLIC AWARENESS, PREPAREDNESS AND RESPONSE

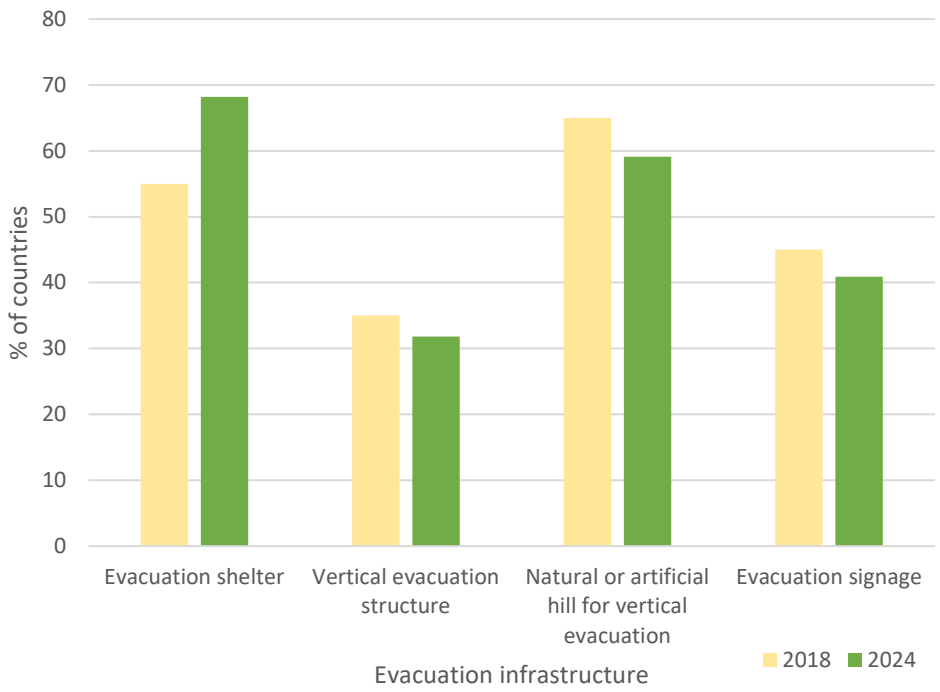
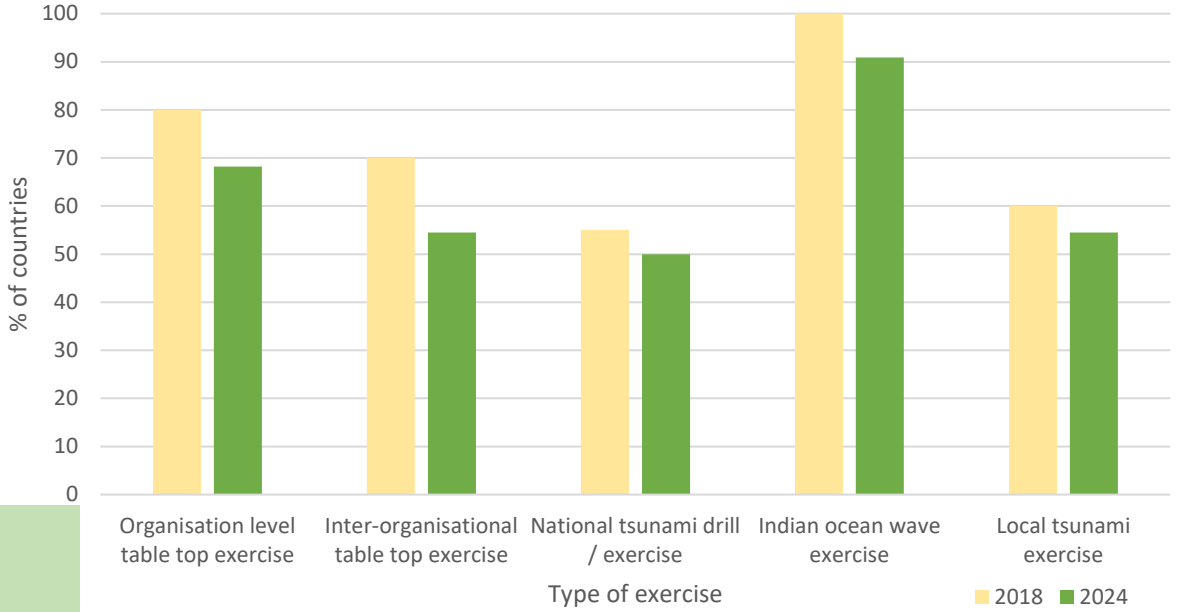


