

ENVIRONMENTAL STUDIES

15CIV18



UNIT -3

DISASTERS



OUTLINES

- **What do you mean by a disaster?**
- **Disaster Characteristics**
- **Classification of Disasters**
- **Natural Disaster**
 - **Characteristics of Natural Disasters**
 - **Impact of Natural Disasters**
 - **Trends of World Natural Disasters 1984-2013**
 - **Impacts of World Natural Disasters by region, 1984-2013**

WHAT DO YOU MEAN BY A DISASTER?

- Disaster is the occurrence of a sudden or major misfortune, which disrupts the basic fabric, and normal functioning of a society.
- The High Powered Committee of the Government of India, in its October 2001 Report defines Disaster as *“an occurrence of a severity and magnitude that normally results in deaths, injuries and property damage and that cannot be managed through the routine procedures and resources of government. It usually develops suddenly and unexpectedly and requires immediate, coordinated and effective response by multiple government and private sector organizations to meet human needs and speedy recovery”*.

WHAT DO YOU MEAN BY A DISASTER?

- The Disaster Management Act 2005 defines disaster as *“a catastrophe, mishap, calamity or grave occurrence affecting any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature magnitude as beyond the coping capacity of the community of the affected area”*.
- WHO defines disaster as *‘any occurrence that causes damage, economic destruction, loss of human life and deterioration in health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community or area.’*

Disaster Characteristics



- **Increased death, injury, illness that can't be managed**
- **Coordination public, government, and private organizations**
- **Equal triage distribution**
- **Notification of family**
- **Evacuation/Sheltering of evacuees**

Disaster Characteristics

- **Media attention**
- **Heightened security; crime scene**
- **Immediate and long term emotional support**
- **Significant property damage**



Classification of Disasters

- Disasters identified by the High Powered Committee in 2001

I. Water and Climate related disaster

1. Floods and Drainage Management
2. Cyclones
3. Tornadoes and Hurricanes
4. Hailstorm
5. Cloud Burst
6. Heat Wave and Cold Wave
7. Snow Avalanches
8. Droughts
9. Sea Erosion
10. Thunder and Lighting

II. Geologically related disasters

1. Landslides and Mudflows
2. Earthquakes
3. Dam Failures/Dam Bursts
4. Mine Fires

Classification of Disasters

III. Chemical, Industrial and Nuclear related disasters

1. Chemical and Industrial Disasters
2. Nuclear Chemicals

IV. Accident related disasters

1. Forest Fires
2. Urban Fires
3. Mine Flooding
4. Oil Spill
5. Major Building Collapse
6. Serial Bomb Blast
7. Festival Disasters and Fires
8. Electrical Disasters and Fires
9. Air, Road and Rail Accidents
10. Boat Capsizing
11. Village Fire

V. Biologically related disasters

1. Biological Disaster and Epidemics
2. Pest Attacks
3. Cattle Epidemics
4. Food Poisoning

NATURAL DISASTERS

These types of disaster naturally occur in proximity to, and pose a threat to, people, structures or economic assets. They are caused by biological, geological, seismic, hydrologic, or meteorological conditions or processes in the natural environment (e.g., cyclones, earthquakes, tsunami, floods, landslides, and volcanic eruptions).



NATURAL DISASTERS

- Tornadoes
- Forest Fires
- Floods
- Blizzards
- Cyclones/Typhoon
- Hurricanes
- Heatwave
- Tsunami
- Volcanic Eruption
- Earthquakes
- Mudslides
- Limbic Eruption
- Draught/Famine
- Hail

CHARACTERISTICS OF NATURAL DISASTERS

- **Regional Characteristics of Natural Disasters**
- **Disaster Characteristics in Asia:**
 - Asia has been suffering from about 38 % of the major natural disasters of the world.
 - Meanwhile, Asian region accounts for 57 % of killed people by natural disasters and 88 % of the affected people.
 - The number of people killed and affected, and the amount of damage tend to be higher compared to the number of disasters.
 - Therefore Asian region cannot be neglected as one of vulnerable areas to natural disasters.

CHARACTERISTICS OF NATURAL DISASTERS

- **Disaster Characteristics in Africa**
- In Africa, the number of disasters accounts for 29% of epidemic, 26 % of flood and 22 % of drought, and which holds 77 % of the total number of disasters.
- On the other hand, the number of people killed and affected people are caused 70~80 % due to drought and it characterizes Africa as a serious drought prone continent.
- On top of that, it is also clear that earthquake disasters cause major economic damage to the continent

