2011

Trinidad and Tobago

National Earthquake Plan

Office of Disaster Preparedness and Management


Caribbean Sea
Man 'o War Bay
Englishman's Bay
Castara Bay
Speyside
King's Bay
Turtle Beach
Mt. Irvine Bay
Pigeon Point
Scarborough
Atlantic Ocean
Store Bay
Canoe Bay


Caribbean Sea
Paria
Toco
Maracas
Chaguaramas
Salibea
Curepe
Port-of-Spain
Arima
Piarco International Airport
Sangre Grande
Chaguanas
Caroni Plains
Gulf of Paria
Atlantic Ocean
Biche
San Fernando
Princes Town
La Brea
Mayaro
Point Fortin
Siparia
Guayaguayara
Moruga
Icacos

The Republic of Trinidad and Tobago
National Earthquake Plan

June 2011

Record of Change

No. of Change	Date of Change	Subject of Change	Name of person
1	May 11 2011	Revision in ODPM-CDEMA Workshop 2-4 May 2011.	ODPM and participants.
2	June 24 2011	Revision	MPRU

PREFACE

The primary mission of government in an emergency is to protect the lives and property of its citizens. Regardless of how well all systems are organized to provide assistance, the unpredictable nature of earthquakes and the time and space factors involved dictate that the local jurisdiction must be prepared to cope with the initial impact of an earthquake on its own.

Recognizing that routine emergency services will, by their nature, be inadequate to cope with the effects of a major earthquake, it is the duty of local government to provide for the emergency expansion of its survival capabilities within the limits of available resources.

The Office of Disaster Preparedness and Management (ODPM) National Earthquake Plan is an Incident or Hazard Specific Annex to the National Emergency Operations Centre, Standard Operating Procedure (NEOC SOPs). It has been developed to provide a sound basis for earthquake-oriented emergency programmes and to establish the organizational and operational concepts and procedures designed to minimize the loss of life and property and to expedite the restoration of essential services following a major earthquake.

In preparing this plan, emergency duties and responsibilities have been assigned, to the extent possible, to agencies having the same or similar responsibilities in the NEOC SOPs. Where necessary, agencies should develop specific standing operating procedures (SOPs) explaining what tasks need to be performed and how they will be accomplished in the aftermath of an earthquake.

This incident annex has been developed in consonance with cited authorities that currently exist. Specific details and background from these sources are usually referenced rather than included. Agencies using this annex should, therefore, become familiar with the provisions of the Emergency Services and Disaster Law.

It is well understood that being prepared to recover from the effects of an earthquake requires the constant development and revision of emergency procedures, training of staff and auxiliary personnel, and exercises to test this aspect of the NEOC SOPs. This process and the results of actual emergency response operations will allow refining and distillation of this plan and its associated SOPs and supporting plans.

Contents

Acronyms

ADRA	-	Adventist Development and Relief Agency
CERT	-	Community Emergency Response Teams
ESF	-	Emergency Support Function
EOC	-	Emergency Operations Centre
DIPU	-	Division of Infrastructure and Public Utilities (Tobago)
JIG	-	Joint Information Task Group
LGA	-	Local Government Authority
MEEA	-	Ministry of Energy and Energy Affairs
MOCD	-	Ministry of Community Development
MOFA	-	Ministry of Foreign Affairs
MOH	-	Ministry of Health
MOLG	-	Ministry of Local Government
MPA	-	Ministry of Public Administration
MPSD	-	Ministry of the People and Social Development
MPU	-	Ministry of Public Utilities
MOSD	-	Ministry of Social Development
MOT	-	Ministry of Tourism
MOWI	-	Ministry of Works and Infrastructure
MOT	-	Ministry of Transport
MOU	-	Memorandum of Understand
NEOC	-	National Emergency Operations Centre
ODPM	-	Office for Disaster Preparedness and Management
REACT	-	Radio Emergency Associated Communication Teams
RHA	-	Regional Health Authority
SAR	-	Search and Rescue
SJAB	-	St. John’s Ambulance Brigade
SOP	-	Standard Operating Procedures
TEMA	-	Tobago Emergency Management Agency
THA	-	Tobago House of Assembly

TTARL	-	Trinidad and Tobago Amateur Radio League
TTARS	-	Trinidad and Tobago Amateur Radio Society
TTDF	-	Trinidad and Tobago Defence Force
TTFS	-	Trinidad and Tobago Fire Service
TTPS	-	Trinidad and Tobago Police Service
TTRCS	-	Trinidad and Tobago Red Cross Society

Section 1: National Earthquake Plan Introduction

1.1 Purpose

The purpose of this plan is to minimize the loss of life and damage to property and the environment in Trinidad and Tobago by detailing actions to be taken to mitigate against, prepare for, respond effectively to and recover quickly from, the impacts of major earthquakes and consequent tsunamis.

1.2 Authority

This Plan is promulgated under the general direction of the Minister of National Security. There are, however, several pieces of legislation that have dealt with matters related to disaster management. Chief among these are:

a) The Disaster Measures Act No. 1978 (Under revision)
b) The Municipal Corporations Act No. 21 of 1990
c) The Fire Service Act
d) Environmental Management Act 2000

1.3 Rationale

As difficult as the promotion of hurricane and other hazard countermeasures has proven to be in the Caribbean and elsewhere in the world, the promotion of earthquake countermeasures has proven to be even more so. This is because, in the Caribbean, the occurrence of serious earthquakes (magnitude 6.0 or greater) tends to be infrequent. It therefore appears to be unreasonable to expend scarce resources on countermeasures against such an infrequent event. Thus, earthquake risk management activities tend to be low-priority items on governmental agendas.

Another reason for this difficulty is the fact that, unlike most other more commonly-occurring hazards, earthquakes tends to occur without warning. This not only makes it impossible to take preemptive action, it also tends to promote a feeling of powerlessness.

1.4 Concept of Operations

a) Assumptions

In preparing this plan the following assumptions were made:

i. There is a National Emergency Management Plan
ii. All stakeholders are both aware and capable of performing their assigned roles
iii. All Memoranda of Understanding with key stakeholders required for the execution of the plan have been developed
iv. Efforts have been made, and continue to be made to organize and train communities (however geographically defined) across Trinidad and Tobago to respond appropriately to emergencies

b) **Management of Emergencies**

Regardless of the severity of hazard impacts all emergencies occurring within and requiring a multi—agency response will be managed using the National Emergency Operations Centre (NEOC) and the Incident Command System (ICS).

c) **Activation of the NEOC**

After a serious earthquake has occurred the (National Emergency Operations Centre) NEOC will be activated immediately and manned within an hour to coordinate the activities of all emergency response agencies. The NEOC will indicate the strategies to be adopted to respond to the emergency, establish the priority of activities to be undertaken and coordinate the various actions being undertaken by emergency response organizations. The merits of this approach are that:

(i) It facilitates efficient coordination through the collection of all information on emergency related activities
(ii) It enables the taking of effective action by providing direction and advice to emergency response organizations in a consistent and coordinated manner.
(iii) It clarifies responsibilities for the various countermeasures.

N.B. The NEOC's Standard Operating Procedures (SOP) Outline the approach to partial and full activation.

d) **Suspension of Routine Activities:**

Day-to-day functions of state agencies that do not contribute directly to disaster response and life sustaining operations may be suspended during an emergency sensitization. Similarly, state resources normally required for routine activities may be redirected to accomplish emergency-related tasks. The Disaster Measures Act 1978, and anticipated disaster legislation will authorize the abovementioned.

e) **Non-Discrimination:**

No aspect of emergency relief will be denied to anyone on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program.

f) **Individual Preparedness:**

The existence of this Plan does not absolve citizens of their individual responsibility to be aware of, and prepare for, hazards to which Trinidad and Tobago is subject. All citizens are expected to be aware of developing events and take appropriate steps to

ensure personal safety and protect property. The National Disaster Management Organisation (ODPM) will make every reasonable effort to provide information, via various media, to assist citizens in dealing with an earthquake emergency.

g) **Review and Update**

This Plan will be reviewed annually by key stakeholders in the National Disaster Management Framework, under the leadership of the ODPM. Additional revisions or enhancements deemed necessary, either following an actual earthquake event or as a result of findings of an exercise, may also be made.

h) **Related Documents**

It is anticipated that the following documents will be relevant to the implementation of this plan:

- National Disaster Management Plan (To be updated)
- NEOC Standard Operating Procedures
- National Response Framework
- Comprehensive Disaster Management Policy and Legislation
- Critical Facilities Protection Policy and Plan
- ESF Emergency Response Plans
- Major City Evacuation and Egress Plans
- National Mass Casualty Plan
- National Shelter Plan (To be developed)
- National Disaster Debris Management Plan (To be developed)
- National Relief Plan
- Draft Volunteer policy

Section 2: Characteristics of an Earthquake

2.1 Potential Consequences

Ground Shaking **-** The potential severity of ground shaking and its consequential impact on buildings and life-lines depend on several factors, including:

- The magnitude of the earthquake at epicentre (point of origin) determines the amount of energy released.
- The distance and the type of materials through which an earthquake travels attenuate its seismic waves.