Figure 34: Evacuation infrastructure

Thailand response:
Evacuation shelter - 233 in 6 provinces
Vertical evacuation – 6 provinces
National or artificial hill – 6 provinces
Evacuation signage – 6 provinces



Thailand response:
All except inter-organizational table top

Figure 36: Types of tsunami exercise conducted

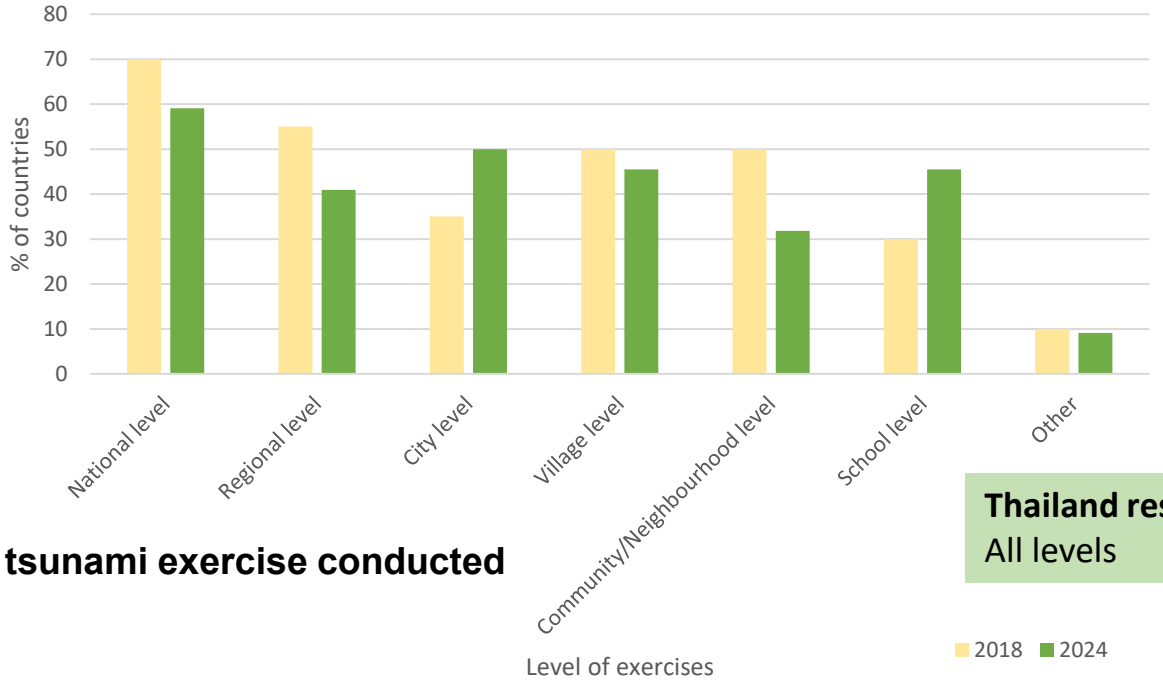


Figure 35: Levels of tsunami exercise conducted

Thailand response:
All levels

4. PUBLIC AWARENESS, PREPAREDNESS AND RESPONSE

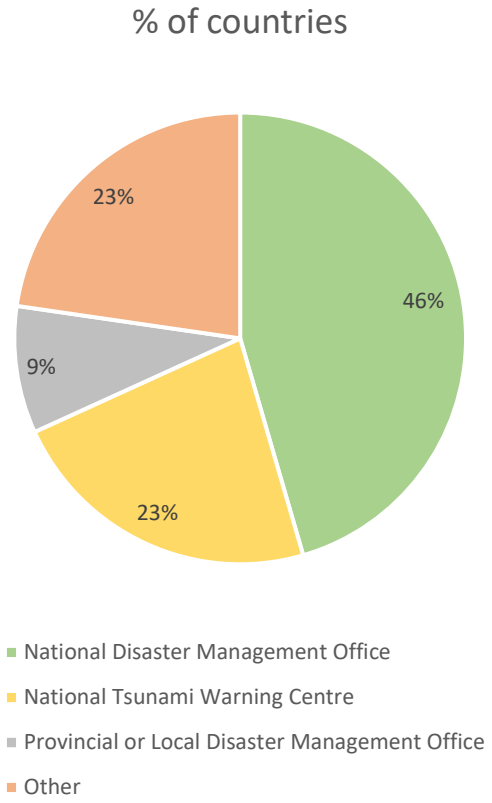


Figure 37: Organisation responsible for tsunami public awareness programmes

Thailand response:
Other: All three organisations

Thailand response:
All except Competitions or other ways of highlighting tsunami safety