CHARACTERISTICS OF NATURAL DISASTERS

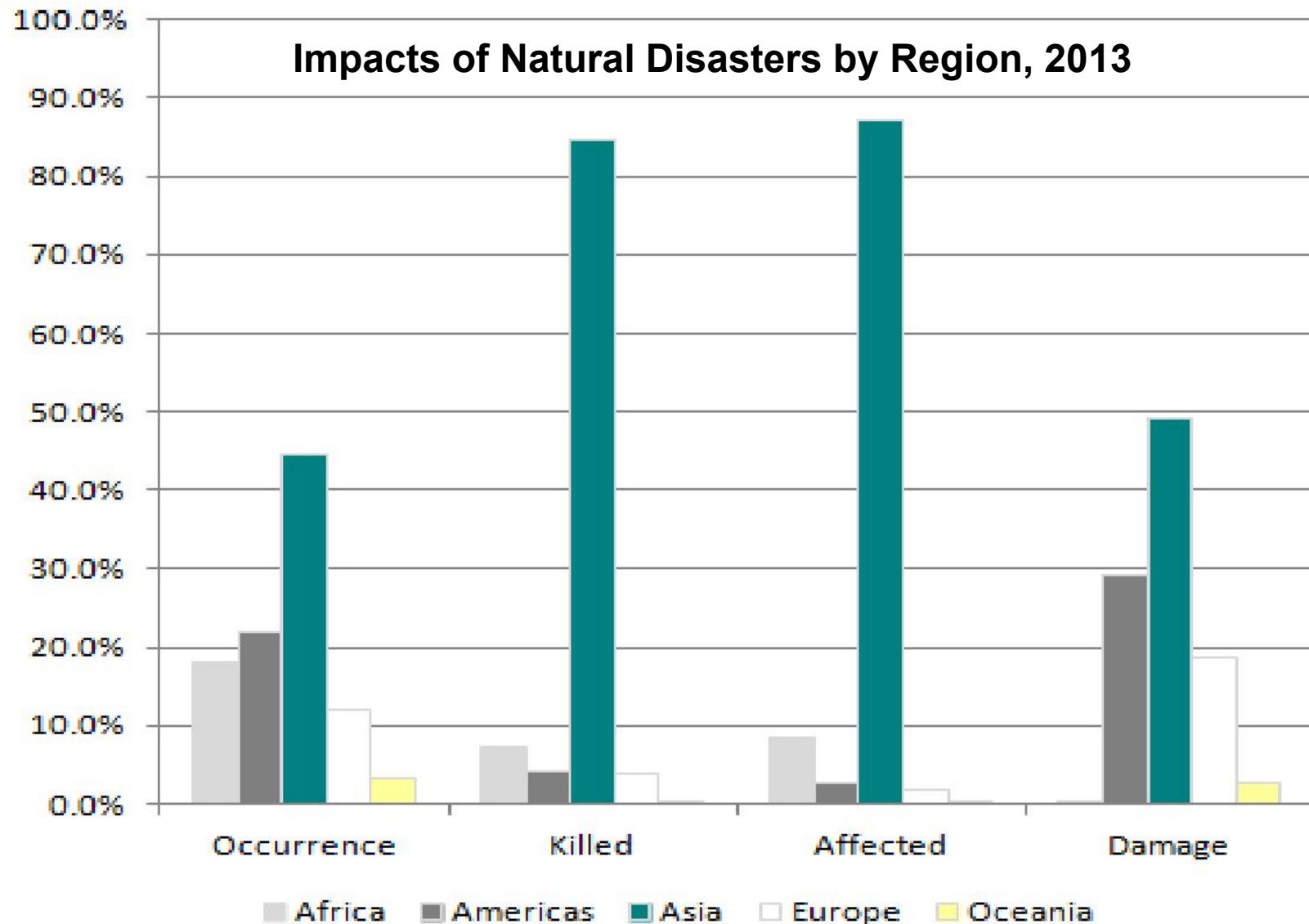
- **Disaster Characteristics in America:**
- In North and South America, wind and flood disasters share 65 % of the total number of natural disasters.
- When we consider the number sufferings, the most number people killed is caused by floods (27 %), earthquakes (26 %) and windstorms (19 %) and the most number of affected people is by floods (36 %).
- Additionally, it stands out that windstorms cause about the half of the economic damage (48 %).

IMPACT OF NATURAL DISASTERS

- Asia ranks first among all regions in all the categories of disaster occurrence, the number of killed and affected people and economic damage, accounting for 44.6 percent, 84.6 percent 87.1 percent and 49.0 percent respectively.
- While Africa ranks the second in the number of killed and affected, its share in economic damages accounts for 0.2 percent, the lowest share.



IMPACT OF NATURAL DISASTERS



IMPACT OF NATURAL DISASTERS

Impacts of Natural Disasters by Region, 2013

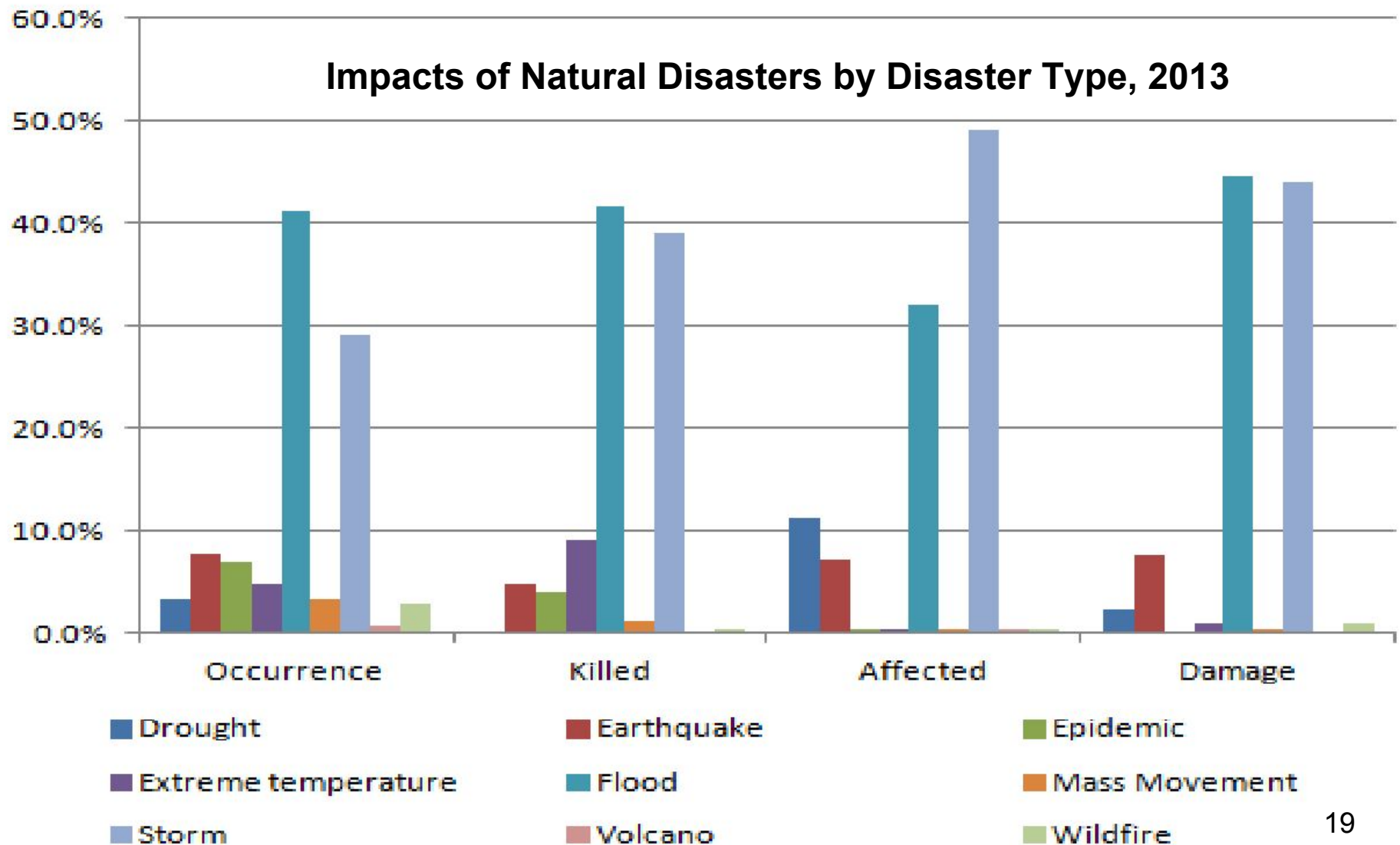
Region	Impact							
	Occurrence (share in %)		Killed (share in %)		Affected (share in %)		Damage (US\$ million) (share in %)	
Africa	65	(18.0%)	1,685	(7.2%)	8,281,798	(8.3%)	241	(0.2%)
Americas	79	(21.9%)	1,026	(4.4%)	2,752,169	(2.8%)	35,060	(29.4%)
Asia	161	(44.6%)	19,910	(84.6%)	87,045,468	(87.1%)	58,521	(49.0%)
Europe	44	(12.2%)	895	(3.8%)	1,749,143	(1.8%)	22,289	(18.7%)
Oceania	12	(3.3%)	22	(0.1%)	79,690	(0.1%)	3,259	(2.7%)
Total	361	(100.0%)	23,538	(100.0%)	99,908,268	(100.0%)	119,369	(100.0%)