Therefore, the intensity of the same earthquake could differ at two locations that are equidistant from the epicentre. Other factors that contribute to the destructiveness of earthquakes include the nature of the ground on which affected structures are located as well as the duration of the shaking.

Induced Ground Failures **-** Ground shaking could trigger landslides or rock falls, and can also cause liquefaction which, in turn, could result in casualties or damage to structures.

Secondary Hazards **-** Secondary hazards, such as dam failure or fires due to ruptured gas lines, may be caused by collapsed or damaged structures. Additionally, residual landslides can be triggered.

2.2 The Trinidad and Tobago Earthquake Experience

2.2.1 In Trinidad and Tobago an earthquake may be felt as often as once per month. These felt earthquakes represent about 2-6% of all earthquakes in the region, recorded by seismometers.

2.2.2 The largest earthquake on record directly impacting Trinidad and Tobago took place in 1766. There have been eight (8) events of magnitude 6.0 or greater between 1899 and 1952 occurring within 250 km of Trinidad and Tobago. One of these –occurring on 10 January 1910 – was of magnitude 7.2. The earthquakes of 1925 caused significant damage to all the buildings in Port of Spain, most of which were just two storeys tall and constructed of un-reinforced masonry.

2.2.3 Prior to 1982, most of the earthquakes in Trinidad were concentrated in two significant zones west of the island. One zone lies north of the Paria peninsula with events trending northeast-southwest. The other lies in the Gulf of Paria, with events having a northwest-southeast trend. However, in 1982, a swarm of earthquakes (numbering several hundred tremors) occurred of the southwest coast of Tobago. The strongest of these measured 5.26 magnitude on the Richter scale.

2.2.4 Similarly, in 1988, the area east of Trinidad, which up till then had seen only a few low intensity events, experienced a magnitude 6.2 event. This was followed by hundreds of aftershocks spanning a number of years.

2.2.5 There is an inverse relation between the hypo-central distance from populated centres and the damage caused by an earthquake. This was recently demonstrated by the millions of dollars in damages wrought by the two strongest events of 1997 in Tobago; the focal points and epicenters of which were shallow (approx. 28 km and < 5 km respectively) and relatively close (30 km and 15 km respectively) to Scarborough. Table 1 lists some of the large earthquake affecting Trinidad and Tobago since 1766.

Table1.

Date	Intensity	Magnitude	Notes
21 October 1766	-	7.9	San Jose (Capital) destroyed
29 September 1825	VIII	-	
24 February 1918	VIII	-	
04 December 1954	VIII	>6.5	One death; several injured
September 1968	V – VII	5.1	Damages to churches
March 1982	-	5.4	Tobago swarm
March 1983	-	5.8	Several injured at the coast
March1988	-	6.2	
01 January 1996	VI	5.0	One home destroyed; several damaged
02 April 1997	-	5.6	
22 April 1997	-	5.9	Over TT$18m in estimated damage in Tobago
09 July 1997	-	5.7	
04 October 2000	-	5.8	

Source: http://www.nema.gov.tt/resources/downloads/earthquakeriskin trinidadandtobago.pdf.

2.3 Social Considerations

In planning to respond to the impacts of serious earthquakes social considerations should be examined, these include:

i. 'Special' populations such as the aged, children, the physically challenged, and tourists. Persons falling into these categories may have trouble hearing or understanding warnings, instructions or other information. Some may have difficulty in moving quickly, when quick movement is required.

ii. A high 'vehicles-to-persons' ratio, which means that there is a high potential for roads to become congested should people be required to evacuate an area. Consideration must also be given to restricting the use of vehicles completely or, alternatively, on designated routes, to facilitate emergency response.

iii. ‘God is a Trini’ culture of low risk perception which negatively impacts disaster preparedness, mitigation and response. Efforts must be made to sensitize the public on the risk, and the emergency response plans to ensure increase national resilience.

2.4 Critical Facilities Protection

2.4.1 Critical facilities – The primary physical structures, technical facilities and systems which are socially, economically or operationally essential to the functioning of a society or community, both in routine circumstances and in the extreme circumstances of an emergency.

2.4.2 The ODPM’s mandate to protect critical facilities in terms of Earthquake impact mitigation, preparedness, response and recovery would vary by the different Sectors outlined in the Critical Facilities Protection Policy. These sectors would therefore be required to develop specific plans and consider the threat of an Earthquake.

Section 3: Mitigation of the impacts of Earthquakes

3.1 General

3.1.1 Comprehensive earthquake management begins with actions that are necessary to **avoid the hazard** (i.e. removing oneself away from the vulnerable environment), or to **reduce its impact** (by either mitigating the hazard or reducing vulnerability to it). In the lexicon of the ODPM 'mitigation' refers to the "*activities that prevent an emergency, reduce the chance of an emergency happening, or reduce the damaging effects of unavoidable emergencies."* Typically, such mitigation actions fall into two categories: structural and non-structural. Structural measures include physical interventions that modify the disaster risk landscape and include building codes and the retrofitting of infrastructure. Non-structural measures are social interventions for impact reduction and include hazard mapping, land-use planning, zoning of development activities, effective early-warning, public awareness and education, and disaster management planning.

3.2 National-level Mitigation Measures:

Structural measures the State should take to counter the earthquake threat include:

1) Institute and enforce building codes, material standards and workmanship for all structures,
2) Construction and retrofitting of critical facilities and public structures as necessary.

Non-structural measures the State should take to counter the earthquake threat include:

1) Improve Understanding of Earthquake Processes and Impacts
    - Advanced understanding of earthquake phenomena and generation processes
    - Advanced understanding of earthquake effects on the built environment
    - Advanced understanding of the social, behavioural, and economic factors linked to implementing risk reduction and mitigation strategies in the public and private sectors
    - Improve post-earthquake information acquisition and management
    - Earthquake hazard Mapping and regular Vulnerability and Risk assessments.

2) Develop Cost-Effective Measures to Reduce Earthquake Impacts on Individuals, the Built Environment, and Society-at-Large
    - Develop advanced loss estimation and risk assessment tools
    - Utilize existing best practice tools to improve the seismic performance of buildings and other structures e.g. *Techniques for*

the Seismic Rehabilitation of Existing Buildings: Federal Emergency Management Agency (FEMA)

- Utilize existing best practice tools to improve the seismic performance of critical infrastructure

3) Improve the Earthquake Resilience of Communities Nationwide
    - Improve the accuracy, timeliness, and content of earthquake Early Warning Systems. Implement new systems where none exist and are necessary
    - Develop comprehensive earthquake risk scenarios and risk assessments and run simulations and drills
    - Promote the implementation of earthquake-resilient measures in professional practice and in private and public policies
    - Public education and awareness programmes
    - Provide incentives to discourage development in certain hazard-prone areas.(For example, reduced insurance premiums or refund of taxes for construction in non-hazard-prone areas)
    - Inform the public of cost effective mitigation methods for homes, property etc.

4) Adopt and execute appropriate land use plans

5) Zone physical development activities: National Physical Development Plan and Local Area Plans

6) Ensure that all agencies of the national emergency management system are adequately resourced and well-practiced

7) Develop, promote and implement an earthquake awareness plan and initiate a community-based strategy for earthquake disaster risk management

8) Institute a mechanism for interagency collaboration and partnership

9) Ensure that all utilities, critical facilities and support agencies have disaster plans

10) Standardise disaster plans in accordance with NFPA 1600 and any other ratified standard so that business continuity planning can be featured in these plans

11) Create soft loans for rebuilding and retrofitting according to building codes

12) All key stakeholders shall review/revise their plan annually and submit a copy of the version to ODPM

3.3 Personal/Household Mitigation Measures

3.3.1 Notwithstanding the State's responsibilities regarding the earthquake threat, it is the responsibility of every individual to take steps to protect yourself and your family.

Structural measures that can be promoted at the household level include:

1) Adherence to recommended building codes
2) Retrofitting the house as necessary to meet recommended building codes
3) Securing the contents of the house (paying attention to heavy items that can move or topple over during an earthquake)
4) Apply strict monitoring of buildings in accordance with approved designs and building codes (MOWI, MOLG, and MOH).

