3. Response

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 the notification of earthquake occurrences. The SRC has a series of remote sensing stations throughout the eastern Caribbean that enables its staff to advise on 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 NDO will initiate the National Earthquake Response Plan. Factors which will influence initiation are:

- an earthquake has seriously impacted a community;
- a severe earthquake affects more than one municipality and requires a multi-agency response; or as determined by the NDO.

Individual Immediate Action

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. However, be aware that when the shaking starts you probably won't be the only thing moving. Objects in and outside the building or home, such as light fixtures, lamps, computers, bookshelves, signs, chimneys, plus many others, will also be moving. They could be falling, toppling, sliding, rolling or even flying. Not only is there the potential for these objects to be damaged, but their movement can cause damage, injury or even loss of life.

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

When the shaking stops and you begin to move about:

1. Check your surroundings for other dangers (e.g. fires, escaping gas, live electricity wires, etc)
2. 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)
3. Contact any one of these agencies →
   - Fire Service
   - Police Service
   - Municipal Corp. office
   - ODPM
4. 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.)
5. Move to a safer location.

Action by the State

Phase 1 – Initial Stage

Activation of NEOC: The ODPM and all other public agencies having emergency response-related responsibilities shall nominate personnel responsible for emergency response in advance; these persons shall immediately answer the call to mobilize whenever such a call is issued or when they deem it necessary.

Once activated, the NEOC and other EOCs are to operate in accordance with established SOPs.

Phase 2 – Response Stage

This phase typically begins about 24 hours after the event and should last for about seven days maximum (depending on the scale of the earthquake event). The main activities in this stage are geared towards saving lives and preventing damage to property and the environment. Key actions include:

a) Prompt gathering and transmission of information on the details of the earthquake, the securing of a reliable means of communication and the initial assessment of the damage caused.

b) Determining the need to declare a State of Emergency or a "Disaster Area", as appropriate,

c) Preventing confusion resulting from rumours 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) Disaster prevention activities such as fire-fighting and tsunami counter-measures in order to prevent secondary or chain reaction emergencies

f) Guiding victims to safe shelters

g) Securing means of emergency transportation by controlling vehicular and pedestrian traffic to support smooth rescue, medical assistance and fire-fighting activities and to issue emergency supplies to victims, and

h) Ascertaining the risk of secondary hazards such as flooding, landslides etc., and, where necessary, evacuating residents and implementing countermeasures against these potential hazards

Phase 3 – Return to Normalcy Stage

This phase typically 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 include:

a) Procuring and distributing food, water, medicines and other daily supplies necessary for maintaining an acceptable level of comfort for victims

b) 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

c) Accepting material and monetary donations from abroad

d) Preventing confusion caused by rumours and false reports

e) Transmitting correct information to disaster victims and other members of the public; thereby encouraging appropriate judgment and decision-making based on accurate information

f) 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

g) Clearing debris from roads, airports and ports. These activities should include debris management considerations

h) Reopening roads, ports and airports.

i) Making temporary repairs to damaged buildings.

j) Considering possible isolation of areas, and resupply options available to assist them

k) Re-establishing communications systems

l) Establishing procedures to deal with media enquires

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

Government of the Republic of Trinidad and Tobago
Ministry of National Security

Office of Disaster Preparedness and Management

SNAPSHOT: Earthquake

July 25, 2014

National Earthquake Response Plan

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 hurricanes and the time and space factors involved dictate that the local jurisdiction must be prepared to cope with the initial impact of a hurricane 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.

This Plan is a Hazard Specific Annex to the National Emergency Operations Plan (ODPMEOP). 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.

Emergency duties and responsibilities have been assigned, to the extent possible, to agencies having the same or similar responsibilities in the ODPMEOP, Basic Plan. Where necessary, agencies should develop specific standing operating procedures (SOPs) explaining what tasks need to be performed and how they will be accomplished in an emergency situation.

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 ODPMEOP. This process and the results of actual emergency response operations will allow refining and distillation of this incident annex to the ODPMEOP and its associated SOPs and supporting plans so that we are as well prepared as possible to cope with earthquake effects.