IMPACT OF NATURAL DISASTERS

- **IMPACTS OF NATURAL DISASTERS BY DISASTER TYPE, 2013**
- This section provides the breakdown of impacts of disasters sorted by disaster type.
- As Figure shows, two disasters, flood and storm, are dominant in all categories. While flood tops in occurrence, the number of people killed and damage, storm has highest the share of 49.2 percent in the number of people affected.

IMPACT OF NATURAL DISASTERS

Impacts of Natural Disasters by Disaster Type, 2013



IMPACT OF NATURAL DISASTERS

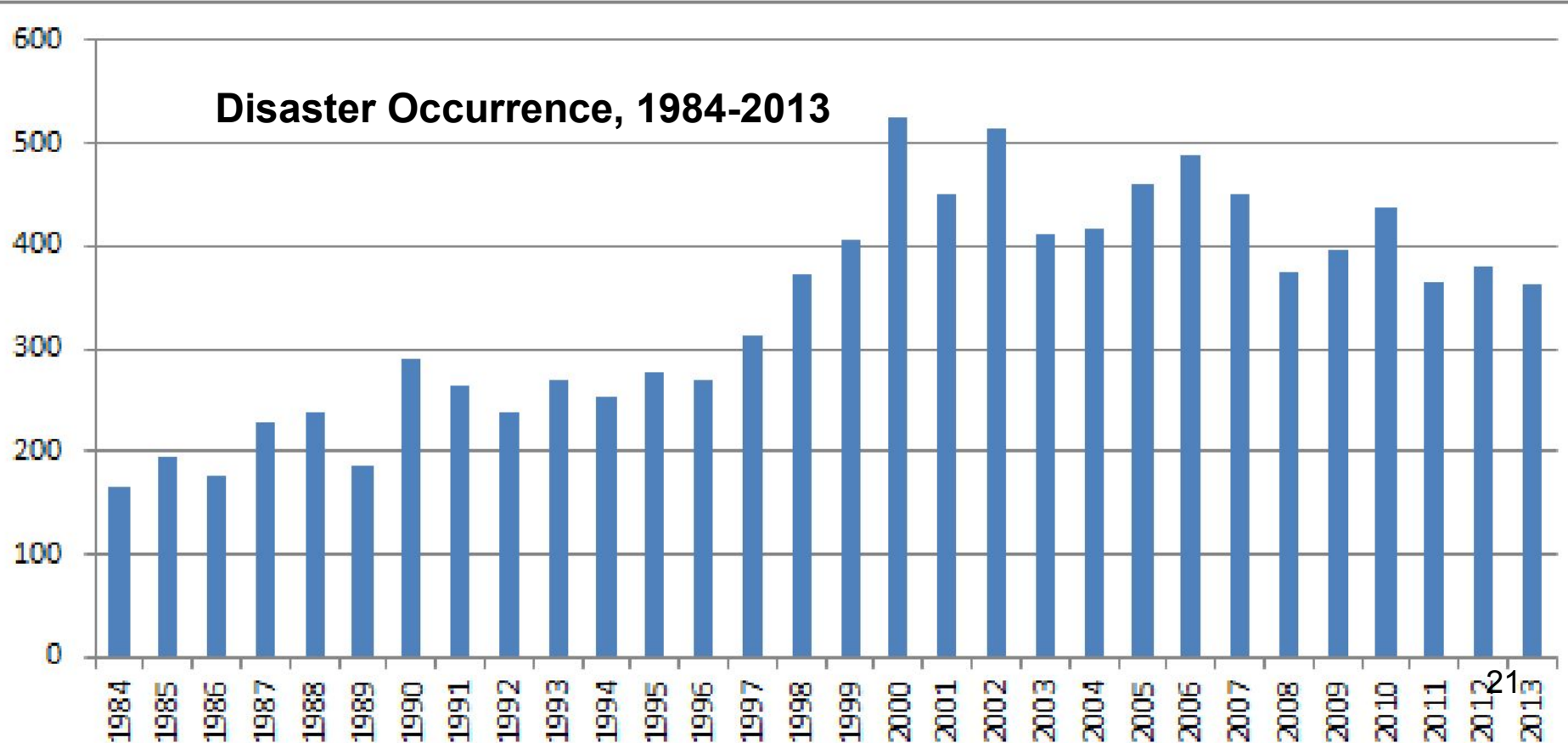
Impacts of Natural Disasters by Disaster Type, 2013