Non- Structural measures that can be taken at the personal/household level include:

1) Practice risk avoidance and transfer
2) Be aware of the earthquake threat and of vulnerability reduction measures.
3) Have disaster supplies on hand
4) Have a family emergency management plan (including a Communication Plan)
5) Help your community get ready to deal with earthquakes and other hazards
6) Create a CERT (Community emergency response team) for all communities

N.B. More information on personal/household measures that can be taken is available at Annex 2 to this Plan

3.4 Earthquake Mapping

3.4.1 An earthquake hazard map displays earthquake ground motions for various probability levels across the country. To facilitate an effective response to an earthquake, information on evacuation routes, shelters, hospitals, public utilities, etc shall be provided on overlays to earthquake maps. The ODPM in conjunction with the relevant authorities should ensure that credible and accurate Earthquake maps are developed and are displayed in prominent places to educate the general public about evacuation and egress routes, shelters, etc and to advise against development in vulnerable areas.

3.5 Land use Plans and Building Codes

3.5.1 Trinidad & Tobago government through the Ministry of Planning, Economic and Social Restructuring and Gender Affairs, Ministry of Housing and the Environment, and the Ministry of Local Government's Regional Corporations shall pursue the systematic development of urban and rural areas on the basis of a comprehensive disaster management land use plan. The ODPM should ensure that these plans are developed and are in keeping with international best practice for disaster mitigation.

3.5.2 The Government through ODPM shall regulate the identification of vulnerable areas based on a full assessment of the hazards faced and a determination of acceptable levels of risk.

In pursuing national development the ministry responsible for planning through the relevant agency shall carefully consider the design and locating of community lifelines.

3.5.3 In terms of building codes the ODPM will work with the relevant authorities, namely the Ministry of Planning and the Trinidad and Tobago Bureau of Standards and any other relevant technical advisory body on the promotion and sensitization of existing Building Codes (CUBIC, Small Building Code). These organizations should also strive to follow the examples of Developed countries and implement a mandatory building code system.

3.6 Mitigation Efforts in Lifeline Services and Critical Facilities (CF)

3.6.1 In the event of an earthquake, facilities and services deemed "Critical/ lifeline" cannot become non-operational or unavailable as there availability will directly impact Trinidad and Tobago's ability to recover, sustain the lives and livelihood of citizens and maintain an economic footing to meet basic needs and obligations. The Critical Facilities Protection Policy would address the requirements of specific sectors and the ODPM will be required to audit and assess the state of preparedness and response and recovery capabilities of these facilities **(For all hazards, including earthquakes)**.

3.6.2 Owner and Operator responsibility

- The management of all critical facilities shall take steps to ensure the survivability of their respective infrastructure and equipment by adhering to appropriate construction codes, arranging alternate facilities, and having redundant systems and an emergency power supply system.

- All agencies shall allocate an annual budget to provide emergency supplies and ensure existing supplies are sufficient

- All agencies should ensure redundancies in their emergency response systems, centres and equipment and the required resources.

3.7 EXAMPLES of Critical Facility Sectors and requirements for earthquake impact mitigation

N.B*. [To be covered in more detail in the Critical Facilities Protection Programme]*

3.7.1 Water Supply

The water authority (WASA) shall take steps to ensure the survivability of essential infrastructure such as water treatment plants, sewage plants, dams, reservoirs, distribution stations, pumping stations, water mains and the like.

Emergency related organizations (hospitals, fire stations, shelters, etc) shall ensure that they have alternate water supplies by installing tanks, wells, etc. to last at least seven (7) days
WASA shall, from their needs assessment determine their emergency stockpile materials and equipment in order to facilitate a speedy restoration of its service in an emergency.

They shall also ensure robustness and alternative means to ensure continuity and reliability in their communication

3.7.2 Electricity Supply

The electrical power company (T&TEC) shall take steps to ensure the survivability of essential infra- structure such as power –generation plants, transmission system and distribution systems. T&TEC from their needs assessment shall determine their emergency spares, supplies and materials to facilitate a speedy restoration of its service in an emergency. They shall also ensure robustness and alternative means to ensure continuity and reliability in their communication.

As far as possible, power supply systems such as electric lines, transformers, and the like shall be designed and constructed to reduce the impacts of earthquake damage and fires.
T&TEC shall promote redundancy by having a plurality of systems to ensure the supply of power as far as possible in the event of an emergency.

3.7.3 Communications

- All agencies shall establish memorandum of understanding with the Trinidad & Tobago Amateur Radio Society, Radio Emergency Associated Communication Teams (REACT) and Trinidad & Tobago Amateur Radio League. Additionally, existing internal radio units should ensure they constantly test communication channels with emergency first responders and the ODPM.

- Telecommunication companies shall take steps to ensure the survivability of essential infrastructure.

- Telecommunication companies shall promote redundancy by having a plurality of systems (wireless radio networks, satellite phones and the like) to ensure they can provide some means of communication in the event that their primary land lines are cut.

- Telecommunication companies from their needs assessment shall determine their emergency spares, supplies and materials to facilitate a speedy restoration of its service in an emergency.

3.7.4 Health Care Services

The management of all public and private health services by the Ministry of Health and the Regional Health Authorities shall take steps to ensure the survivability of their respective infrastructure, services and equipment by adhering to appropriate construction codes, and having redundant systems and an emergency power supply.
They shall also ensure robustness and alternative means to ensure continuity and reliability in their communication

3.7.5 Mitigation efforts for Transportation Networks

- The MOT shall take steps to ensure the survivability of critical transportation infrastructure such as roads, bridges, airports, seaports and the like. In doing so, cognizance will be taken of the impact of such measures on the national transportation plan and other related plans.

- The MOT shall also increase their bulk fuel storage to build capacity for national distribution and availability in times of emergency.

- The MOT shall utilize its experiences of past emergencies to inform their needs assessment to establish strategically-located stockpiles of materials and equipment to facilitate a speedy restoration of its transportation network in an emergency.

- They shall also ensure robustness and alternative means to ensure continuity and reliability in their communication

Main Roads

- The MOT shall designate some main roads as emergency transportation routes and indicate their priority with respect to route-clearing activities.
- The MOT shall institute measures to protect main routes, emergency evacuation and egress routes from hindrances such as landslides, sign boards, etc.
- The MOT shall encourage the making of agreements with private construction companies regarding the provision of personnel and equipment needed for road-clearing, heavy-lift and other works following the occurrence of an earthquake.

Seaports and Airports

- The MOT shall pay particular attention to the survivability of airports and seaports in view of their vital importance to the receipt of supplies, evacuation, and other emergency support functions.

- The MOT and municipal authorities shall identify sites to be used as heliports in emergency situations and shall create (MOA) memorandum of agreement with site-owners to ensure the availability of these sites in an emergency and ensure these sites meet the requirement of the civil aviation authority. Considerations should be taken for international aid/ relief drop off sites

N.B. All the Sectors to be examined under the Critical Facilities Protection Programme (Oil and Gas; Essential Gov't Services; Food Supply; Finance; ICT; Public Health; Public Safety; Transportation; Water; Electricity)

3.8 Mitigation Efforts in the Handling of Hazardous Materials

3.8.1 The Ministry of Energy and Energy Affairs (MEEA) shall examine the safety of facilities that explore, produce handle, store, transport and process petroleum, high-pressure gas (e.g. LPG) and toxic chemicals

3.8.2 Responsibilities of the TTFS, OSH Agency, MEEA and other relevant regulatory bodies:

i. Ensure that the administrators of such facilities prepare emergency plans and conduct simulation exercises to ensure a response in the event of an earthquake.

ii. Collaborate with facility administrators to ensure that a system is in place to prevent the outbreak of fires and the leakage of toxic or otherwise hazardous materials.

iii. Ensure that such facilities prepare a manual for the handling of their differing materials in case of an emergency.

iv. Ensure that all companies inform communities of any hazard posed by the operations of any plant or factory located within or near to such communities.

3.9 Mitigation Efforts against Liquefaction and Landslides

3.9.1 Liquefaction

3.9.1.1 An attempt should be made to thoroughly assess the risk to Liquefaction occurring and identify the high risk areas. Liquefaction occurs when the wave motion of an earthquake induces the water contained within soils into actions so that the soil as a body behaves as a liquid. As a result of liquefaction foundations lose their load-bearing capacity and cause structures to collapse or undergo damage, while underground infrastructure and installation become buoyant and broken.

3.9.1.2 To reduce the effects of liquefaction soil should be improved by

a) Replacing the soil
b) Tightening the soil
c) Reducing the level of underground water

3.9.1.3 Where structural mitigation is chosen, international best practices and standards should be used to ensure the highest safety standard. Alternatively, if risk avoidance is chosen, a thorough assessment and subsequent zonation of high risk areas should ensure that limited development and construction occurs in these locations.

