St Andrew's Secondary School
Geography Unit

Topic: Living with Tectonic Hazards Part 3

Name: _____ **( )** **Class:**_____ **Date:** _____

1. Study Fig. 1 below.

Magnitude 6.1 earthquake hits northern Sumatra

On the afternoon of July 2, 2013, a magnitude 6.1 earthquake struck near Takengon, the capital city of the Central Aceh Regency in northern Sumatra, causing significant casualties and property damage (total estimated at 24 deaths, 210 injured, and about 1500 buildings damaged according to the National Agency for Disaster Management in Indonesia, BNPB).

The Indonesian island of Sumatra is located in a highly seismic area of the world. In addition to the subduction zone and the associated Sunda Arc off the west coast of the island, Sumatra also has a large transform fault, the so-called Great Sumatran Fault, running the entire length of the island. This fault zone accommodates most of the lateral motion associated with the oblique convergence between the Indo-Australian and Eurasian plates.

The significant damage for the moderate size of the earthquake is due to the shallow crustal depth of its source, the proximity of the epicenter to the population centre and the materials used for construction purposes.

Fig. 1

Based on the information in Fig. 1, **explain** why Sumatra is prone to earthquakes and why a moderate size earthquake like this can cause such significant damage to properties and injury to a large number of people. [6]

2. Study Fig. 2, which shows the damage of earthquakes in Nepal.

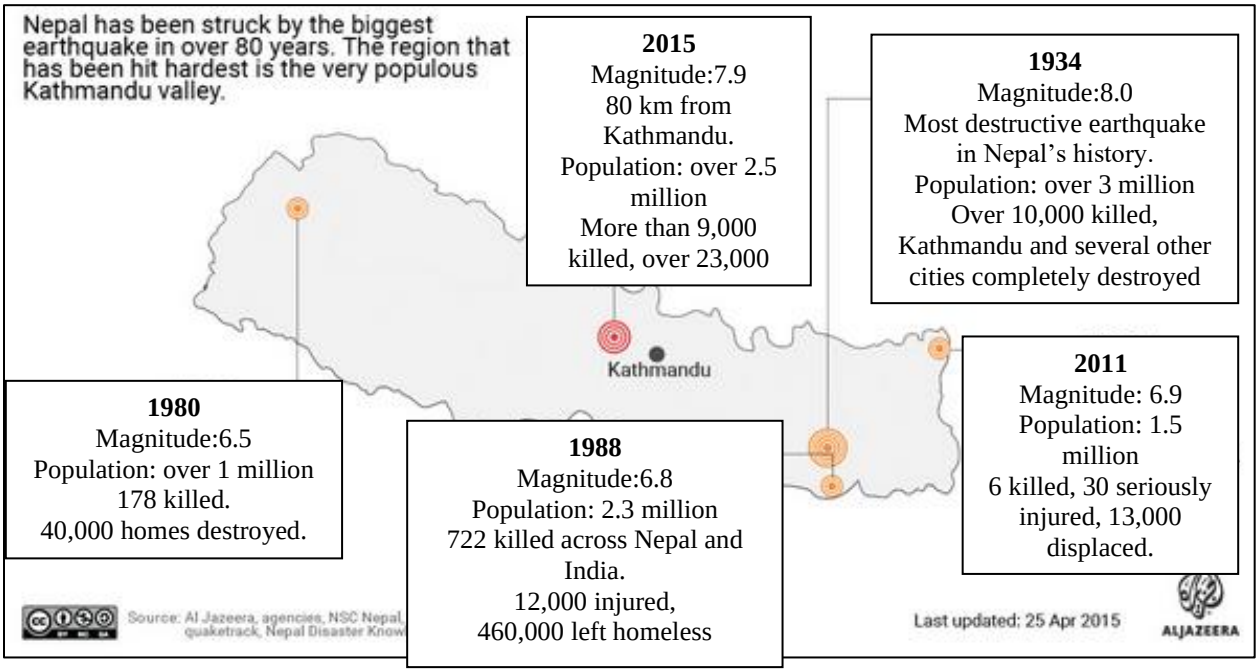

Fig. 2

With reference to Fig. 2 and studies made, suggest reasons for the difference in damage shown. [4]

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3. Study Fig. 3a, shows the nature of the earthquake in Nepal in April 2015 and Fig. 3b shows the statistics of earthquakes between Nepal and Japan.

