Cruz Roja Nicaragüense

SISTEMA NACIONAL PARA LA PREVENCION MITIGACIÓN Y ATENCIÓN DE DESASTRES
SINAPRED

Humanitarian Aid and Civil Protection

Earthquakes

SERIES #1
TOGETHER PROMOTIONG SAFER NEIGHBORHOODS

Toolbox on earthquakes for community work in urban contexts

Credits
Nicaraguan Red Cross

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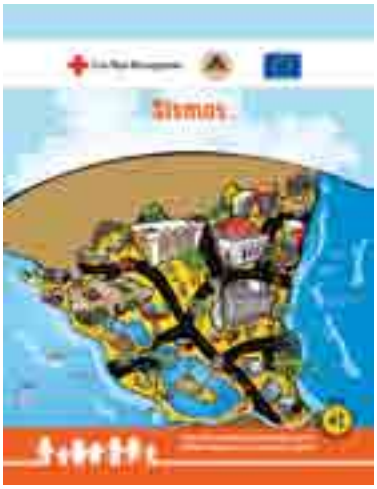
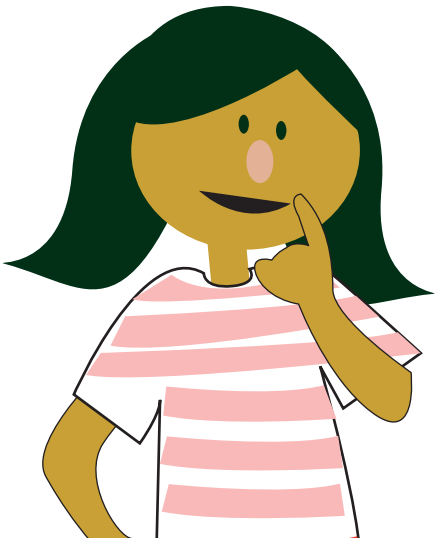




Earthquakes and tremors are part of the Earth's dynamics and our country is susceptible to their recurrence. In Managua, earthquakes have occurred that remain etched in our memory, such as the earthquakes of 1931, 1968 and 1972. These phenomena can occur in Managua and/or other cities in Nicaragua's Pacific region, and although they cannot be predicted, it is important to live with this threat.

The series 'Together promoting safer neighbourhoods' is presented, which consists of four booklets on seismic risk, developed within the framework of the 'Strengthening capacities for preparedness and response to earthquakes in urban areas of Managua's district IV' (DIPECHO VII), implemented by the Nicaraguan Red Cross and funded by the Directorate-General for Humanitarian Aid and Civil Protection (ECHO) and the consortium of Spanish Red Cross, Netherlands Red Cross and Italian Red Cross.

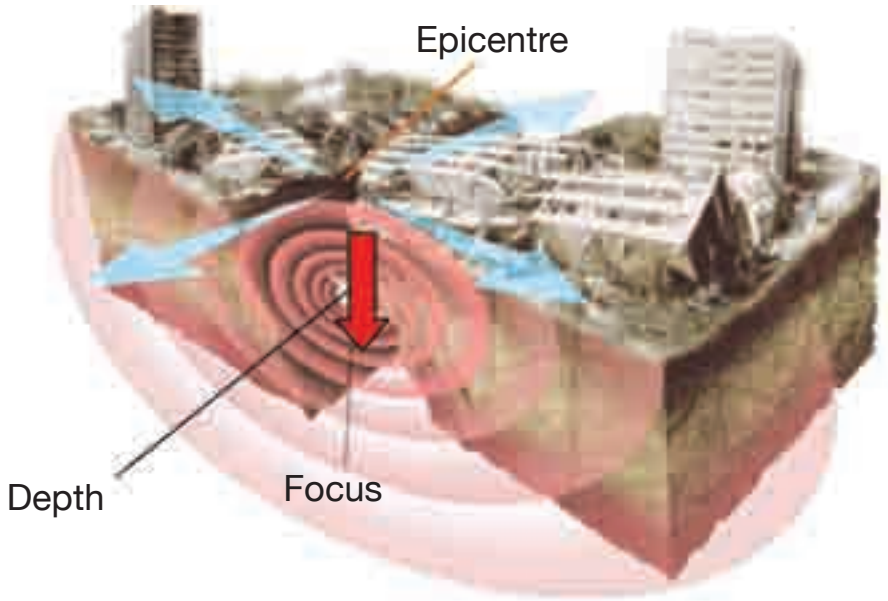
The series 'Together promoting safer neighbourhoods' is the result of the efforts of professionals from various institutions that form part of the National System for Disaster Prevention, Mitigation and Management (Spanish acronym 'SINAPRED'), which has contributed their knowledge and experience with earthquakes during the DIPECHO VII project. These institutions include (but are not limited to): INETER, SE-SINAPRED, MTI, Civil Defence, Mayoralty of Nicaragua, UNI, CRN, MINED, MINSA, and the CRREC of the IFRC.