3.9.2 Landslides

3.9.2.1 The *MOWI* shall periodically map the location of steep and unstable slopes, noting their location, land use, degree of danger, expected level of damage, and the like. Mitigation should also be carried out where possible.
Based on this list, the *MOWI* shall notify the general public of the areas having dangerous slopes.

N.B. *The ODPM has developed landslide susceptibility models that can be used to help guide the determination of high risk (landslide areas) and the implementation of mitigation or risk avoidance.*

3.9.2.2 The Ministry of Planning, Economic and Social Restructuring and Gender Affairs and the Ministry of Local Government shall regulate development in these areas.

Section 4: Preparedness

4.1 Preparedness Goals

To ensure the execution of an effective response to an earthquake emergency, the following goals should be achieved:

Actions	Responsible Agency
➢ Establishing emergency response and management information systems in advance so that response and recovery activities can be carried out quickly and efficiently	ODPM, ESFs
➢ Preparing a manual that provides details of the evacuation plan of the major municipal jurisdictions	ODPM, MOLG, Relevant Agency
➢ Stockpiling of food, water, medical supplies, tents, body bags, etc.	MOLG, MPSD
➢ Educating both emergency response staff and the general public about the earthquake hazard.	ODPM
➢ Organizing and training communities to respond appropriately to all types of hazard emergencies	ODPM & MOLG
➢ Hardening earthquake monitoring and warning systems and promoting research on these systems	UWI Seismic, ODPM

4.1.1 Emergency Mobilization & Communication

All emergency response organizations (both state and non-state) shall institute systems for the rapid assembly of their personnel. In doing so, they will pay particular attention to Early Warnings broadcasted by the relevant authorities (UWI Seismic and ODPM) and trigger the necessary internal mechanisms, plans and procedures. Preparation should involve tabletops, drills, after action reviews, testing employee knowledge etc.

4.2 Preparing for Emergency Response

4.2.1 All national and local government bodies , other public institutions and emergency related organizations shall take steps to ensure the survivability of their respective facilities and equipment so that they will be in a position to discharge their responsibilities in the aftermath of a serious earthquake.

4.2.2 For instance instituting an independent power supply as well as an appropriate system for stockpiling food, water and other supplies and equipment for their own use in the event that they have to mobilize.

4.2.3 The ODPM should collaborate with first responders and ESFs to develop clear, core functions for each agency and ensure that each agency develops capacity to carry out these functions.

4.3 Mutual Aid Agreements

4.3.1 After a catastrophic earthquake has occurred, mechanisms for mutual support and cooperation among emergency response organizations are vital to the achievement of an efficient coordinated response. National, local government bodies, private sectors and other institutions that have emergency response functions shall therefore take steps beforehand to strengthen cooperation and mutual support through *Memoranda of Understanding* and other similar instruments. These mechanisms for cooperation and support care are identified in the Comprehensive Disaster Management Policy and the NEOC SOPs.

4.3.2 A centralized agency ODPM/CTB should be designated to negotiate MOUs to suppliers of goods and services in times of emergency. Copies of these MOUs should be sent to the relevant agencies for implementation. Additionally, under emergency situations, the responsibility of resources should be redirected from one agency to another to affect timely response.

4.3.3 Legislation should include the emergency procurement procedures that are different from the non-emergency situations

N.B. At present the Disaster Measures Act 1978 outlines the emergency procurement procedures that can be delegated by the President after the declaration of a disaster. However, the revision of this legislation will transfer this authority to the ODPM/ Ministry of National Security. This will ensure that resources can be transferred where and when necessary.

4.4 Information Management

4.4.1 Information Gathering. To ensure prompt and reliable communications among national and local government bodies, other public institutions and emergency response agencies, the ODPM shall fully utilize existing systems for the gathering and exchange of information among such bodies.

4.4.2 In doing so, the Government shall, through the ODPM, also ensure that such systems can operate on a 24-hour basis.

4.4.3 The ODPM, local government bodies, other public institutions and emergency related organization should strive to put in place systems for collecting disaster-related information from diverse sources, including the media, citizens, and private sector organizations and companies, among others.

4.5 Communications

4.5.1 In anticipation of a situation where damage from a serious earthquake has severely impacted their core functions, the ODPM, other national and local government bodies and other emergency related organizations shall strive to acquire multiple channels of communications, including land lines, cellular phones, satellite telephones, wireless radio networks, and the Internet, among others.

4.5.2 Key staff of Government ministries, agencies, public institutions and other emergency related organizations shall be trained in the operation of all aspects of their respective emergency communications system.

4.5.3 Key staff of national and local government bodies and other emergency related organisations shall be exercised regularly to ensure they achieve the expected level of competency.

4.6 Public Information

4.6.1 –When an earthquake event has happened, the ODPM, with assistance from MOLG, MOPSD, MOCD and TEMA shall inform affected communities of possible secondary hazards (e.g. tsunamis, landslides, etc), as well as the level of damage, any recommendation of an evacuation, traffic restrictions, and so on. In cases where the NEOC is fully activated, the Information Task Group (ITG) shall disseminate inform. The details of emergency communication are found in the National Crisis Communication Plan

4.6.2. To ensure that disaster-related information gets to the community quickly, relevant ministries and agencies (ODPM, MOLG, MOPSD, MOCD, TEMA, TTRC, TTFS, TTPS) shall utilize multiple channels of communication (e.g. traditional methods or by installing radios or cabled loud speakers in each community). The MOLG Disaster Management Units are responsible for maintaining updated lists of “mike men,” key community representatives, etc. In addition, the ODPM or ITG, if activated, shall provide such information to the general public via the national media (newspapers, radio stations, and television and cable networks).

4.6.3 In the absence of established communication, contracted or volunteer amateur radio operators should be positioned at shelters shall to ensure that shelter management and shelterees receive necessary information.

4.7 Protection of Data

4.7.1 The ODPM and the Ministry of Public Administration shall ensure that all government ministries and agencies implement a Business Continuity System for protecting and mitigating against, preparing for and responding to all potential hazards, including earthquakes. [Ongoing]

N.B. Protection of the data of Critical Facilities will be addressed in the knowledge management framework of the Critical Facilities Protection Programme

4.8 Search and Rescue & Emergency Medical Treatment

4.8.1 *Search & Rescue (SAR)*

4.8.1.1 It is important that the Trinidad and Tobago Fire Service ensure that SAR activities begin immediately following the earthquake due to the fact that the survival rate of trapped persons decreases incrementally with time.

4.8.1.2 To prevent injury to rescuers, or further injury to already-injured persons, SAR should be undertaken only by, or under the supervision of, trained personnel – T&T Fire Services and subsequently GMRTT, Red Cross etc.

4.8.1.3 Because the first 72 hours are the most important all available resources should be pooled and directed to the SAR effort.

4.8.2. Emergency Medical Treatment (EMT)

4.8.2.1 Both State and private medical facilities, as well as NGOs that provide emergency medical treatment (e.g. Global Medical Response Trinidad and Tobago (GMRTT) Red Cross, St. John's Ambulance Brigade, Foundation for the Enhancement and Enrichment of Life (FEEL)), They shall also ensure that all their staff responsible for providing emergency medical treatment are properly trained, especially in triage procedures

4.8.2.2 These agencies should also stockpile practical emergency relief medicines and equipment in anticipation of a large number of casualties.

4.8.2.3 The Ministry of Health will also strengthen and update its Mass Casualty plan to address large numbers of injured persons, overcrowding and limited resources issues.

4.8.2.4 The ODPM shall guide the preparation of plans to ensure communication and cooperation between all medical institutions, government and private, and between institutions.

1) Ministry of Health – Regional Health Authorities
2) T&T Fire Services
3) Heavy Equipment Agencies, private and government
4) Helicopter Services, NHSL and BRIKO
5) Ambulance Service, GMRTT
6) Amateur Radio Clubs, (TTARL, TTARS, REACT)

4.9 *Fire Fighting*

4.9.1 When an earthquake occurs, there is an increased possibility of the outbreak and spread of multiple fires. It is therefore very important that communities are trained to prevent the spread of fires. Community Emergency Response Teams

4.9.2 The Trinidad and Tobago Fire Service shall establish a system to ensure the rapid assembly of fire-fighting personnel. It shall also establish a system for the discovery and reporting of fires.

4.10 *Shelters*

4.10.1 The MOLG and the MPSD shall designate and ensure the management of public and private shelters. Privately-owned buildings (e.g. schools, churches, halls, etc.) may be designated as shelters after obtaining approval of the owners of such buildings.

4.10.2 Designated hazard-specific shelters shall be listed and inspected regularly to ensure their fitness for use as shelters.