Earthquake profile in Nepal

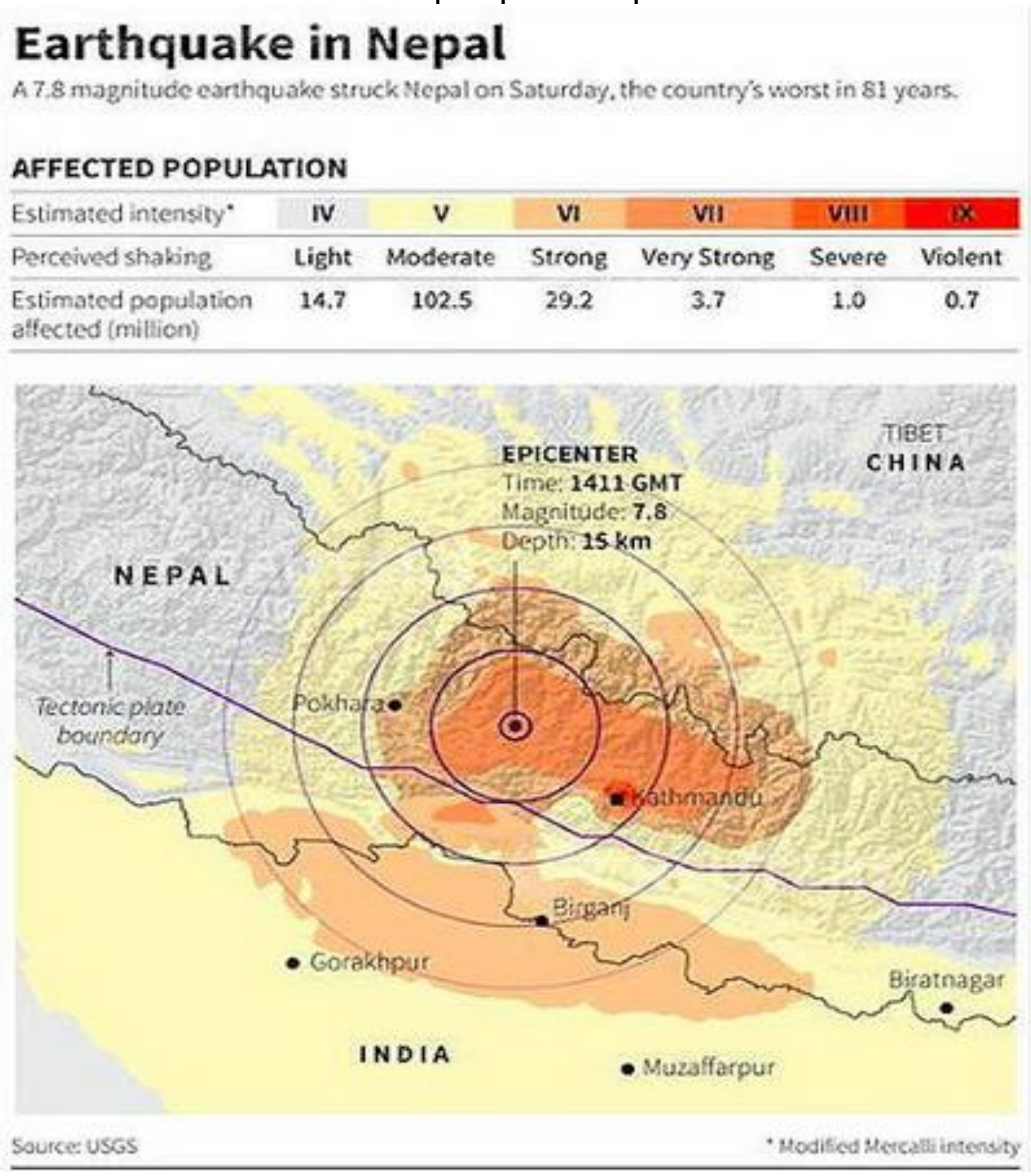

Fig. 3a

Comparison of Earthquake Statistics

Country	Nepal, 2015	Japan, 1993
Magnitude	7.8	7.7
Death toll	8000	239

Fig. 3b

Refer to Figs. 3a and 3b and studies made, **account for** the earthquake in Nepal and **suggest** why Nepal has a higher death toll than Japan despite having similar earthquake magnitude. [5]

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4. Study Figs. 4, 5a, 5b and 6 (Insert), which show information about tectonic hazards and population of Indonesia.