Disaster Type	Impact							
	Occurrence (share in %)		Killed (share in %)		Affected (share in %)		Damage (US\$ million) (share in %)	
Drought	12	(3.3%)		(0.0%)	11,223,522	(11.2%)	2,547	(2.1%)
Earthquake	28	(7.8%)	1,120	(4.8%)	7,031,162	(7.0%)	9,075	(7.6%)
Epidemic	25	(6.9%)	922	(3.9%)	93,438	(0.1%)		(0.0%)
Extreme temperature	17	(4.7%)	2,142	(9.1%)	270,016	(0.3%)	1,000	(0.8%)
Flood	149	(41.3%)	9,823	(41.7%)	32,050,807	(32.1%)	53,175	(44.5%)
Mass movement	12	(3.3%)	281	(1.2%)	1,033	(0.0%)	8	(0.0%)
Storm	105	(29.1%)	9,215	(39.1%)	49,124,353	(49.2%)	52,492	(44.0%)
Volcano	3	(0.8%)		(0.0%)	105,106	(0.1%)		(0.0%)
Wildfire	10	(2.8%)	35	(0.1%)	8,831	(0.0%)	1,072	(0.9%)
Total	361	(100.0%)	23,538	(100.0%)	99,908,268	(100.0%)	119,369	(100.0%)

TRENDS OF WORLD NATURAL DISASTERS, 1984-2013

NUMBER OF DISASTERS IN THE WORLD (1984-2013)

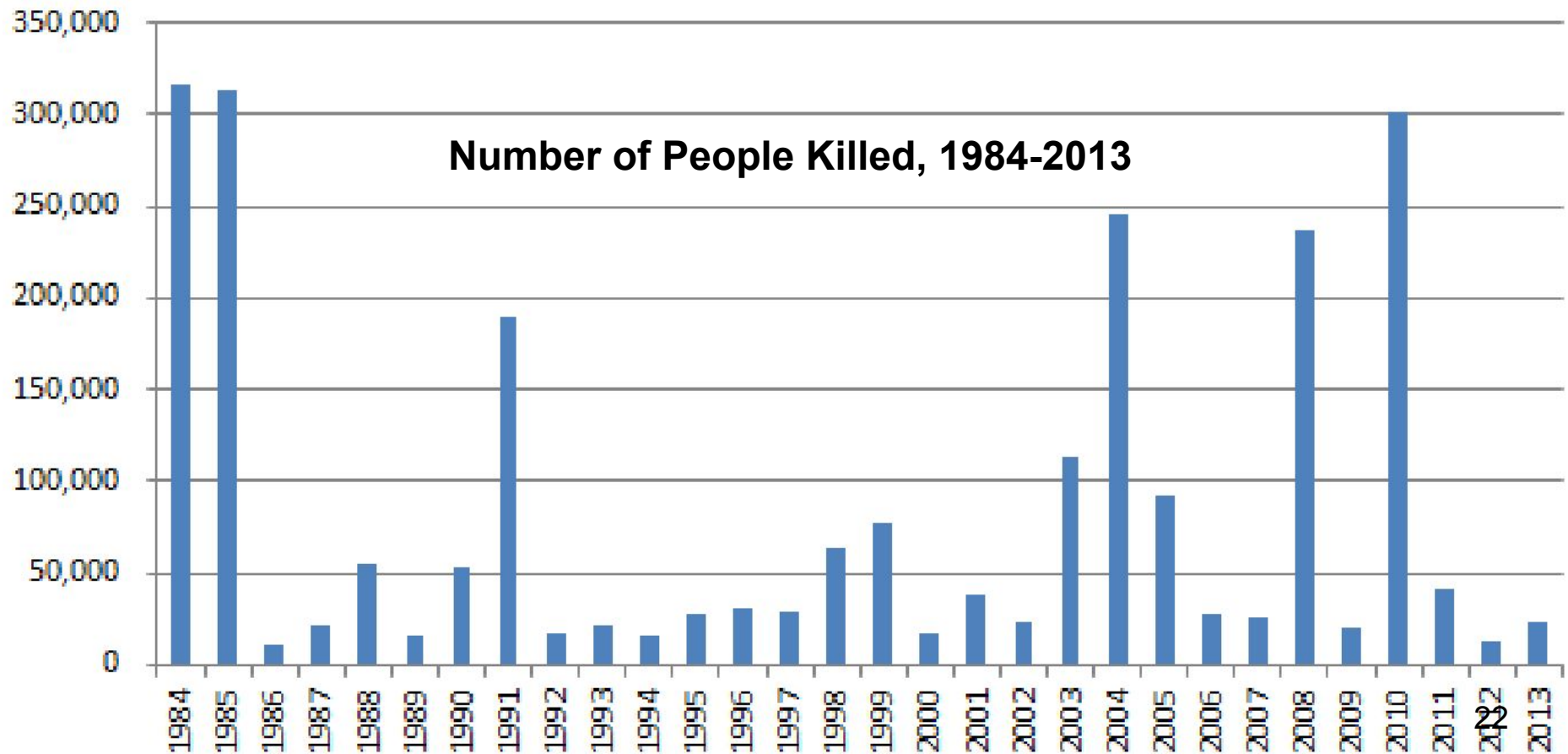
- In terms of number of disasters, the year 2013 sees slight decline from the previous year. In the long run, the upward shift of disaster occurrence's trend continues from the early 1980s through early 2000s.