The brochures are intended for district and municipal authorities, and Neighbourhood Committees for the Prevention, Mitigation and Attention to Disasters (Spanish acronym 'COBAPRED'), as well as permanent staff and volunteers of the Nicaraguan Red Cross and members of other organizations that work on disaster risk reduction and the community in general.

The brochure 'Earthquakes' is a tool that allows the population to strengthen their knowledge about tremors and earthquakes so that they can implement preventative and preparedness measures to reduce the risk of being affected by these events that cause such great loss around the world. We invite you to learn more about earthquakes and to promote the circulation of this booklet amongst your family, neighbours and neighbourhood.

1. What are tremors or earthquakes?

An earthquake is a vibratory motion that originates inside the Earth, releasing energy that propagates in all directions in the form of waves. This can cause damage, depending on the size and the proximity to the site of origin.



Source: http://www.gratisblog.com/zao8/i137999-epicentro_del_terremoto.htm

Other important concepts to understand about earthquakes are:

Epicentre: The point on the Earth's surface that is directly above the point where an earthquake originates.

Hypocentre or focus: The point beneath the Earth's surface where the earthquake originates.

Depth: The distance between the focus and the epicentre. If between 0.0 and 60 kilometres, it is a shallow earthquake; if between 60 and 300 kilometres, it is an intermediate earthquake; and if greater than 300 kilometres, it is a deep earthquake. In Nicaragua, only shallow and intermediate earthquakes occur.

2. What are the internal dynamics of the Earth?

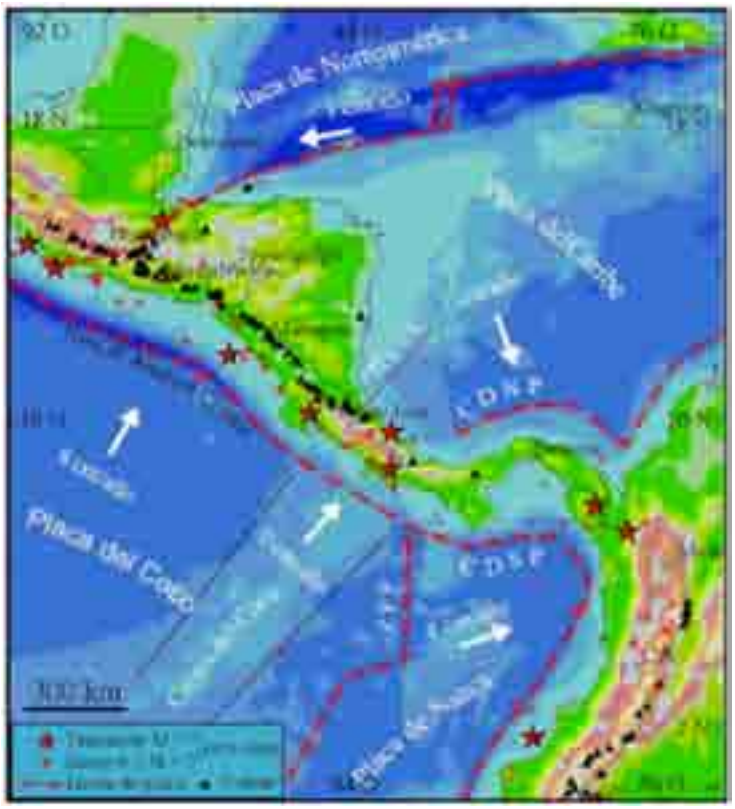
The earth's crust is fractured. Some studies refer to the layer where the continents are found as being divided into parts, called tectonic plates. This is similar to viewing the planet's surface as a jig-saw puzzle.

The edges of these plates collide along the Pacific side of the American continent.