Map of Indonesia

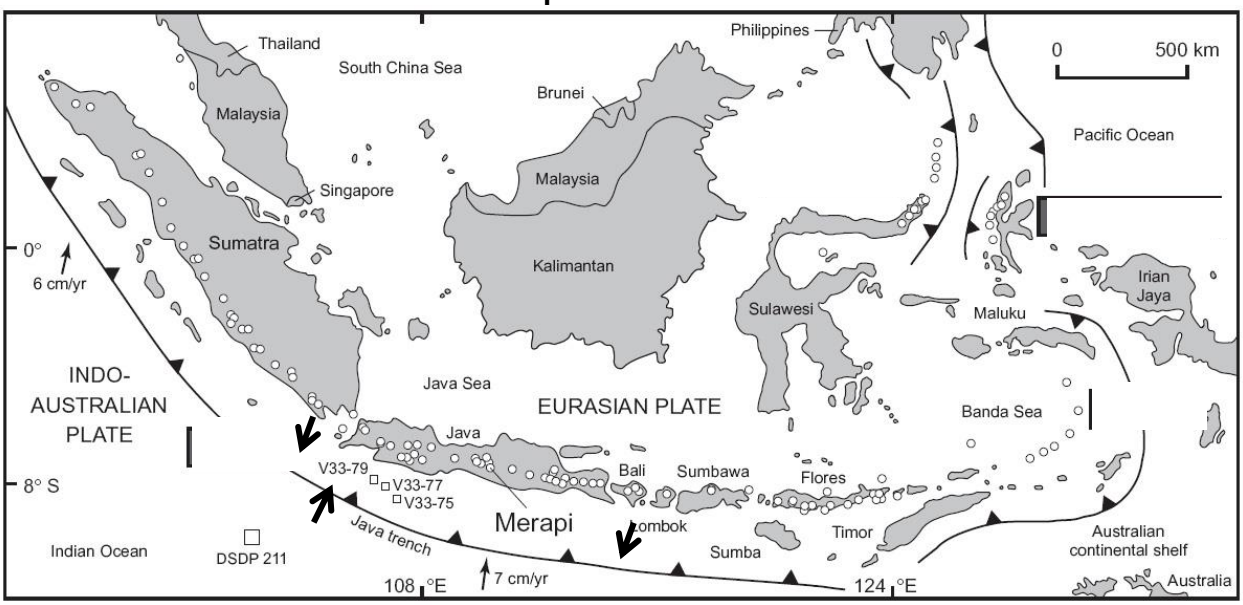

Fig. 4

Mortality rates for earthquakes in Indonesia

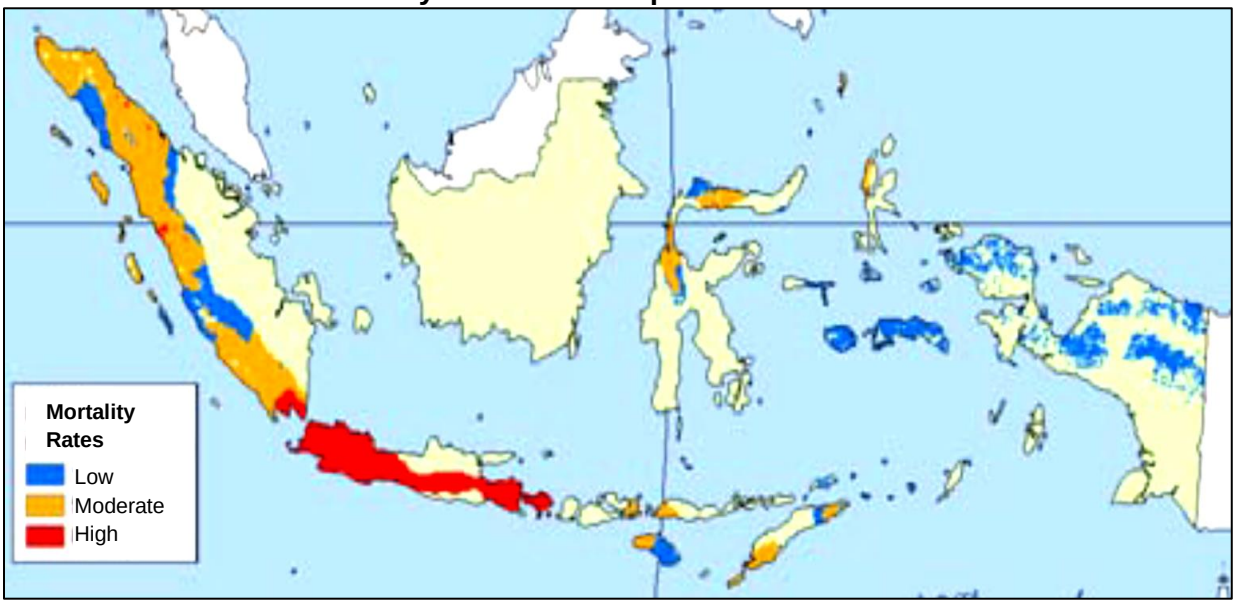

Fig. 5a

Mortality rates for volcanic eruptions in Indonesia

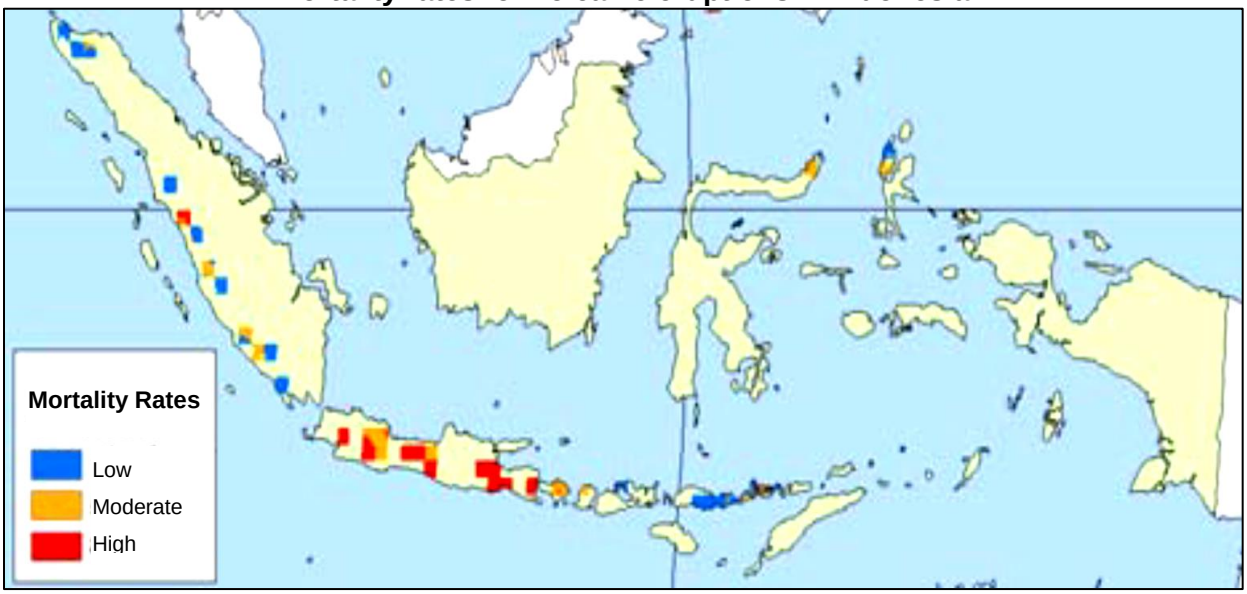

Fig. 5b

Top 10 largest cities in Indonesia

Total Population: 240.7 million (2010)

Rank	Name	Province	Pop.
1	Jakarta	West	9,588,198
2	Surabaya	East Java	2,765,487
3	Bandung	West Java	2,394,873
4	Bekasi	West Java	2,334,871
5	Medan	North Sumatra	2,097,610
6	Tangerang	West Java	1,798,601
7	Depok	West Java	1,738,570
8	Semarang	Central Java	1,555,984
9	Palembang	South Sumatra	1,455,284
10	Makassar	South Sulawesi	1,338,663