4.10.3 There shall be close collaboration with MOLG, MPSD and other agencies, particularly NGOs that are involved in shelter management (e.g. ADRA, FBOs, and private sector orgs).

4.10.4 The MOLG, MPSD and ODPM shall ensure that, additional water tanks, temporary toilets, lighting, communication and other equipment, food, medical supplies, bedding and other supplies can be procured in order to establish and maintain appropriate living conditions in shelters, in accordance with the National Shelter Plan/ Policy

4.10.5 The ODPM shall prepare a National Shelter Plan/ Policy

4.10.6 The MOLG and other shelter management agencies shall take steps to make residents fully aware of the location of the nearest shelter and the route to it. MOLG shall also take steps to educate the public about the operations and management of shelters.

4.10.7 A comprehensive list of all shelters shall be maintained and made available to all disaster response agencies.

4.10.8 Routes to shelters should also be maintained to ensure the safe and efficient movement of displaced persons to and from the facility.

4.11 *Evacuation*

4.11.1 The ODPM may advise the relevant Municipal Corporation to prepare Evacuation & Egress plans for major cities and industrial sites/ neighboring communities.

4.11.2 The MOLG, in collaboration with the ODPM and other relevant agencies (e.g. TTFS, TTPS) shall prepare municipal evacuation plans and shall conduct evacuation drills based on these plans.

4.11.3 The MOT in collaboration with the relevant agencies shall erect signboards indicating evacuation routes and muster points so that residents can seek refuge quickly and safely after an earthquake event.

4.11.4 Evacuation routes shall be communicated to the national population through relevant media.

4.11.5 The MOLG, MOCD and MPSD shall collaborate with local residents to make adequate arrangements for the evacuation of special populations such as the elderly, the sick or bed-bound, children, persons with disabilities, and foreigners. Each Municipal Corporation shall develop and maintain a list of known members of special population groups.

4.12 *Stockpiling*

4.12.1 Based on the assumption that in the event of an earthquake there will be many victims who would have lost their homes, the MOLG, in collaboration with MPSD shall arrange a system for the stockpiling, distribution and further procurement of food and other daily necessities.

4.12.2 In this regard, the special needs of babies, the elderly, and sick or injured persons shall be taken into account.

4.12.3 Stockpiles of food and other supplies and equipment shall be held in strategic locations and shall be checked regularly. The recommended minimum quantity of food to be stored is three meals per day per person, for a minimum of three days.

4.12.4 The MOLG shall ensure the availability of temporary toilets in case it becomes impossible to use a flush lavatory.

4.12.5 The ODPM through national campaigns, and MOLG through municipal region campaigns, shall encourage citizens to store a three-day supply of food and other daily necessities for their own use in case relief supplies cannot be distributed right after the occurrence of an earthquake or other emergency.

4.13 *Community Preparedness*

4.13.1 There may be a time lag between the occurrence of a major hazard event and the response from a state or non-state agency. It may therefore be left to individuals and groups in affected communities to initiate an immediate response. It is therefore essential that communities are educated about the hazards they face and organized and trained to

respond to them. The Community Emergency Response Teams (CERTs) model, utilized in Tobago, shall be adopted for implementation in Trinidad.

4.13.1 The responsibility of education, organization and training of communities to respond to hazard emergencies does not rest solely with the state. Both non-state agencies and individuals can play an invaluable role in ensuring that communities are prepared to respond to emergencies.

4.14 Continuity of Government (CoG)

4.14.1 The Government shall consider its capability to survive the impact of a major earthquake and make plans for the continuity of operations. In this regard, the Government shall have a Continuity of Government Plan that indicates the areas of economic and social activity to which priority of attention will be paid in the aftermath of a major earthquake. This can also be achieved through individual Government bodies developing Business Continuity Management (BCM) Systems internally. (ODPM and Ministry of Public Administration BCM initiative)

N.B. Critical 'Essential Government services' shall also be protected under the Critical Facilities Protection Programme/ Policy (ODPM)

Section 5: Response

5.1 General

The earthquake response phase commences immediately after the impact of an earthquake. The **Seismic Research Centre (SRC)** of the University of the West Indies (UWI), located in St Augustine, Trinidad and Tobago, is responsible for notifying the ODPM of earthquake occurrences and provides information about high magnitude earthquakes that have already occurred. Should there be a potential threat of tsunami **The Meteorological Office of Trinidad and Tobago (MET)** would then notify the CEO of the ODPM by fax followed by a telephone call. The SRC has a series of remote sensing stations throughout the eastern Caribbean that enables its staff to determine the severity and epicentre of an earthquake. Reports of all earth tremors are routinely forwarded from the SRC to all client states on a regular basis. In the event of an earth tremor that results in damage, First Response agencies will be responsible for notifying the NDO.

Once it has been determined that a **Level II** or **Level III** emergency exists, the ODPM will activate the **National Emergency Operations Centre (NEOC)** and be guided by the NEOC's Standard Operating Procedures.

Factors which will influence initiation are:

i. an earthquake has seriously impacted a community
ii. a severe earthquake affects more than one municipality and
iii. requires a multi-agency response; or
iv. as determined by the ODPM CEO or NEOC Director

5.2 Individual Immediate Action.

5.2.1 When the earthquake shaking starts, your first action should be to **DROP, COVER, and HOLD**; preferably under a table, desk, or something sturdy. If this is not an option, move away from windows toward the interior of the room. Objects in and outside of buildings or homes, such as light fixtures, lamps, computers, bookshelves, signs, chimneys, plus many others, will also be moving and pose the initial immediate risk. They could be falling, toppling, sliding, rolling or even flying.

5.2.2 Often the most damage, injury and loss of life during an earthquake are the result of the movement of these "non structural" components. Therefore, it is important to move quickly to protect yourself.

5.2.3 When the shaking stops and you begin to move about, do:

- Check your surroundings for other dangers (e.g. fires, escaping gas, live electricity wires, etc)

- Check for other persons who might have been injured**. Assist them if you know what to do (and can do so safely and without injury to yourself or the injured person)**
- Contact any one of the following agencies and inform them of who you are, who else are with you, what injuries have been sustained, what immediate additional dangers you face, what kind of damage the structure suffered, etc.)

    a) Disaster Management Unit: Regional Corporations (MOLG)

    b) Trinidad and Tobago Fire Service

    c) Trinidad and Tobago Police Service

    d) ODPM

- Move to a safer location. Evacuate the facilities if staying represents a risk. Be wary of potential aftershocks and continued shaking.

5.3 Action by the State: Three phases of Response

5.3.1 Phase 1 – Initial Stage

5.3.1.1 Activation of NEOC (Level 2-3): The ODPM and all other public agencies having emergency response-related responsibilities shall nominate personnel responsible for emergency response in advance. Nominated personnel/organizations should be mandated to maintain contact with the ODPM/NEOC, especially if they would be out of the country, stating when and for how long, they would not be available.

5.3.1.2 Such nominated persons shall immediately answer the call to mobilize whenever such a call is issued or when they deem it necessary and make their way to the NEOC, arriving within an hour of the call out. Alternate arrangements should be made for the support of the immediate families of the Emergency Support Function members involved in the response to the disaster.

5.3.1.3 Once activated, the NEOC, ESFs and other EOCs shall operate in accordance with established SOPs of the NEOC and the HOC.

5.3.2 Phase 2 – Response Stage

5.3.2.1 This phase typically begins within 24 hours after the event and should last ideally for about seven days maximum (depending on the severity of the earthquake impacts). The main activities in this stage are geared towards the saving of lives and the prevention of damage to property and the environment

Consequently, key actions include:

a. Prompt gathering and transmission of information on the details of the earthquake by the UWI SRC to the CEO of the ODPM and the securing of a reliable means of communication (Fax, Telephone, Email, Satellite phone and HF Amateur Radio) and the initial assessment of the damage caused (Undertaken by the MOLG DMU and other relevant ESFs e.g. TTFS, TTPS, TTDF, MOWI, MOT etc.
b. The ODPM in consultation with the Office of the President and Office of the Prime Minister should determine the need to declare a State of Emergency or a Disaster Area, as appropriate.
c. Preventing confusion resulting from rumors or false reports, encouraging appropriate decision-making and action-taking by transmitting correct information to both victims and the rest of the population,
d. Searching for and rescuing disaster victims and providing prompt medical attention to casualties,
e. Clearance of debris from roads, airports and ports. These activities should include debris management considerations.
f. Establishment of procedures to deal with media enquires [Addressed in the National Crisis Communication Plan]
g. Secondary hazard response activities such as fire-fighting; law enforcement by the TTPS and TTDF in instances of looting; civil unrest and general criminal activities which may arise; guiding victims to safe shelters (evacuation); securing means of emergency transportation by controlling vehicular and pedestrian traffic to support rescue; medical assistance and fire-fighting activities and to issue emergency supplies to victims, and any other action deemed necessary
h. Ascertaining the risk of secondary natural hazards such as flooding, landslides and tsunamis, and where necessary, evacuating residents and implementing countermeasures against these potential hazards.
i. Sending Situation Reports to CDEMA and other partner organizations, as appropriate.
j. Establishing a Humanitarian Operations Centre (HOC) for the systematic and efficient management of regional and international aid that may be received immediately following a catastrophic earthquake
k. Critical Facility Response plans will also be activated to ensure that these facilities and services are not compromised. [To be outlined in Critical Facility Protection Programme]