Purpose: To minimize the loss of life and damage to property and the environment in Trinidad and Tobago by detailing actions to be taken to prepare for, respond effectively to and recover quickly from, the impacts of major earthquakes and tsunamis.

Assumptions

1. There is a National Emergency Management Plan
2. All stakeholders are both aware and capable of performing their assigned roles
3. All Memoranda of Understanding with key stakeholders required for the execution of the Plan would have been put in place
4. 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

These policy statements govern the operation of this plan:

a) *Management of Emergencies:* Regardless of their particular level, all emergencies occurring within and requiring a multi-agency response will be managed using the Incident Command System (ICS).

b) *Activation of the NEOC:* When a serious earthquake occurs the NEOC will be activated as soon as possible 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. This approach:

   1) Facilitates efficient coordination through the collection of all information on emergency related activities
   2) Enables taking of effective action by providing direction and advice to emergency response organizations in a coordinated manner
   3) Clarifies responsibilities for the various countermeasures

c) *Suspension of Routine Activities:* Day-to-day functions of state agencies that do not contribute directly to disaster relief operations may be suspended for the duration of any emergency; state resources may be redirected to accomplish emergency-related tasks.

d) *Non-Discrimination:* No aspect of emergency relief will be denied to anyone on the basis of political affiliation, race, physical or other disability, religion, sex, marital status, age, sexual orientation or nationality.

e) *Individual Preparedness:* The existence of this Plan does not absolve citizens of their 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 ODPM will make every reasonable effort to provide information, via various media, to assist citizens in dealing with an earthquake emergency.

f) *Review and Update:* This Plan will be reviewed annually by agencies in the National Disaster Management System, under the leadership of the ODPM; additional revisions or enhancements deemed necessary

g) *Related Documents:* These Plans will be relevant to the smooth implementation of this Plan: →
   - National Disaster Mgmt Plan
   - National Mass Casualty Plan
   - National Shelter Plan
   - National Debris Mgmt Plan

1. Environmental and Social Conditions

The Caribbean is an area of considerable tectonic complexity and almost every sort of tectonic activity can be observed within relatively short distances. Western Caribbean islands such as Hispaniola, Puerto Rico and the U.S. Virgin Islands sit on top of small crustal blocks that characterize the ever-shifting boundary between the massive North American and Caribbean tectonic plates. Each year, the Eastern Caribbean experiences about 1200 earthquakes greater than magnitude 2.0. It is also estimated that the region will experience at least one magnitude 6 earthquake every 3 – 5 years.

In the Caribbean, as in other parts of the world, social conditions are also changing. The 'aged' population (persons 65 years and older) is increasing. So, too, is the number of persons who own vehicles. For many English-speaking Caribbean countries tourism is the mainstay of their economies while many of their visitors will not have a good command of the English language. Increases in population density, poor land use practices and the absence of effective building codes for dwelling houses and other small buildings have exponentially increased the potential this rapid-onset hazard has to impart destruction. These environmental and social factors underscore the need to give greater priority to the enhancement of earthquake preparedness and response.

Characteristics of an Earthquake

Ground Shaking: The potential severity of ground shaking and its consequential impact on buildings and life-lines depend on several factors. The magnitude of the earthquake at epicentre (point of origin) determines the amount of energy released. Both 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. The nature of the ground on which affected structures are located as well as the duration of the shaking are other contributing factors to the destructiveness of an earthquake event.

Induced Ground Failures - Ground shaking could trigger landslides or rock falls, and could 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.

Trinidad and Tobago Earthquake Experience: 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.

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. The one 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.