Fig. 6

(i) Using Fig. 4, 5a and 5b, describe the distribution of mortality rates for tectonic hazards (earthquakes [2], volcanic eruptions [2]) in Indonesia. [4]

(ii) Use Fig. 4 to explain why Indonesia is prone to tectonic hazards. [4]

(iii) Using Fig. 5a, 5b and 6, describe [2 - 3] and account for [2 - 3] the relationship between tectonic hazards and population size in Indonesia. [5]

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5. Study Fig. 7, which shows tectonic activities along the Sunda Trench.

Tectonic activities along the Sunda Trench

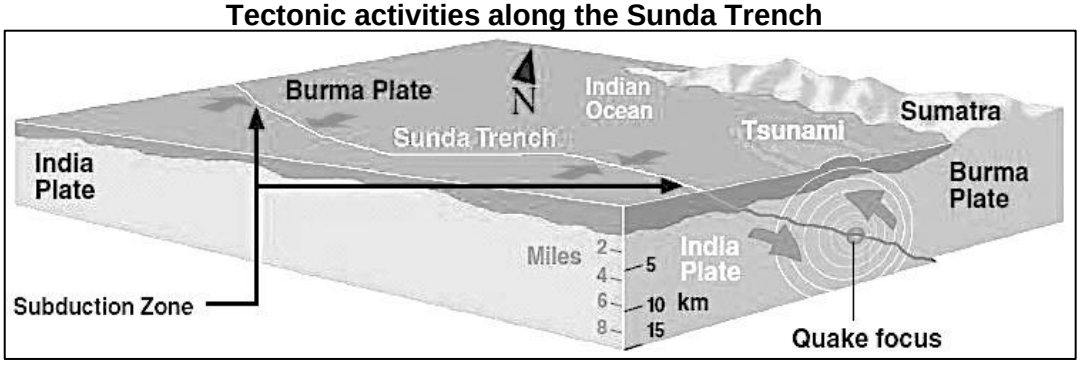

Fig. 7

(i) Use the information from Fig. 7, **explain** the formation of a tsunami along the Sunda Trench and **describe** possible risks to surrounding coastal towns. [5]

(ii) With the use of examples, **explain** how potential risks from tsunamis may be better managed. [4]

6. Describe and explain two measures the Japanese government took in response to the 9.0 magnitude earthquake that happened in Tohoku, in order to reduce future risks. [4]

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7a. Explain in detail the formation of tsunamis. You may use annotated diagrams in your answer. [5]

b. Figs. 8A and 8B show features of building design in order to mitigate the effects of earthquakes.