The collision of plates causes the formation of subduction zones (a sinking process) and trenches. The consequence of this phenomenon is major earthquakes and significant volcanic activity.

Nicaragua is located in a subduction zone, due to the collision of the Cocos (oceanic plate) and Caribbean (continental plate) plates.

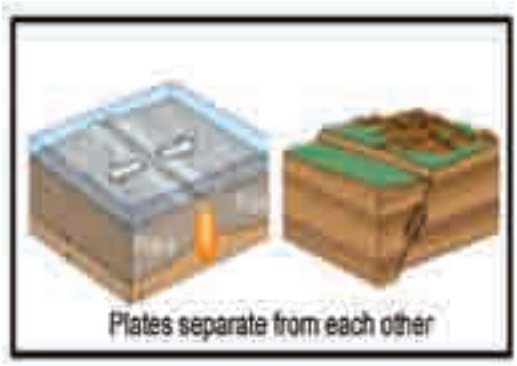
The tectonic plates Cocos and Caribbean collide in the contact zone along the Pacific coast of Central America.

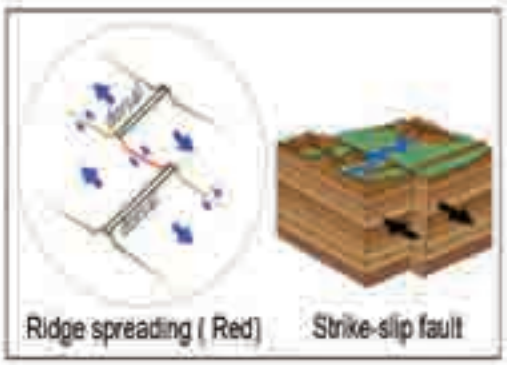


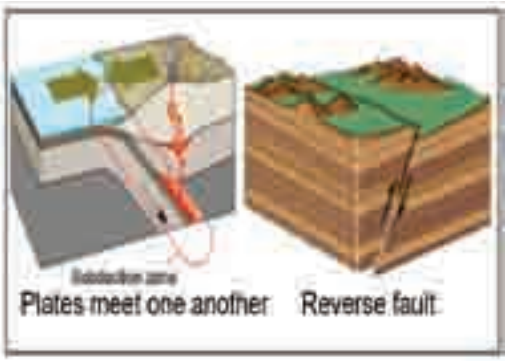
3. What is a fault?

A fault is a crack that divides two blocks of the Earth's crust. These blocks can move relative to one another, and this movement can cause earthquakes.

There are three basic types of faults: normal, strike-slip and reverse.







The areas where this type of tectonic movement takes places are known as geological faults. The Tiscapa fault is an example in Nicaragua.

4. How are earthquakes classified according to their origin?

Managua has suffered two large earthquakes (1931 and 1972). Considering the number of faults that exist, there is a risk that another earthquake will take place and affect the cities along Nicaragua's Pacific coast. The large amount of faulting can be observed on a map of Managua's geological faults.

Due to its geographic location, Nicaragua is considered a high risk seismic zone because of its proximity to the collision zone of the Cocos and Caribbean plates, where a large amount of energy accumulates.

Furthermore, Nicaragua possesses an active volcanic chain, as well as local faults across the country

Tectonic earthquake: Originates due to plate interaction, causing them to collide against each other. Another type is local faulting, which occurs in the upper layers of the Earth's crust. Both typically occur in zones where energy accumulation results in adjustments beneath and on the surface of the Earth.

Volcanic earthquake: Originates due to the rise of magna within volcanoes. Generally, they are small or low in magnitude, and are limited to the volcanic structure.

Earthquake swarm: In some regions, a series of tremors takes place that are not associated with a larger earthquake.

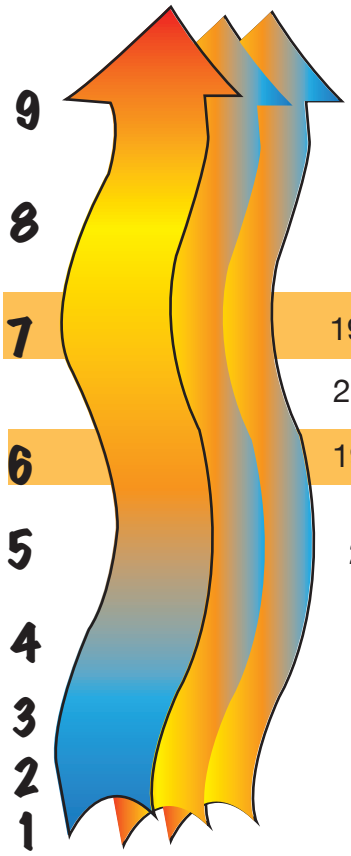
Volcano-tectonic earthquake: Occurs due to local faulting associated with a volcano.