5.3.3 Phase 3 – Return to Normalcy Stage

5.3.3.1 This phase ideally starts approximately 72 hours after the earthquake event and can last from a few weeks to a few months (depending on the scale of the earthquake event). Activities in this phase are aimed at stabilising peoples' daily lives and economic activities. Key activities undertaken during this stage include:

a. procuring and distributing food, water, medicines and other daily

b. supplies necessary for maintaining an acceptable level of comfort for disaster victims,
c. sending DANA reports to CDEMA and other partner organizations, as appropriate,
d. establishing law and order through crime prevention and suppression activities, and implementing measures to ensure the reliability of supply and the stability of commodity prices,restoration of lifelines and utilities,
e. acceptance of material and monetary donations from abroad,
f. preventing confusion caused by rumors and false reports,
g. transmitting correct information to disaster victims and other members of the public; thereby encouraging appropriate judgment and decision-making based on accurate information,
h. assessing the state of health of disaster victims, health and hygiene activities such as waste disposal, quarantine activities, and the recovery and handling of dead bodies,

i. Reopening of roads, ports and airports.
j. Temporary repair of damaged buildings.
k. Consider possible isolation of some areas, and the resupply options available to assist them.
l. Re-establishment of communications systems.

m. Establishment of procedures to inform/obtain information about family-related matters,
n. Posting of up-to-date information on the NEOC's WEB EOC interface or the ODPM's public incident notification page. Additionally, CDEMA may post information on the event on their website.

N.B. Aftershocks may continue to affect the community. National and local plans should take into account the effects these might have on response operations.

5.4 Emergency Support Functions

In the aftermath of any emergency, there is usually the need for one or more of several Emergency Support Functions (ERFs) to be performed. The following matrix lists these ERFs and indicates the phases when they are likely to be required.

RESPONSIBILITY MATRIX –EARTHQUAKE RESPONSE

SER	Emergency Response Actions	Primary Agency	Alternate Agency	Response Phase
1	Search and Rescue	TTFS	TTDF	Phase 2
2	Emergency Medical Treatment	MOH/GHRSTT	TTRCS	Phase 2
3	Requesting External Assistance	MOFA	ODPM	Phase 2-3
4	Shelter Operations	MOLG/ MPSD	MCD/TTRCS/ADRA	Phase 2-3
5	Firefighting	TTFS	TTEMAS	Phase 2
6	Communications	TSTT	TTARS/REACT	Phase 2 -3
7	Damage Assessment and Needs Analysis	MOLG	TTRCS/ADRA	Phase 2

8	Hazardous Materials response	TTFS	TTEMAS/MEEA	Phase 2
9	Inspection/Clearing of Roads and Bridges	MOT	TTDF ENG. BAT	Phase 2 -3
10	Airport and Seaport Operations	MOT	TTDF/RSS	Phase 2 -3
11	Inspection of Dams, Reservoirs, etc	MOWI/WASA	TTDF/RSS	Phase 2 -3
12	Inspection of Silos, Tank Farms,	MOWI/MEEA	TTDF/TTEMAS/RSS	Phase 2
13	Public Information	Office of PM	ODPM	Phase 2-3
14	Restoration of Public Utilities	WASA/TTEC/MPU	TTDF	Phase 2 -3
15	Environmental Protection/Pollution Control	EMA	TTFS/TTEMAS	Phase 2-3
16	Law Enforcement and Security	TTPS	TTDF	Phase 2-3
17	Handling of Dead Bodies	MOH/RHA	TTDF	Phase 2-3
18	Overseas Relief Coordination	HOC/MOFA	ODPM	Phase2- 3
19	Relief Supplies Distribution	HOC/ MOFA	ODPM/MOLG	Phase 2-3
20	Continuation of Government	MPA	MNS	Phase 2-3
21	Inspection and Demolition of Unsafe Buildings	TTFS/ MOWI	TTDF/RSS	Phase 3
22	Welfare of Visitors/Tourists	MOFA	MOT/MOSD	Phase 3

N.B. The abovementioned responsibility is extrapolated from the corresponding list of responsibilities for all hazards response identified in the NEOC SOPs.

Section 6: RECOVERY

6.1. General

6.1.1 Actions in the Recovery phase are of two types:-

i. Short Term (rehabilitative): These are actions that seek to restore vital services to the community while providing for basic needs.
ii. Long Term (reconstructive): These are actions taken to restore the affected community to an improved status.

6.1.2 Activities in the Recovery phase shall have the aim of creating the fundamental conditions necessary for the revitalization of the affected area, based on the following policies:

i. Quick decisions on the general direction of the recovery effort and the systematic implementation of projects and programmes,
ii. Rapid restoration of community lifelines, transportation systems and other public facilities and infrastructure that contribute to the stability of daily living conditions.
iii. Support for the rebuilding of individual lives of earthquake victims through the provision of capital aid, housing and employment,

6.2. Recovery Plans

6.2.1 The recovery of a disaster-stricken area is often a complex undertaking, requiring large-scale projects that involve numerous organizations. In order to implement such projects as quickly as possible, recovery plans shall be prepared and systematic recovery pursued through the coordination of the various projects being undertaken by the relevant organizations.

The Cabinet and the T.H.A. shall decide whether to aim for a quick restoration of the original condition of the affected area or to aim for a systematic recovery that seeks to address some medium-to-long term issues, such as reducing the level of vulnerability to hazards, depending on the extent of the damage, the characteristics of the area, the wishes of the management of the public facilities, and the like.

The ODPM/TEMA shall implement measures, in keeping with a National Mitigation Policy/ Plan, to mitigate the effects of future earthquakes by undertaking regional redevelopment projects that promote vulnerability reduction and environment protection (for example, the demolition or relocation of squatter settlements and other buildings that violate building codes).

6.2.2 Recovery Planning

When making recovery plans the CABINET/T.H.A. through designated agencies shall take into account the following:

1) Designing basic infrastructure such as main roads, parks, schools, hospitals, etc in such a manner so that they can, in the event of an earthquake emergency, become evacuation routes, shelters, emergency relief centers, and the like.
2) Ensuring that community lifeline services and other public buildings and facilities are both earthquake and fire resistant.
3) Ensure that Business Continuity plans address rapid recovery of key government and non-governmental organizations.
4) Critical Facilities receive the necessary resources to ensure functionality

6.2.3 Support for Recovery of Economic Activity

In giving support to the recovery of economic activity in the aftermath of a major earthquake the Cabinet/T.H.A. shall be guided by the Government Continuity Plans/ BCM plans.

6.2.3.1 The Government of Trinidad and Tobago/ T.H.A and the ODPM/TEMA will keep earthquake victims informed of all assistance measures aimed at helping them to recover. Further, the Government/T.H.A. will, wherever possible, set up 'One-stop Shops' where earthquake victims will be able to access as many of the available support services as possible.

6.2.3.2 Support for Individual Recovery

The MPSD, MOH, MOF, MOFP & T.H.A will support, as far as possible, individual recovery by implementing such measures as:

1) the giving of grants,
2) the extending of deadlines for the payment of taxes or the deferring, reducing or exempting of such payments
3) the loaning of low-interest or no-interest loans
4) the providing of temporary or permanent housing
5) the providing of jobs
6) the applying of various welfare measures

6.2.3.3 Support for the National Economy

In addition to assisting individuals to recover, the MOF MOFP and T.H.A. will also facilitate the recovery of the national economy by:

1) offering low interest loans for operating capital and equipment restoration capital to earthquake-affected private enterprises,
2) loaning of low-interest capital to affected agricultural, forestry or fisheries enterprises for the restoration of facilities and for business stabilization,
3) improving structures for the growth of industries in keeping with economic trends

6.2.4 Support for the National Transportation System

6.2.4.1 To facilitate the emergency response, MOT, MOLG and DIPU (THA) shall mobilize as quickly as possible to assess the extent of damage to roads under their jurisdiction and to effect the necessary road clearing and repair works.