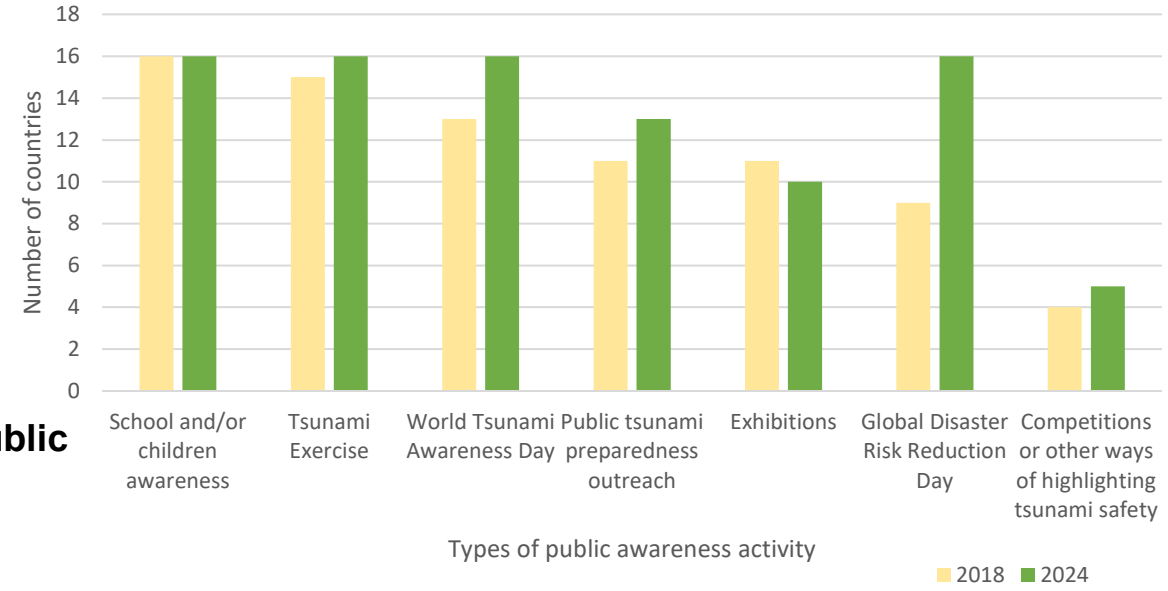


Figure 39: Types of public awareness activity

Thailand response:
All except Teaching kits and Public evacuation maps

Yes, willing to share

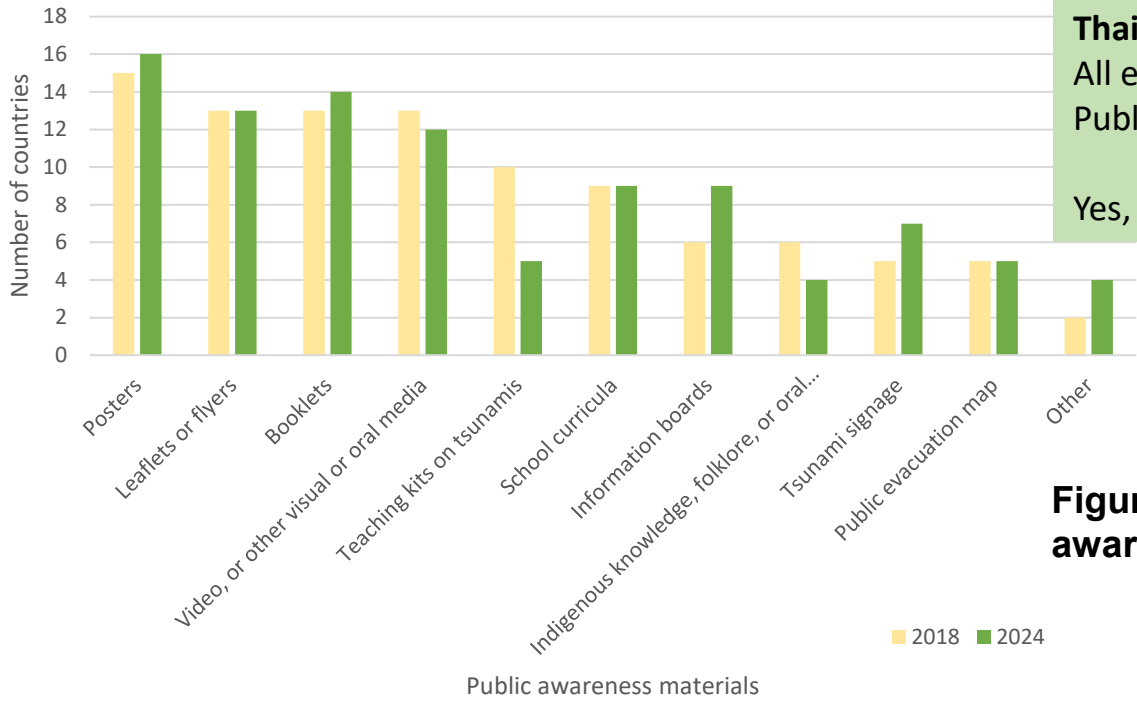


Figure 38: Types of public awareness materials

4. PUBLIC AWARENESS, PREPAREDNESS AND RESPONSE

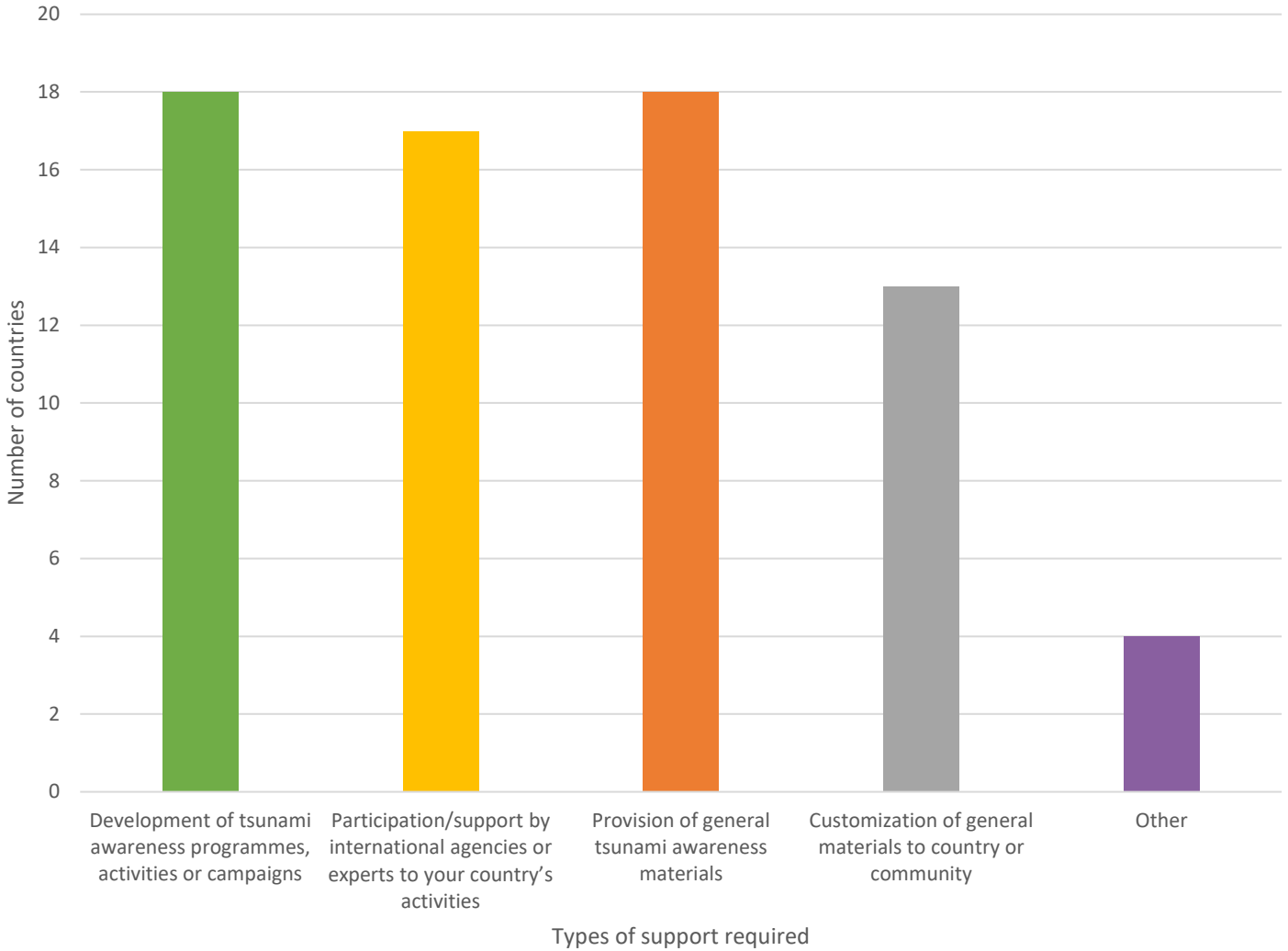


Figure 40: Support required for public awareness activity

	Support required for public awareness activity				
	Provision of general tsunami awareness materials	Customisation of general materials to country or community	Development of tsunami awareness programmes, activities or campaigns	Participation/support by international agencies or experts to your country's activities	Other
Australia	●	●	●	●	●