TRENDS OF WORLD NATURAL DISASTERS, 1984-2013

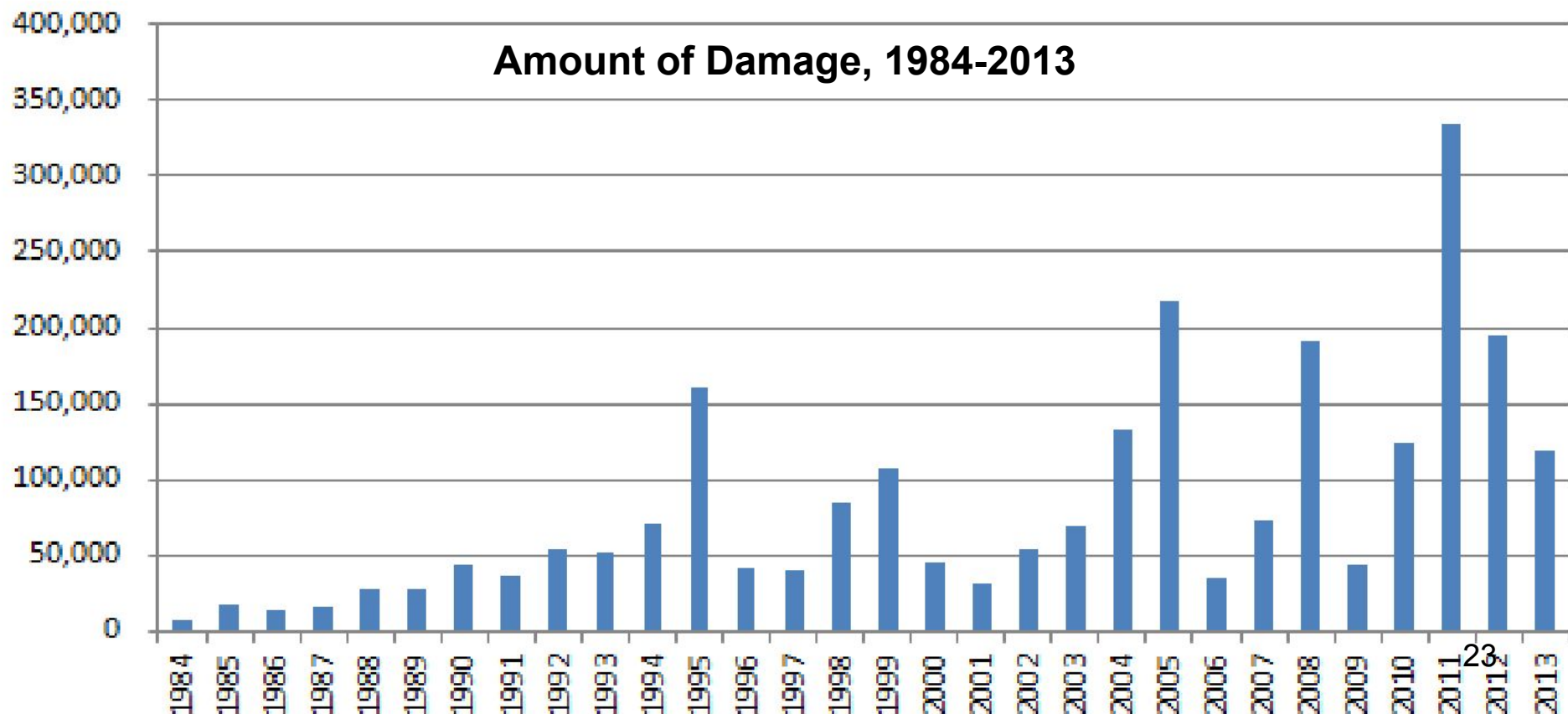
NUMBER OF PEOPLE KILLED IN THE WORLD (1984-2013)

- The death toll in 2013, standing at 23,538 is doubled from the figure of previous year's 10,783.



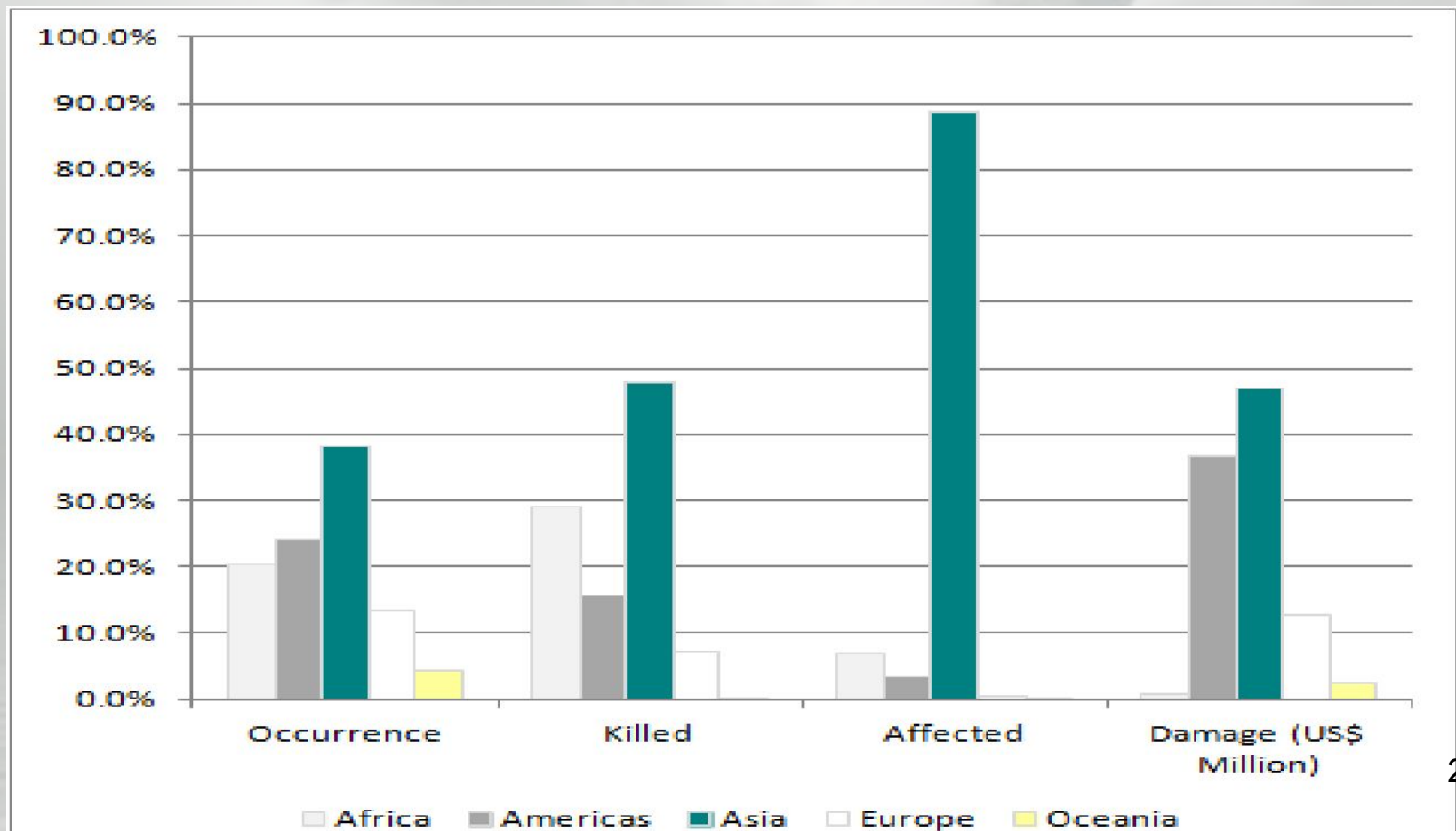
TRENDS OF WORLD NATURAL DISASTERS, 1984-2013