6.2.4.2 Roads
Priority shall be placed on the securing of emergency routes. The MNS, MOT, MOLG and DIPU (THA) shall provide to the NEOC/TEOC situation reports regarding the results of their assessments as well as their intended restoration activities.

6.2.4.3 Airports & Sea Ports.
To facilitate the rapid recovery, MOT AND DIPU (T.H.A.) responsible for any aspect of airports and sea ports management shall mobilize as quickly as possible to assess the extent of damage to airports and sea ports. Such bodies shall make efforts to remove obstacles from port areas and navigation channels.

6.2.5 Recovery of Public Utilities

6.2.5.1 To facilitate the speedy resumption of the normal living conditions and economic activities within communities, WASA, TSTT, T&TEC AND TATT shall urgently assess the extent of damage to facilities under their jurisdiction and take measures to effect necessary repairs. Priority shall be given to restoring the supply of electricity and water to, as well as the communication systems of, emergency facilities such as hospitals, Fire stations, Police stations, Defence Force installations, shelters, and the like.

6.2.5.2 Water
The priority of damage assessment and repair action to water facilities by WASA shall be as follows:

1) Water filtering plants, intake weirs or towers, aqueducts
2) Water distribution facilities, pumps and main supply lines
3) Water supply branch lines, Standpipes and Water tanks
4) Water Lines that are causing flooding on roads, etc

In the event of damage to branch lines, priority of restoration of supply will be as follows:

1) Emergency facilities such as Hospitals, PRIMARY HEALTH CARE FACILITIES, NURSING HOMES, HOMES FOR THE AGED, FACILITIES FOR THE DIFFERENTLY ABLED Fire stations, Police stations, Defence Force installations, shelters, IDENTIFIED CRITICAL INFRASTRUCTURE (SEE ANNEX) and the like
2) Other emergency facilities NEOC, TEOC, REOCs, AIR AND SEA PORTS and the like.

6.2.5.3 Electricity
When electrical power supply systems have been damaged, the priority of action shall be the prevention of secondary hazards (e.g. fires, electrocutions) followed by the restoration of the electricity supply. Once power is restored, it is still necessary to maintain a watch for the outbreak of fires

6.2.5.4 Telephones
Telecommunication companies shall give priority to restoring the communications systems of emergency response institutions such as the NEOC/TEOC, police, fire service, hospitals, (SEE 7.2.5.2.). Telecommunication companies shall institute systems that allow them to control the volume of calls made on communications systems in emergency situations.

6.3 Damage Assessment

6.3.1
The MOLG, MSPD, ODPM/TEMA shall assess, and place a cost on, the damage done to infrastructure and all sectors of the economy. A cost will also be placed on all the resources applied to the emergency recovery effort (personnel, fuel, food, medical supplies, etc). In this regard assistance can be sought from regional agencies such as ECLAC or AECS.
The ODPM/TEMA shall assess the degree of danger posed by damaged buildings and make an estimate of the funds needed for repairs.

6.3.2. Inspection of Buildings
THE MOWI, DIPU (THA), TTFS, MOLG, APETT, AND TCPD shall collect information on the type of damage, valuation and method employed, and insurance cover for all affected areas.

6.3.3. Causes of Failure
THE MPD, MOWI, DIPU (THA), TTFS, MOLG, APETT, and TCPD shall seek to establish the causes of failure of public buildings and shall incorporate the lessons learned in the design and construction of their replacement.

6.4 Public Information

6.4.1.
The OPM/THA shall, via Information task group keep the national community informed of all recovery activities. In providing information to the general public the government shall give due consideration to the special needs of persons with disabilities and foreigners.
The ITG/ID SHALL monitor the information carried by the media and shall take action to correct any inaccurate reports.

ANNEX A –Mercalli Scale

Modified Mercalli Scale

Intensity	Effects	PGA*(gals)
I	Not felt. Marginal and long-period effects of large earthquakes.	less than 1
II	Felt by persons at rest, on upper floors or favourably placed.	1 - 2
III	Felt Indoors. Hanging objects swing. Vibration like passing of a light truck. Duration estimated. May not be recognized as an earthquake.	2 - 5
IV	Hanging objects swing. Vibration like passing of heavy trucks: or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Car alarms activated. Windows, dishes, doors rattle. Glasses clink, crockery clashes. In the upper range of IV wooden walls and frames creak.	5 - 10
V	Felt Outdoors. Direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close open. Shutters, pictures move, pendulum clocks stop, start, change rate.	10-25
VIa	Felt by all: many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books etc. off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked. Small church and school bells ring. Trees, bushes shaken (visibly or heard to rustle).	25-50
VII	Difficult to stand. Noticed by car drivers. Hanging objects quiver. Furniture broken. Damage to masonry D including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones tiles cornices unbraced parapets, and architectural ornaments. Some cracks in masonry C. Waves on ponds; water turned turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete culverts damaged.	50-100
VIII	Steering of motor cars affected. Damage to masonry C: partial collapse. Some damage to masonry B, none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and steep slopes.	100-250
IX	General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. General damage to foundations. Frame structures shifted off foundations if not bolted down. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks on ground. Sand boils, earthquake fountains, and sand craters.	250-500
X	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes etc. Sand shifted horizontally on beaches and flat land. Rails	500-1000

ANNEX B – Earthquake Management Tips

(Adapted from FEMA Guidelines)

What to Do Before an Earthquake

Six Ways to Plan Ahead

1. **Check for Hazards in the Home**
    - Fasten shelves securely to walls.
    - Place large or heavy objects on lower shelves.
    - Store breakable items such as bottled foods, glass, and china in low, closed cabinets with latches.
    - Hang heavy items such as pictures and mirrors away from beds, couches, and anywhere people sit.
    - Brace heavy overhead light fixtures.
    - Repair defective electrical wiring and leaky gas connections. These are potential fire risks.
    - Secure a water heater by strapping it to the wall and bolting it to the floor.
    - Repair any deep cracks in ceilings or foundations. Get expert advice if there are signs of structural defects.
    - Store weed killers, pesticides, and flammable products securely in closed cabinets with latches and on bottom shelves.

2. **Identify Safe Places Indoors and Outdoors**
    - Under sturdy furniture such as a heavy desk or table.
    - Against an inside wall.
    - Away from where glass could shatter around windows, mirrors, pictures, or where heavy bookcases or other heavy furniture could fall over.
    - In the open, away from buildings, trees, and telephone and electrical lines, overpasses, or elevated roadways.

3. **Educate Yourself and Family Members**
    - Contact your local emergency management office or the Trinidad and Tobago Red Cross chapter for more information on earthquakes.
    - Teach children how and when to call 9-1-1, the police or fire department, and which radio station to tune to for emergency information.
    - Teach all family members how and when to turn off gas, electricity, and water.

4. **Have Disaster Supplies on Hand**
    - Flashlight and extra batteries.
    - Portable battery-operated radio and extra batteries.
    - First aid kit and manual.
    - Emergency food and water (3 days' supply).
    - Nonelectric can opener.
    - Essential medicines.

- Cash and credit cards.
- Sturdy shoes and extra clothing.

5. **Develop an Emergency Communication Plan**
    - In case family members are separated from one another during an earthquake (a real possibility during the day when adults are at work and children are at school); develop a plan for reuniting after the disaster.
    - Ask an out-of-area relative or friend to serve as the "family contact." After a disaster, it's often easier to call long distance. Make sure everyone in the family knows the name, address, and phone number of the contact person.

6. **Help Your Community Get Ready**
    - Publish a special section in your local newspaper/on the community notice board with emergency information on earthquakes. Localize the information by printing the phone numbers of local emergency services offices, the Antigua and Barbuda Red Cross, and hospitals.
    - Conduct a short series on locating hazards in the home.
    - Work with local emergency services and Red Cross officials to prepare special reports for people with mobility impairments on what to do during an earthquake.
    - Provide tips on conducting earthquake drills in the home.
    - Interview representatives of the gas, electric, and water companies about shutting off utilities.
    - Work together in your community to apply your knowledge to building codes, retrofitting programs, hazard hunts, and neighborhood and family emergency plans.

What to Do During an Earthquake

Stay as safe as possible during an earthquake. Be aware that some earthquakes are actually foreshocks and a larger earthquake might occur. Minimize your movements to a few steps to a nearby safe place and stay indoors until the shaking has stopped and you are sure exiting is safe.

If indoors

- **DROP** to the ground; take **COVER** by getting under a sturdy table or other piece of furniture; and **HOLD ON** until the shaking stops. If there isn't a table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.
- Stay away from glass, windows, outside doors and walls, and anything that could fall, such as lighting fixtures or furniture.
- Stay in bed if you are there when the earthquake strikes. Hold on and protect your head with a pillow, unless you are under a heavy light fixture that could fall. In that case, move to the nearest safe place.