Bangladesh	●	●	●	●	○
Comoros	●	●	●	●	○
France Indian Ocean Territories	○	○	○	○	○
India	●	○	●	○	○
Indonesia	●	●	●	●	●
Iran	●	○	●	●	○
Kenya	●	●	●	●	○
Madagascar	●	●	●	●	○
Malaysia	●	●	●	●	○
Maldives	●	●	●	○	○
Mauritius	●	●	●	●	●
Mozambique	●	○	●	●	○
Myanmar	●	●	●	●	○
Oman	●	●	●	●	○
Pakistan	○	○	○	●	○
Seychelles	●	●	●	●	○
Singapore	○	○	○	○	○
South Africa	●	○	●	●	○
Sri Lanka	●	●	●	●	●
Thailand	●	○	●	●	○
United Arab Emirates	○	○	○	○	○

● = Yes ○ = No

5. UNESCO-IOC Tsunami Ready Recognition Programme (TRRP)

13 countries are already participating in TRRP
มี 13 ประเทศที่เข้าร่วม TRRP แล้ว

8 are not currently doing so
มี 8 ประเทศที่ยังไม่เข้าร่วม TRRP

Of those, 6 have plans to do so in the near future, while 2 do not
ในจำนวน 8 ประเทศที่ยังไม่เข้าร่วมนั้น มี 6 ประเทศที่มีแผนจะเข้าร่วมในอนาคตอันใกล้ และมี 2 ประเทศที่ไม่มีแผนจะเข้าร่วม TRRP

Thailand response:
Not participating ยังไม่ได้เข้าร่วม

We are interested in joining TRRP.
ไทยมีความสนใจที่จะเข้าร่วม TRRP

We are in progress of study.
เรากำลังอยู่ในกระบวนการศึกษา

Table 3: Number of villages, cities/districts and provinces/state levels at risk to tsunami

Country	Village	City / District	Province / State
Australia			
Bangladesh		14	
Comoros	50	20	3
France Indian Ocean Territories	36		
India	3174	73	13
Indonesia	5744	255	26
Iran	50	6	2
Kenya			4
Madagascar			
Malaysia			3
Maldives	172	5	198
Mauritius		6	
Mozambique			
Myanmar	1000	70	5
Oman	60	23	7
Pakistan	0	2	2
Seychelles		27	
Singapore	0	0	0
South Africa			3
Sri Lanka		14	5
Thailand	509	27	6
United Arab Emirates			2