Induced (or artificial) earthquakes: Open-air quarry and mine detonations, amongst others.

5. How are earthquakes measured?

When an earthquake occurs, there are two types of information. One is objective, which is the measurement of the motions of the ground, such as seismic waves, using a seismograph or seismometer. The other is subjective, which is how people perceive and describe the event.

Richter magnitude scale



Some important earthquakes

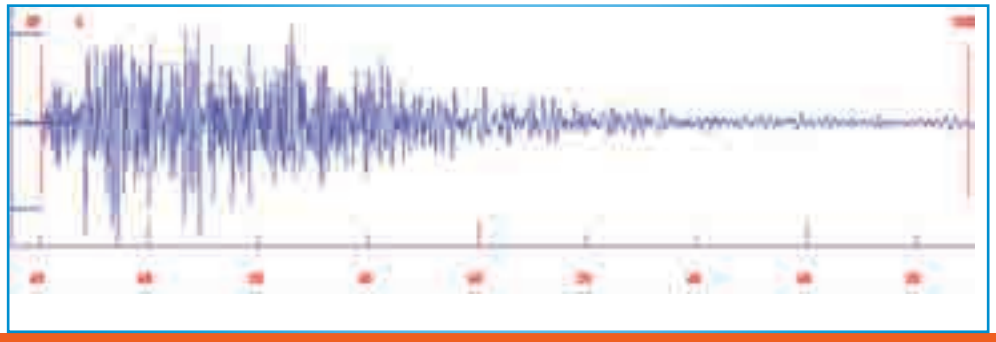
Year	Location	Richter
1992	Pacific Ocean	7.2
2004	Pacific Ocean	6.9
1972	Managua	6.2
2000	Apoyo Lagoon	5.4

Richter magnitude scale, with data from major earthquakes occurred in the country

The Richter magnitude scale measures the energy released during an earthquake, named in honour of the American seismologist Charles F. Richter.

Magnitude: It is a measure of the amount of energy released from the earthquake's hypocentre in the form of waves. It is registered directly by seismographs.

There are various ways to measure the magnitude of an earthquake: (a) the duration of the earthquake on record; (b) the amplitude of the ground motion caused by the earthquake in different parts of the seismogram.

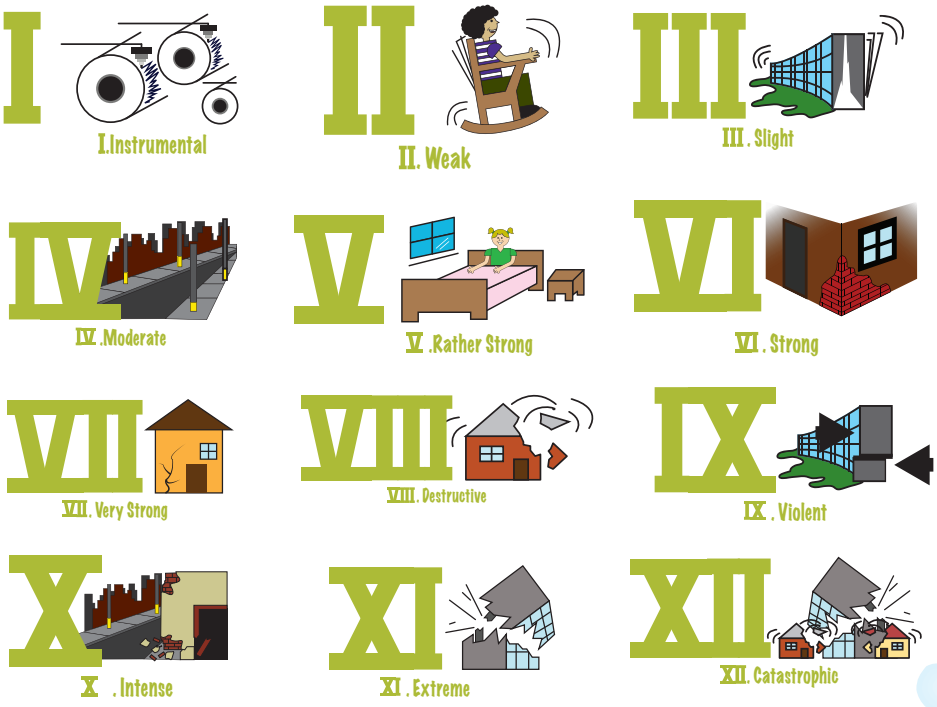


Duration: Measured from the earthquake's first movement to the moment the soil returns to its pre-quake state.