- Use a doorway for shelter only if it is in close proximity to you and if you know it is a strongly supported, load-bearing doorway.
- Stay inside until shaking stops and it is safe to go outside. Research has shown that most injuries occur when people inside buildings attempt to move to a different location inside the building or try to leave.
- Be aware that the electricity may go out or the sprinkler systems or fire alarms may turn on.
- DO NOT use the elevators.

If outdoors

- Stay there.
- Move away from buildings, streetlights, and utility wires.
- Once in the open, stay there until the shaking stops. The greatest danger exists directly outside buildings, at exits, and alongside exterior walls. Most earthquake-related casualties result from collapsing walls, flying glass, and falling objects.

If in a moving vehicle

- Stop as quickly as safety permits and stay in the vehicle. Avoid stopping near or under buildings, trees, overpasses, and utility wires.
- Proceed cautiously once the earthquake has stopped. Avoid roads, bridges, or ramps that might have been damaged by the earthquake.

If trapped under debris

- Do not light a match.
- Do not move about or kick up dust.
- Cover your mouth with a handkerchief or clothing.
- Tap on a pipe or wall so rescuers can locate you. Use a whistle if one is available. Shout only as a last resort. Shouting can cause you to inhale dangerous amounts of dust.

What to Do After an Earthquake

- **Expect aftershocks.** These secondary shockwaves are usually less violent than the main quake but can be strong enough to do additional damage to weakened structures and can occur in the first hours, days, weeks, or even months after the quake.

- **Listen to a battery-operated radio or television.** Listen for the latest emergency information.

- **Use the telephone only for emergency calls.**

- **Open cabinets cautiously.** Beware of objects that can fall off shelves.

- **Stay away from damaged areas.** Stay away unless your assistance has been specifically requested by police, fire, or relief organizations. Return home only when authorities say it is safe.

- **Be aware of possible tsunamis if you live in coastal areas.** These are also known as seismic sea waves (mistakenly called "tidal waves"). When local authorities issue a tsunami warning, assume that a series of dangerous waves is on the way. Stay away from the beach.

- **Help injured or trapped persons.** Remember to help your neighbors who may require special assistance such as infants, the elderly, and people with disabilities. Give first aid where appropriate. Do not move seriously injured persons unless they are in immediate danger of further injury. Call for help.

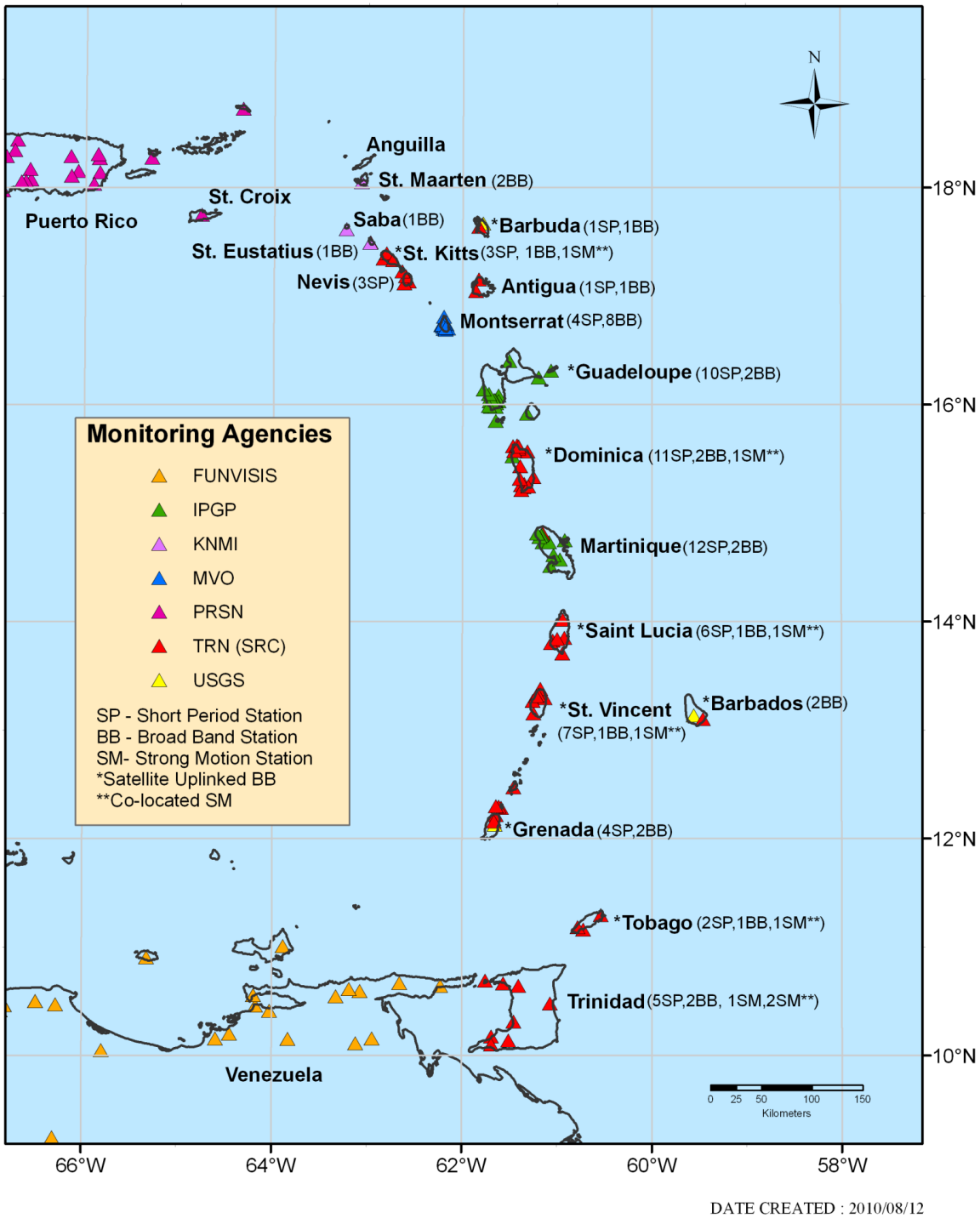
- **Clean up spilled medicines, bleaches, gasoline or other flammable liquids immediately.** Leave the area if you smell gas or fumes from other chemicals.

- **Inspect utilities.**
    - **Check for gas leaks.** If you smell gas or hear blowing or hissing noise, open a window and quickly leave the building. Turn off the gas at the outside main valve if you can and call the gas company from a neighbor's home. If you turn off the gas for any reason, it must be turned back on by a professional.

    - **Look for electrical system damage.** If you see sparks or broken or frayed wires, or if you smell hot insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice.

    - **Check for sewage and water lines damage.** If you suspect sewage lines are damaged, avoid using the toilets and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water by melting ice cubes.

ANNEX C – Map of Seismic Stations in the Eastern Caribbean



ANNEX D –International Contact

Organization	Address	Contact Person	Contact Information
CDEMA	Building #1, Manor Lodge Complex, Lodge Hil,l St. Michael	Executive Director, Mr. Jeremy Collymore	1-(246)-425-0386 Jeremy.Collymore@cdema.org
Grenada National Disaster Management Agency (NaDMA) [Focal Point]	Fort Frederick Mt. Wheldale St. Georges Grenada	Mr. Benedict Peters National Disaster Coordinator National Disaster Management Agency (NaDMA)	Tel: (473) 440-0838 Fax: (473) 440-6674 E-mail: nadma@caribsurf.com http://www.spiceisle.com/nero
Guyana Civil Defense Commission	Camp Ayangauna Annex, Thomas Lands, Georgetown Guyana	Colonel Chabillal Ramsarup Director General	Tel: (592) 226 1114 Tel: (592) 226 1117 Fax: (592) 226 1027 E-mail: info@cdc.gy Website: http://www.cdc.gy chubbyr@hotmail.com
ODPM	4A, Orange Grove Road, Trincity	Dr. Stephen Ramroopm Chief Executive Officer	1-(868)-640-1285 or 800-ODPM (6376) sramroop@mns.gov.tt
Suriname National Coordination Center For Disaster Relief (NCCR), Ministry of Defense[Focal Point]	Kwattaweg #29, Paramaribo	**Lieutenant-Colonel JERRY SLIJNGARD,** Coordinator	**Tel:** (597) 52 0840 / 42 6416 Office **Fax:** (597) 47 4320 **E-mail:** jerryslijngard@gmail.com
UWI Seismic Research Centre	St. Augustine	**Director, Dr. Richard Robertson**	Tel: (868) 662-4659 / Fax: (868) 663-9293 **uwiseismic@uwiseismic.com**