5. UNESCO-IOC Tsunami Ready Recognition Programme (TRRP)

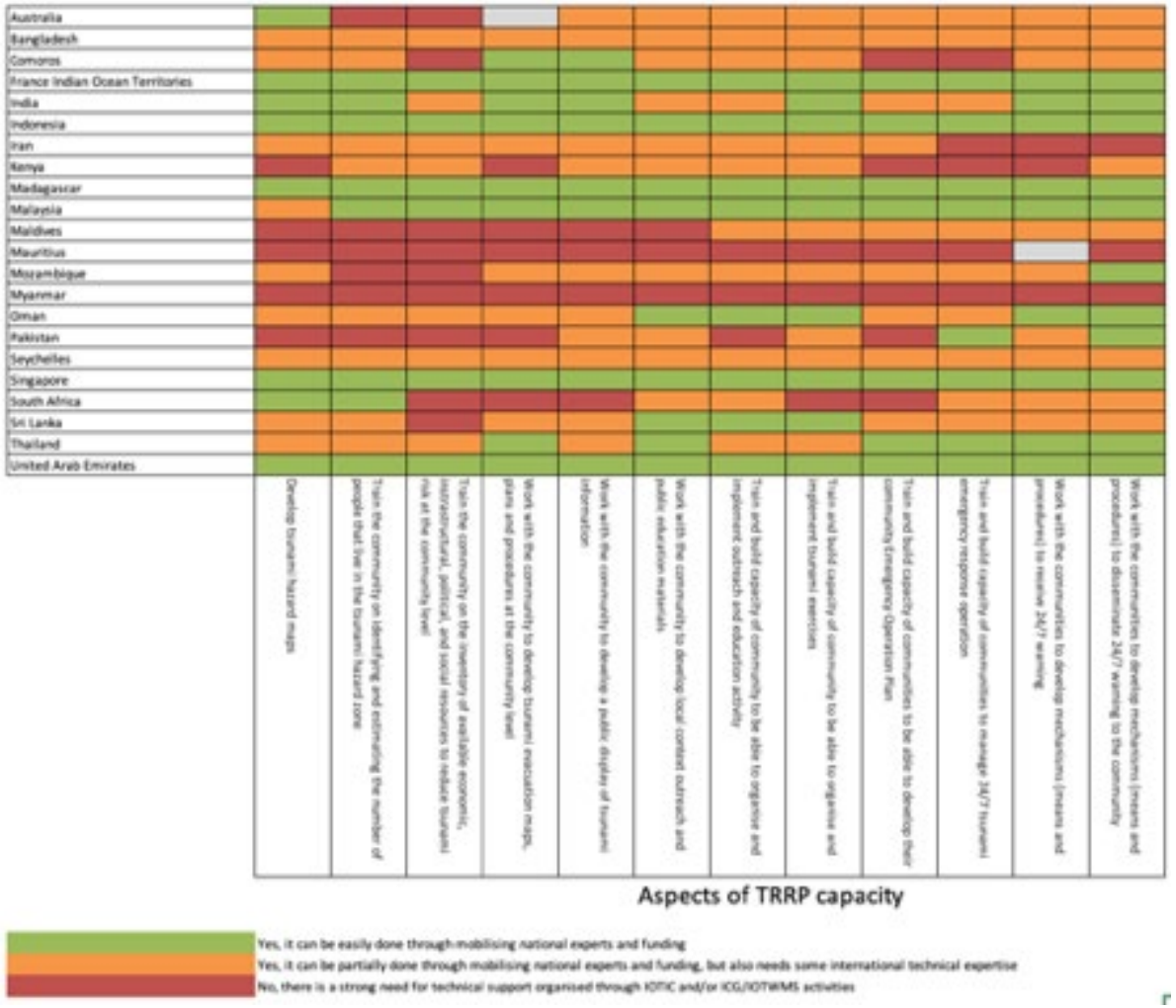
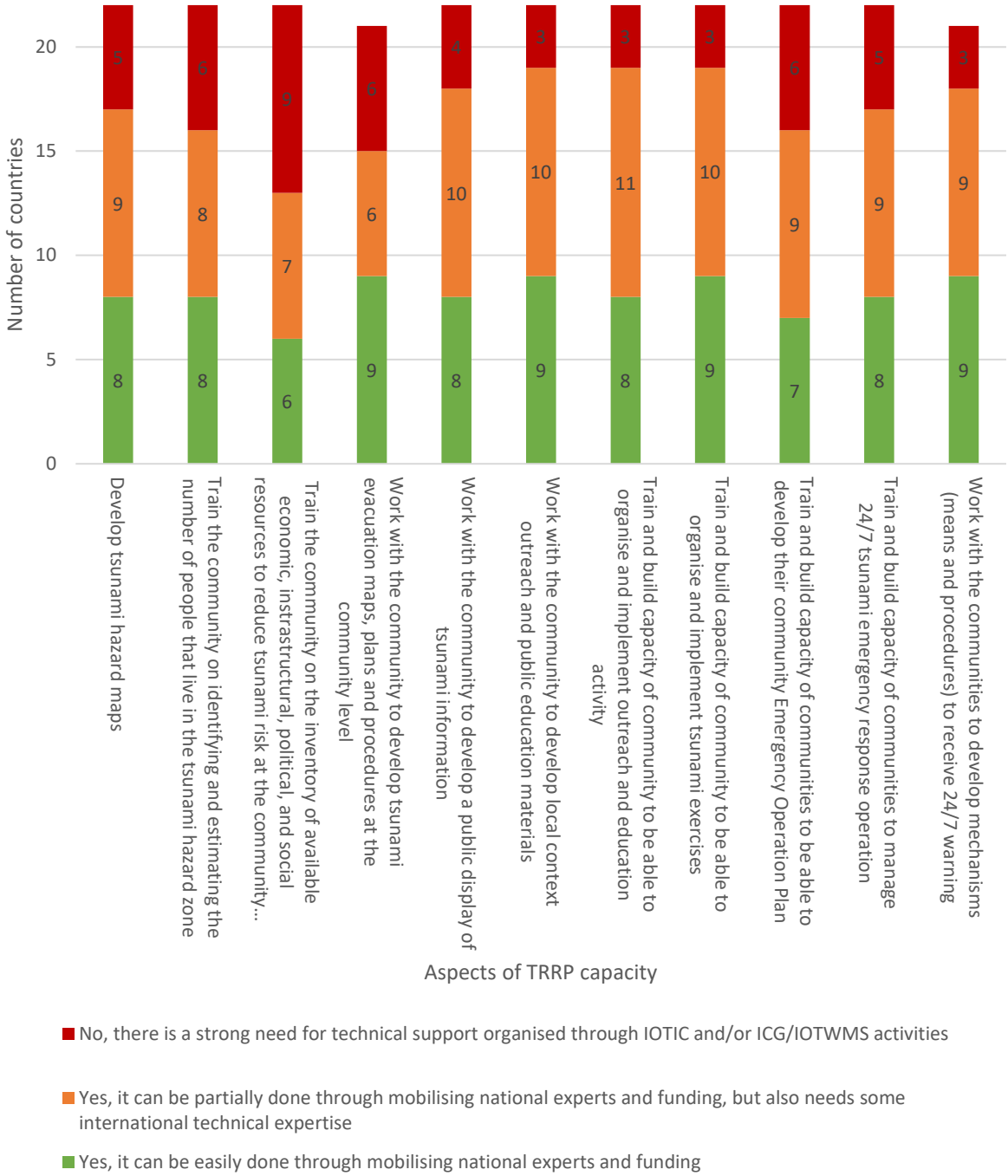