- **ECONOMIC DAMAGE IN THE WORLD (1984-2013)**
- Economic damage caused by natural disasters in 2013 (approximately US\$119 billion) shows sharp decline from the previous year but it still ranks rather high in the period 1984-2013.



IMPACTS OF WORLD NATURAL DISASTERS BY REGION, 1984-2013

- For the period 1984-2013, Asia dominates and ranks first in all natural disaster's impact categories across regions of the world, especially in terms of the number of killed and affected.

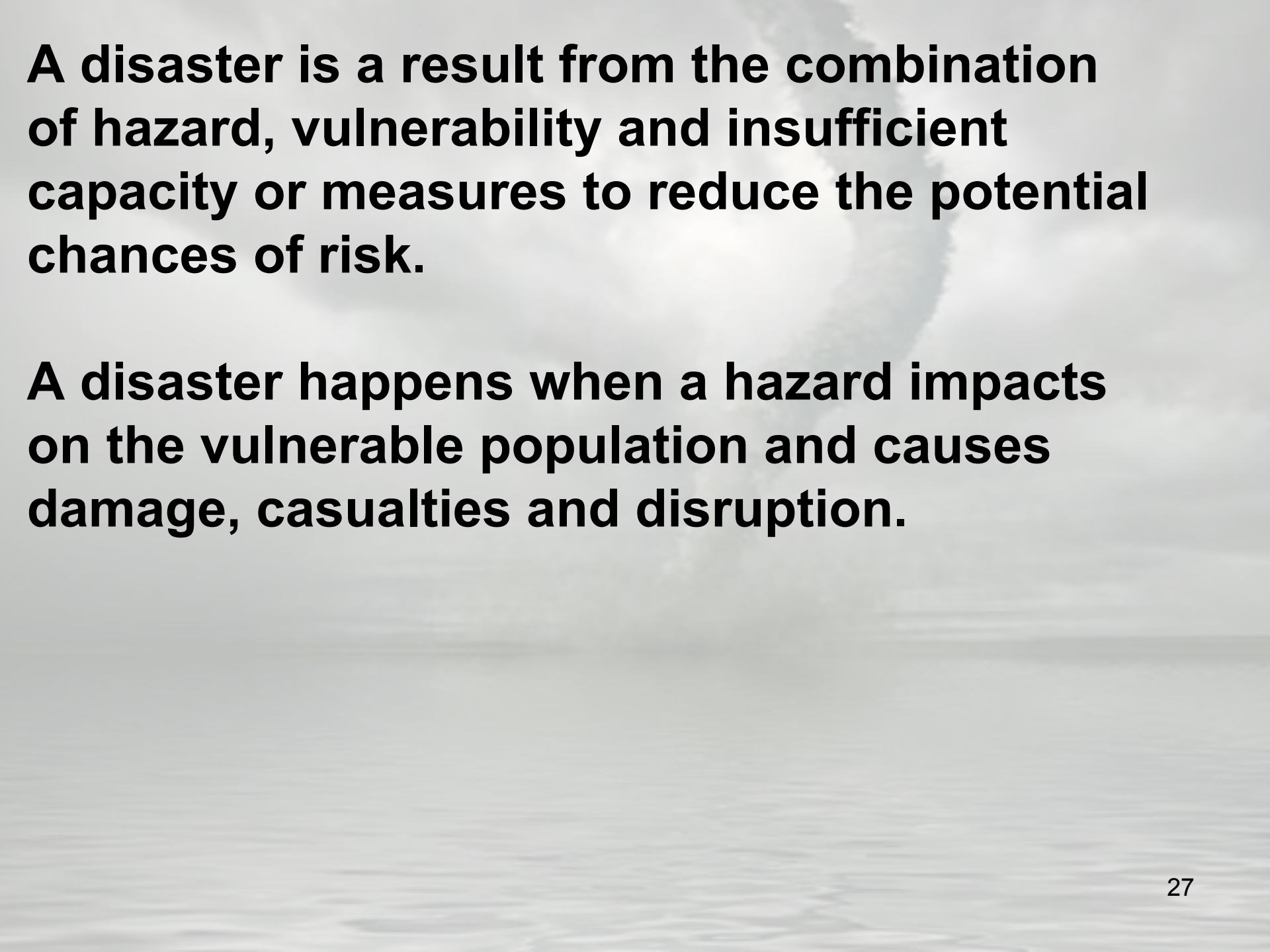


Hazard Vulnerability in



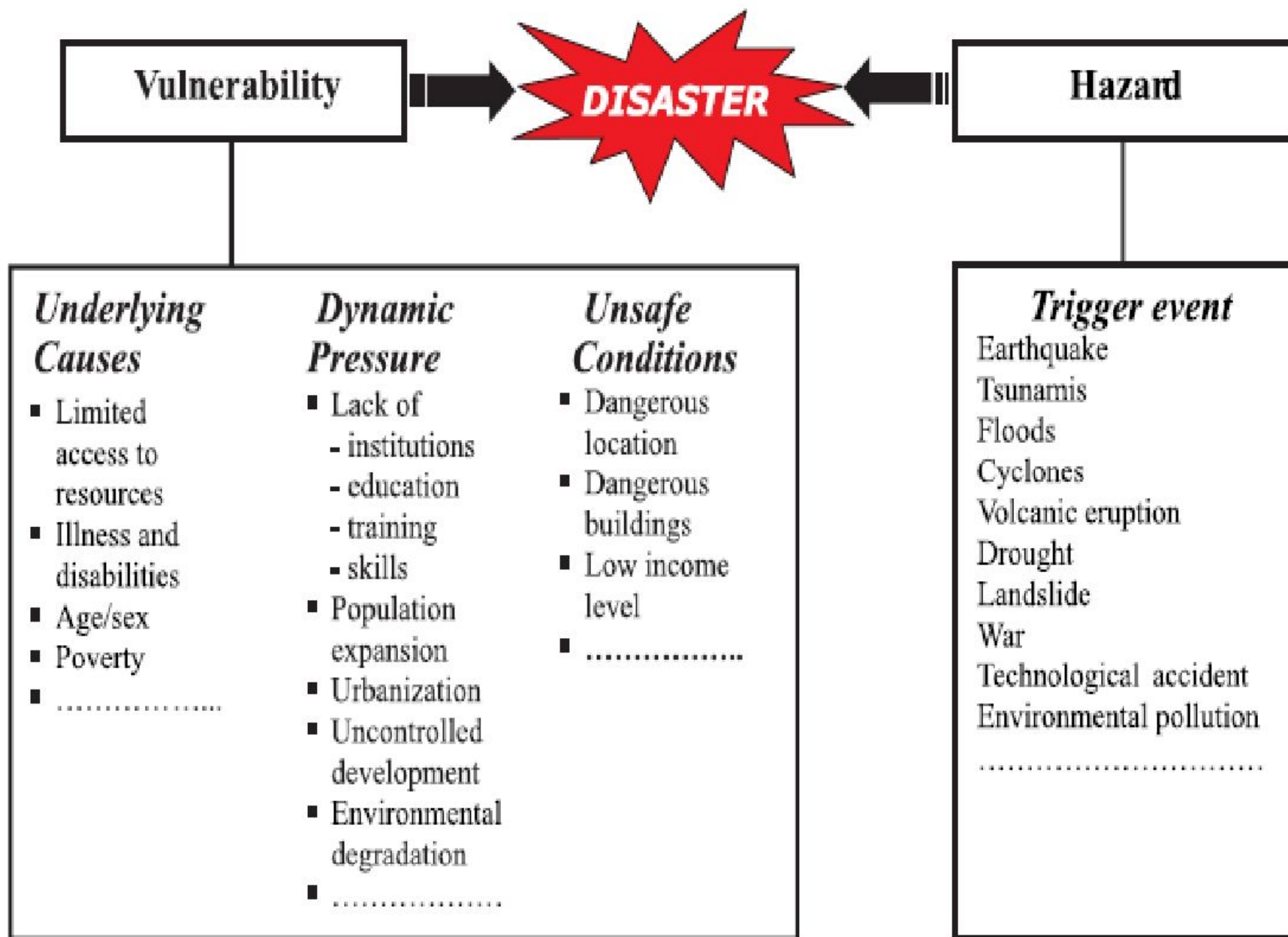
Major Losses in India due to Disasters (2001-2013)

Year	Lives Lost	Cattle Lost	Houses damaged	Cropped area affected (in lakh Ha)
2001-02	834	21,269	3,46,878	18.72
2002-03	898	3,729	4,62,700	21.00
2003-04	1,992	25,393	6,82,209	31.98
2004-05	1,995	12,389	16,03,300	32.53
2005-06	2,698	1,10,997	21,20,012	35.52
2006-07	2,402	4,55,619	19,34,680	70.87
2007-08	3,764	1,19,218	35,27,041	85.13
2008-09	3,405	53,833	16,46,905	35.56
2009-10	1,677	1,28,452	13,59,726	47.13
2010-11	2,310	48,778	13,38,619	46.25
2011-12	1,600	9,126	8,76,168	18.87
2012-13	984	24,360	6,71,761	15.34
2013-14	5,677	1,02,998	12,10,227	63.74



A disaster is a result from the combination of hazard, vulnerability and insufficient capacity or measures to reduce the potential chances of risk.

A disaster happens when a hazard impacts on the vulnerable population and causes damage, casualties and disruption.





- Result from heavy rains
- May involve rivers overflowing, storm surge/ocean waves, & dams or levees breaking
- Most common natural hazard
- Flashfloods = floods that happen very fast
- Related websites:

[PBS: In Focus - Floods!](#)

[How TVA Stops Floods](#)

[Nova - Hot Science: The River's Gift](#)

Earthquake

- **Earthquake is one of the most destructive natural hazard. They may occur at any time of the year, day or night, with sudden impact and little warning. They can destroy buildings and infrastructure in seconds, killing or injuring the inhabitants.**