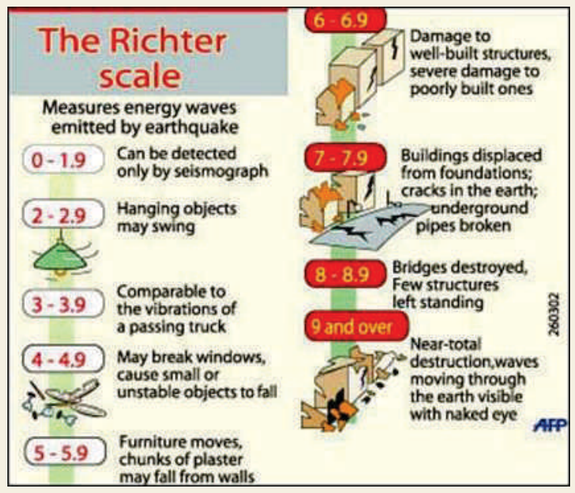
Prior to 1982, most of the earthquakes in Trinidad were concentrated in two significant zones west of the island. One zone lies north of the Paria peninsula with events trending northeast-southwest. The other lies in the Gulf of Paria, with events having a northwest-southeast trend. However, in 1982,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

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.

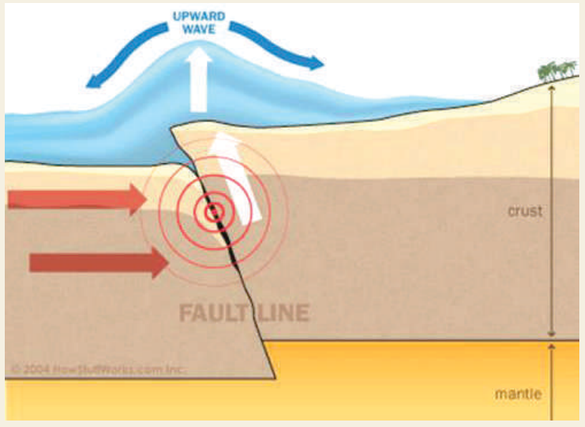
There is an inverse relation between the hypo-central distance from populated centres and the damage caused by an earthquake. This was recently demonstrated by the millions of dollars in damages wrought by the two strongest events of 1997 in Tobago; the focal points and epicenters of which were shallow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

Date	Magnitude	Intensity	Notes
21 Oct 1766	-	7.9	San Jose (Capital) destroyed
29 Sep 1825	VIII	-	
24 Feb 1918	VIII	-	
04 Dec 1954	VIII	>6.5	One death; several injured
Sep 1968	V-VII	5.1	Damages to churches
Mar 1982	-	5.4	Tobago swarm
Mar 1983	-	5.8	Several injured at the coast
Mar 1988	-	6.2	
01 Jan 1996	VI	5.0	1 home destroyed; several damaged
02 Apr 1997	-	5.6	
22 Apr 1997	-	5.9	Over TT$18m in est. damage in Tobago
09 Jul 1997	-	5.7	
04 Oct 2000	-	5.8	

Social Considerations: In planning to respond to the impacts of serious earthquakes, particular attention must be paid to '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 will have difficulty in moving quickly, when quick movement is required. A high 'vehicles-to-persons' ratio means that there is every likelihood that roads will become congested should people be required to evacuate an area. In addition to the means by which information is passed (radio, television, cable network, siren, public address systems, etc), consideration should be given to the use of symbols or pictures in communicating earthquake-related information. Consideration must also be given to restricting the use of vehicles completely or, alternatively, on designated routes, to facilitate response.



How Tsunamis Work



2. Concept of Operations

It is recognized that the occurrence of certain hazards often takes place with little or no warning. In such circumstances, or when the duration of the emergency is estimated to be relatively short, initial management of the emergency will be done by First Responder Agencies on site or as close to the site as possible.

For Level II and Level III earthquake emergencies, the management of response operations will take place at the NEOC, located at 3 Orange Grove Rd, Trincity. The ODPM CEO (or Deputy, if absent) will initiate the National Earthquake Response Plan as necessary.

Response Phases

In the immediate aftermath of a serious earthquake there are often many activities that need to be undertaken in a relatively short time. To ensure scarce resources are used in the most effective and efficient manner the Government must indicate the importance placed on, and the priority level of, each of these activities. To ensure that a management structure is put in place to determine the priority and importance of these necessary activities, the following phases are recommended.