Figure 41: Country responses on national capacity according to different aspects of the TRRP

Figure 42: Summary of national capacity according to different aspects of the TRRP



5. UNESCO-IOC Tsunami Ready Recognition Programme (TRRP)

Thailand response:
None of the above

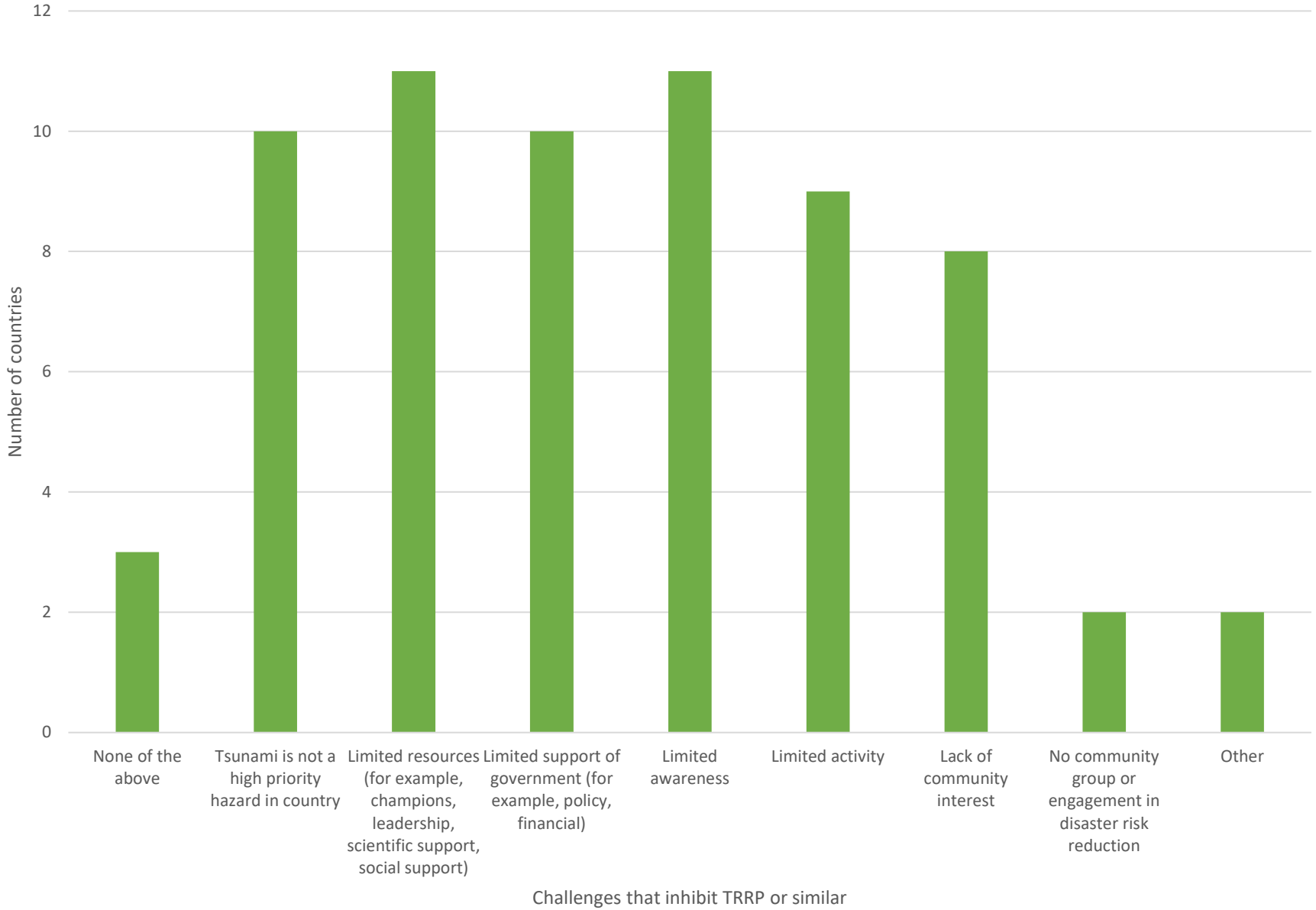


Figure 43: Challenges that inhibit the implementation of TRRP or similar national initiatives

General observations

- Response patterns are similar to 2018

  รูปแบบคำตอบมีความคล้ายคลึงกับปี 2018

  - Stronger capacities at national than sub-national levels

    ศักยภาพในระดับประเทศมีระดับสูงกว่าศักยภาพในภาคส่วนย่อยของรัฐ
  - Higher availability of policies and plans at the national than local levels

    มีนโยบายและแผนการในระดับประเทศมากกว่าในระดับท้องถิ่น
  - Tsunami are most commonly addressed as part of multi-hazard approaches, rather than standalone

    โดยทั่วไป สึนามิถูกจัดเป็นส่วนหนึ่งของการรับมือภัยพิบัติแบบครอบคลุมมากกว่าที่จะแยกเป็นการจัดการแบบเฉพาะเจาะจง
  - Similar detection and warning capacities to 2018

    ความสามารถในการตรวจจับและเตือนภัยมีความใกล้เคียงกับปี 2018

- Some trends to be expected

  แนวโน้มที่คาดว่าจะเกิดขึ้น

  - Increased use of social media, decline of fax

    มีการใช้สื่อสังคมออนไลน์เพิ่มมากขึ้น ขณะที่การใช้โทรสารลดลง
  - Reduction in tsunami exercises (COVID impact?)

    ลดการฝึกซ้อมสึนามิ (อาจเป็นเพราะผลกระทบจากโควิด)

General observations

- Some evidence of improving capacities e.g., to develop hazard and risk maps, to develop SOPs, but many require further support

  มีหลักฐานที่แสดงให้เห็นถึงการพัฒนาศักยภาพ เช่น การพัฒนาแผนที่ภัยพิบัติและแผนที่ความเสี่ยง การพัฒนาขั้นตอนการปฏิบัติงาน ทั้งนี้ ยังมีความต้องการการสนับสนุนเพิ่มเติมในหลายด้าน

- Strong interest in TRRP but many countries need external technical expertise and resources

  มีความสนใจอย่างมากต่อ TRRP แต่หลายประเทศยังคงต้องการความเชี่ยวชาญทางเทคนิคและทรัพยากรจากภายนอก

- Many countries have identified significant challenges in implementing TRRP

  หลายประเทศได้ระบุอุปสรรคที่สำคัญในการดำเนินงานโครงการ TRRP

- Evidence of some progress in certain areas, but most (all?) recommendations from 2018 are likely to be still valid, but would benefit from increased impetus and new ideas

  มีหลักฐานแสดงให้เห็นถึงความก้าวหน้าในบางด้าน แม้ข้อเสนอแนะจากปี 2018 ส่วนใหญ่ (หรือทั้งหมด) ยังคงใช้ได้อยู่ ทว่าเรายังต้องการแรงกระตุ้นและแนวคิดใหม่ ๆ เพิ่มเติมเพื่อให้เกิดการพัฒนา