Amplitude: The largest amplitude measured on the seismic record.

Depending on the site of the seismogram where the amplitude is measured, the magnitude is named: Richter magnitude, local magnitude and superficial magnitude, amongst others.

Intensity: The Modified Mercalli Intensity scale (MMI) is used to measure the effects and damage caused to various structures in specific areas. The MMI quantifies the effects of an earthquake on a scale of twelve degrees, from I (not felt) to XII (total destruction). The scale was developed by the Italian physicist Giuseppe Mercalli.



The exhibition hall of the National Museum of Chinese History in Beijing is home to a restored model of the first seismograph in history, the Houfeng DidongYi, invented to measure seismic movement and wind. It was invented by Zhang Heng (78-140 A.D.).

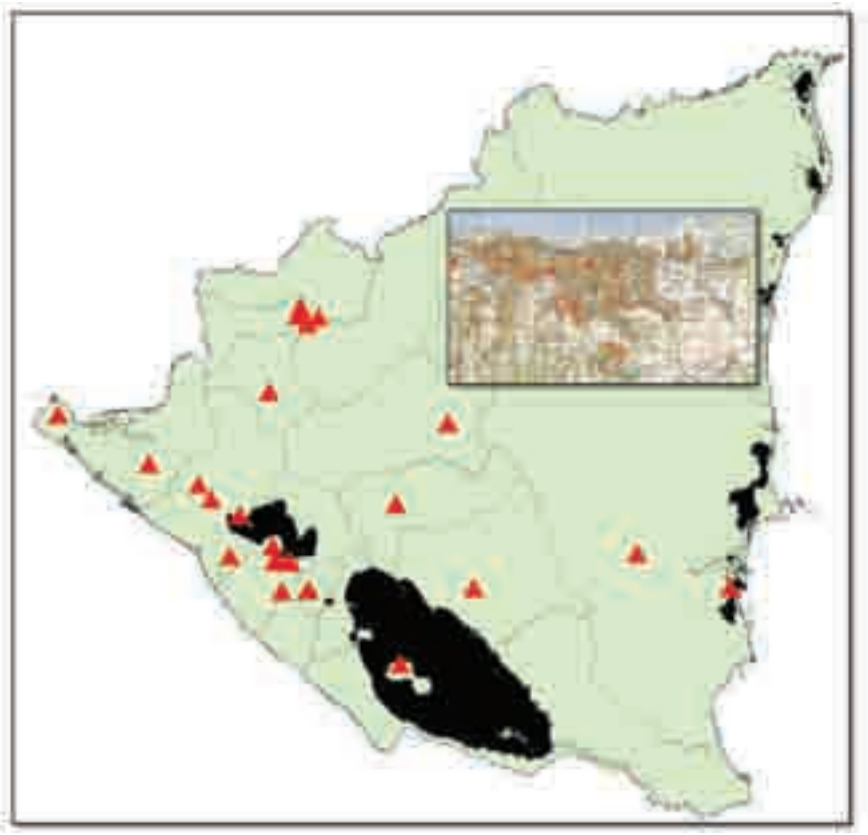
6. How are earthquakes detected?

As seismic waves propagate, they cause the ground to move. To record these movements, instruments such as seismographs and accelerographs are used.

Can earthquakes be predicted?

The seismographs and seismic networks that exist in seismological observatories, such as the Nicaraguan Institute of Territorial Studies (Spanish acronym 'INTER'), are useful for studying earthquake characteristics, but they are not an alert system nor able to predict aftershocks.