Phase	Emergency Response Activities
1 Initial Stage	Activities to focus on establishing an organized response; begins immediately following the occurrence of the earthquake and continues until the NEOC is fully activated and is capable of controlling all emergency response activities. The duration of this period should be as short as possible. Main activities include: a) Mobilising personnel and resources to fully establish the NEOC b) Response agencies activating their respective EOCs and instituting systems to carry out response activities in a comprehensive and efficient manner c) Establishing channels of support through collaboration with other organizations within and outside of the country.
2 Response Stage	Activities to focus on saving lives and protection of property and environment against secondary hazards. The length of this period typically extends from 24 hours after the event to about 7 days maximum (depending on the scale of the earthquake event)
3 Return to Normalcy	Activities to focus on stabilizing peoples' daily lives and economic activities. This phase typically starts approximately three days after the earthquake event and can last from a few weeks to a few months (depending on the scale of the earthquake event)

Preparedness

To ensure the implementation of a prompt and smooth response:

a) Establish emergency response and mgmt information systems in advance so that response and recovery activities can be carried out quickly and smoothly.
b) Prepare an Evacuation Plan for the major municipal jurisdictions
c) Stockpile food, water, medical supplies, tents, body bags, etc.
d) Educate response staff and general public about the earthquake hazard
e) Organise/train communities to respond appropriately to all types of emergencies
f) Harden earthquake monitoring systems; promote research on these systems

a) Emergency Response Systems

Mobilisation & 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 issues such as the means by which personnel will assemble and the securing of means of communications.

Core Emergency Response Functions: Central 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. They shall also consider instituting an appropriate system for stockpiling food, water and other supplies and equipment for their own use in the event that they have to mobilize.

b) Information Management: To ensure prompt and reliable communications among national and local government bodies, other public institutions and emergency response agencies, the ODPM shall institute systems for gathering/exchanging information among these bodies. ODPM is to ensure that such systems can operate, if needed, on a 24-hour basis over an extended period.

The ODPM, local government bodies, other public institutions and emergency response agencies 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.

c) Communications: 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 organisations shall strive to acquire multiple channels of communications, including land lines, cellular phones, satellite telephones, wireless radio networks, and the Internet, among others. All staff are to be trained in the operation of all aspects of the emergency communications system. All 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.

d) Public Information: When an earthquake event has happened, the ODPM and local government bodies shall inform affected communities of possible secondary hazards (e.g. tsunamis, landslides, etc). They should also provide information on the level of damage, any recommendation of an evacuation, traffic restrictions, and so on. To ensure that disaster-related information gets to the community quickly, national and local government bodies shall install radios or cabled loud speakers in each community. In addition, the Government shall provide such information to the general public via the national media (newspapers, radio stations, and television and cable networks). All shelters shall be outfitted with radio or cable communication systems to ensure that shelterees receive necessary information.

e) Protection of Data: It is vitally important that basic information such as emergency facilities lists, citizen's registers, structural diagrams of important facilities, hazard maps, etc, are stored in earthquake-resistant structures. It is also critical that a copy of all this data is stored in another place that is similarly earthquake-resistant.

f) Search, Rescue and Emergency Medical Treatment: Studies of large-scale earthquakes have shown that the survival ratio of persons trapped under debris falls off rapidly to 10-20% after the event. It is therefore very important that the ODPM and local government bodies ensure that SAR activities begin immediately following the earthquake.

Because the first 72 hours are the most important all available resources should be pooled and directed to the SAR effort. Periods of silence should be observed frequently during SAR operations to listen for sounds of survivors.

g) Community Preparedness: There will always be a time lag between the occurrence of a major hazard event and the response from a state or non-state agency. It will therefore always 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 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.

h) Mutual Aid Agreements: In earthquake emergencies, mechanisms for mutual support and cooperation among emergency response organizations are vital to the achievement of an efficient response. The ODPM, other central and local government bodies, other public institutions and emergency response agencies shall therefore take steps to strengthen cooperation and mutual support through Memoranda of Understanding and other similar instruments.