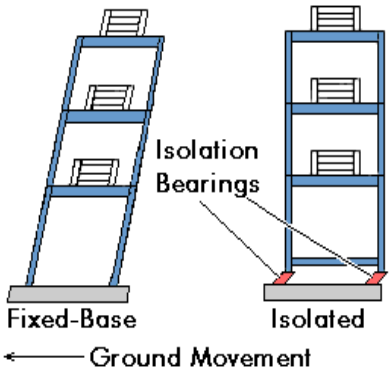

Fig. 8A

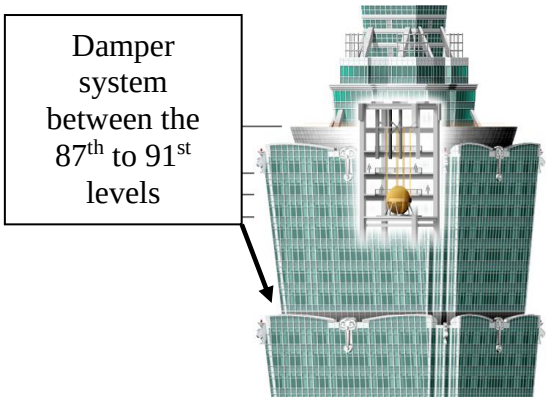

Fig. 8B

Using Figs. 8A and 8B, describe and explain how these design features are able to mitigate the effects of earthquakes. [4]

c. Fig. 8C shows the short-term help that the United States of America provided Nepal after an earthquake.

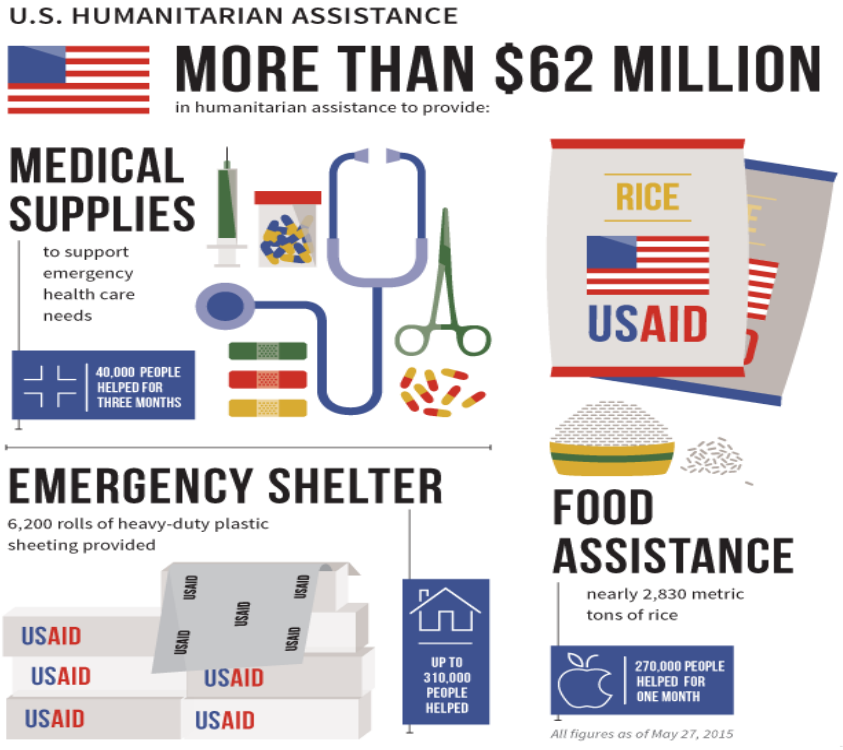

Fig. 8C

Using Figure 5C, explain the importance of such short-term responses to earthquakes. [3]