Interesting note:
The interior of the first seismograph, the Dragon Jar, was ingeniously built. During an earthquake, the Earth's movement caused the pendulum to lose stability, which activated a series of interior levers. This activity would cause one of the eight dragons arranged around the brim to release the copper ball held in its mouth, which would fall into the mouth of a toad that was located just below the dragon. This action would emit a sound that helped people determine the direction of the earthquake



Nicaraguan Seismic Network

Earthquakes cannot be predicted, but it is important to prepare psychologically and to have the necessary materials and supplies ready in the event of an earthquake, which could occur at any time.

7. What are the primary and secondary effects of earthquakes?

When seismic events take place, they can have a negative impact on people and their environment, ranging from a simple shock to the collapse of structures.

Primary effects

The effects have been divided as follows:

Humans:

Nervousness (loss of calm): A reaction caused by a new or unexpected situation. It is important to remain calm during an earthquake.

Loss of human life: The result of the vulnerability of buildings and structures.

Social and economic:

After an earthquake, it is common for other threats to appear, such as delinquency, violence and vandalism, which are often just as severe as the event itself.

Physical

Damage to structures: Buildings can suffer minor to severe damage, depending on the magnitude of the earthquake and the quality of the design and construction.

Secondary effects

Fires: They occur due to short circuits in the power lines or gas coming into contact with electrical appliances.

Landslides: Earthquakes can produce landslides, which originate on unstable slopes.

Liquefaction: This phenomenon occurs when buildings are located on loose, sandy soil that has high water content. The buildings lose their structural integrity during the earthquake, leading to their collapse.

Rising rivers and streams: Rising can occur when a dam ruptures or when a riverbed or stream becomes clogged after a strong earthquake.

Tsunamis: This phenomenon occurs when large earthquakes take place in the contact zones between tectonic plates and cause a deformation of the sea floor.

8. What steps can we take to reduce the risk from earthquakes?

What to do to reduce the risk before an earthquake?

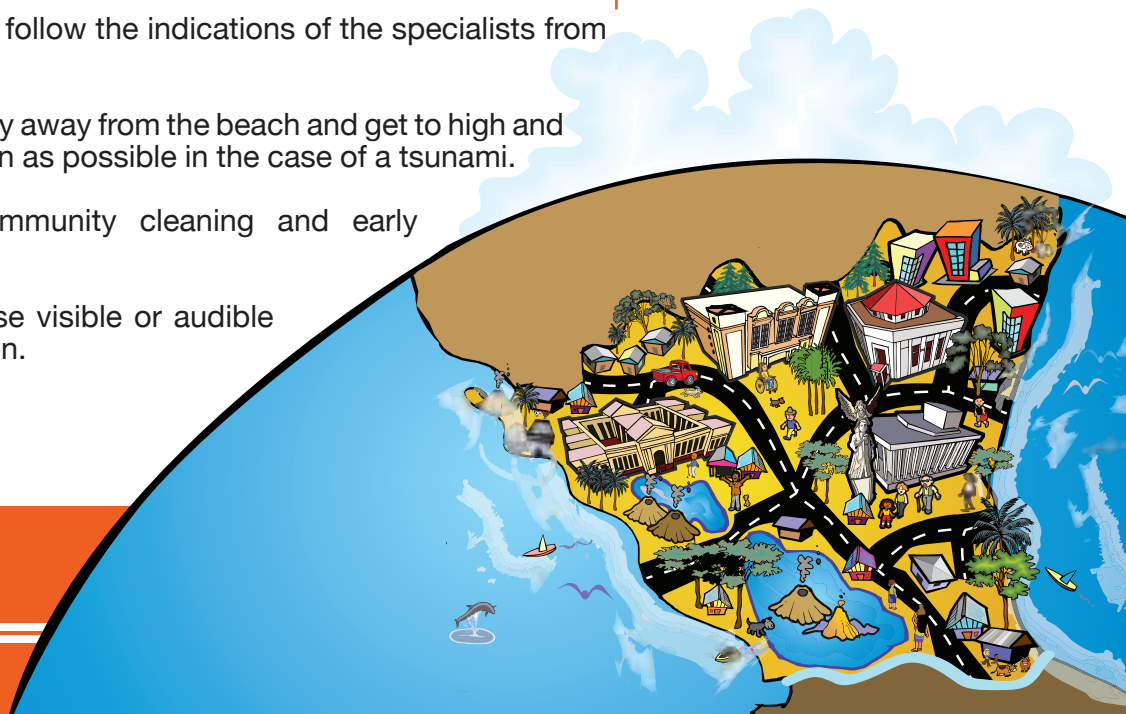
- When building or strengthening one's home, it is important to take into account the rules established in a country's earthquake-resistant building code.
- Review the structure of the home, office or workplace and identify evacuation routes and safe zones. Consult with a specialist to reinforce vulnerable areas.
- Secure objects that could fall, such as bookshelves, furniture and other objects.
- Hallways and doors must be kept free of obstructions.
- Create and/or revise the community and family plan for earthquakes. Do not forget to integrate actions into the plan that promote the participation of children and people with disabilities, amongst others.
- Define the safest place inside and outside the home.
- Conduct drills on a regular basis with family, with the neighbourhood community or COBAPRED, in the workplace and in places of study.
- Have an emergency kit and first aid kit ready.
- Define with family members a safe place, such as a meeting point, in case of separation.
- If possible, secure property and belongings.

What to do in an earthquake?

- Stay calm.
- Help others. Protect children, people with disabilities, pregnant women and the elderly.
- Go to the safest place in the house, or to the place indicated as the building's earthquake safety zone.
- If necessary, use evacuation routes until reaching a safe zone outside.
- Protect yourself alongside or under sturdy furniture, next to columns or under sturdy frames.
- Stay away from heavy objects that could fall.
- If possible, turn off the gas and the main electricity switch.
- Do not light matches and/or any other possible source of fire.
- In public places: Do not rush for the exits because everyone else will try to do the same, which could result in injury or death. Take cover under a chair and avoid places near stairs and elevators.
- In the street: Stay away from tall buildings, signs, power poles and electricity cables. Go to green areas and areas of parks where there are no trees.
- In a vehicle: Stop, take a secure position and wait for the earthquake to pass.
- If you cannot find a safe place, drive calmly towards a place that is far from bridges, roads or electrical cables and park in a danger-free zone. Turn on the lights.

What should we do when the earthquake passes?

- Verify the condition of your family and home.
- Do not touch fallen cables or objects that are touching those cables.
- Do not light matches, candles, open-flame apparatuses, or turn on cell phones or electrical appliances, until you are sure that there is no gas leak. If there is a leak, report it.
- Verify the condition of the surroundings and report damages.
- Do not return home because it is possible that more earthquakes will occur, called 'aftershocks.'
- Meet with acquaintances and/or friends at the previously defined meeting point.
- Avoid moving the badly injured or those with broken bones until professional help has arrived.
- Do not eat or drink until it has been verified as clean.
- Use the telephone only for emergency calls.
- Turn on the radio and follow the indications of the specialists from the Civil Defence.
- If in a coastal area, stay away from the beach and get to high and secure ground as soon as possible in the case of a tsunami.
- Collaborate with community cleaning and early recovery crews.
- If you are trapped, use visible or audible signals to call attention.



DIRECTORY OF EMERGENCY INSTITUTIONS

Nicaraguan Red Cross: 128
Fire Department: 115/911
Police: 118
Electricity: 125

ENACAL: ('Nicaraguan Water and Sewerage Enterprise' in English): 127
Civil Defence: 2280-9917 / 2280-9927
Green Line – ALMA ('Managua Mayor's Office' in English): 135
SINAPRED: SINAPRED ('National System for the Prevention, Mitigation and Attention to Disasters' in English) Executive Secretariat: 2280-9910

Make note of the telephones from your district and neighbourhood:
Distrito IV of the Managua Mayor's Office:
Telephone of the person responsible for the neighbourhood's COBAPRED ('Neighbourhood Committees for Disaster Prevention' in English):

Earthquakes	**Toolbox on earthquakes for community work in urban contexts**

Materials developed within the framework of the project 'Strengthening capacities for preparedness and response to earthquakes in urban areas of Managua's district IV.' DIPECHO VII 5466.

With the technical and financial support of the Directorate-General for Humanitarian Aid & Civil Protection of the European Commission (ECHO), the consortium of the Spanish Red Cross, Netherlands Red Cross and Italian Red Cross, and the CRREC.

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ANSWERS

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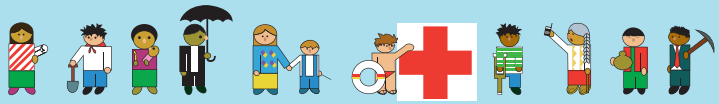

"It's better to prevent..."