Earthquake

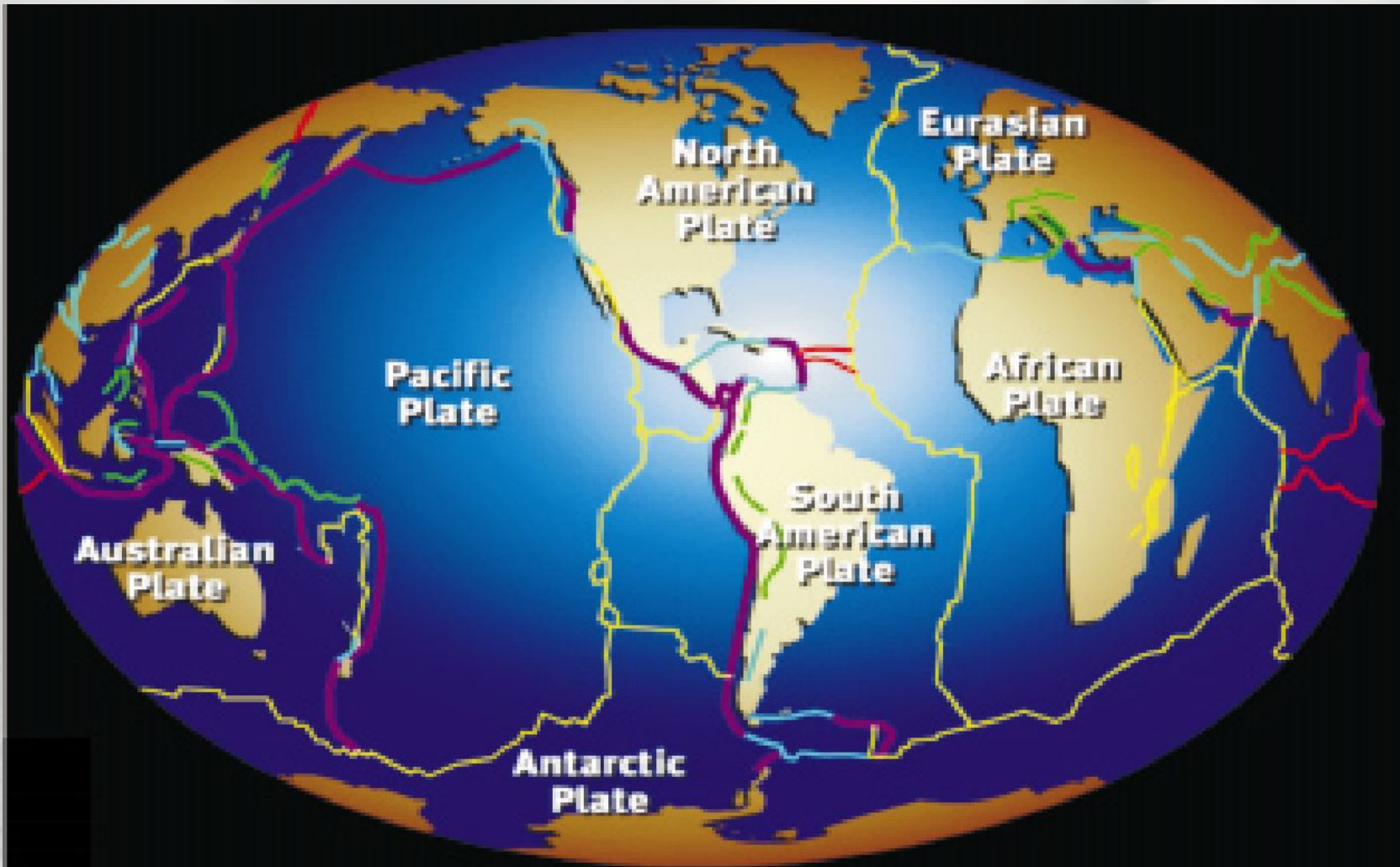
- **what is an earthquake?**
- It is the sudden shaking of the earth crust. The impact of an earthquake is sudden and there is hardly any warning, making it impossible to predict.

Earthquake

- **Cause of Earthquake:** The earth's crust is a rocky layer of varying thickness ranging from a depth of about 10 kilometers under the sea to 65 kilometres under the continents.
- The crust is not one piece but consists of portions called 'plates' which vary in size from a few hundred to thousands of kilometers

Earthquake

Tectonic Plates



Earthquake

The **'theory of plate tectonics'** holds that the plates ride up on the more mobile mantle, and are driven by some yet unconfirmed mechanisms, perhaps thermal convection currents. When these plates contact each other, stress arises in the crust

Earthquake

- These stresses can be classified according to the type of movement along the plate's boundaries:
 - a) pulling away from each other,
 - b) pushing against one another and
 - c) sliding sideways relative to each other.
- All these movements are associated with earthquakes.

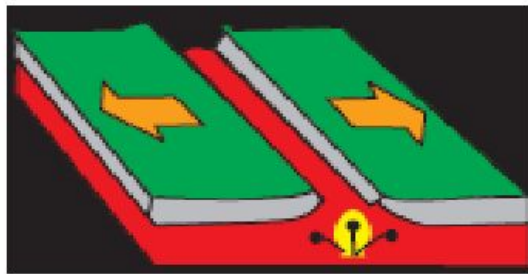
Earthquake

Plate Motions

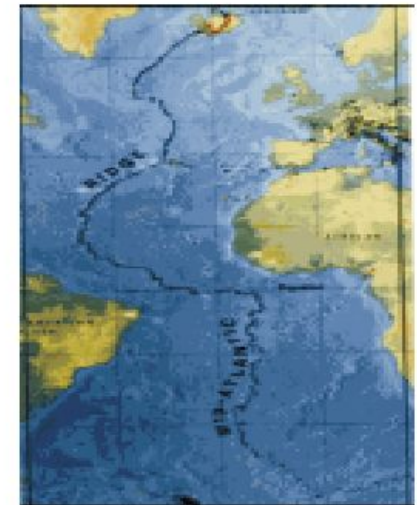
Examples

Illustrations

Divergent - where new crust is generated as the plates pull away from each other.

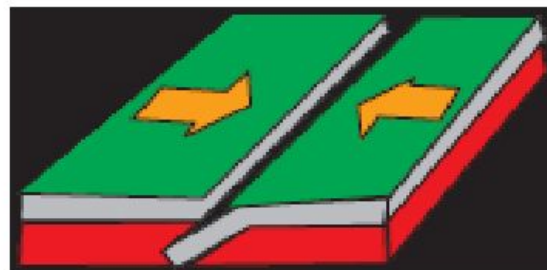


The Mid-Atlantic Ridge, which splits nearly the entire Atlantic Ocean north to south, is probably the best-known and most-studied example of a divergent-plate boundary. The rate of spreading along the Mid-Atlantic Ridge averages about 2.5 centimeters per year (cm/yr), or 25 km in a million years.

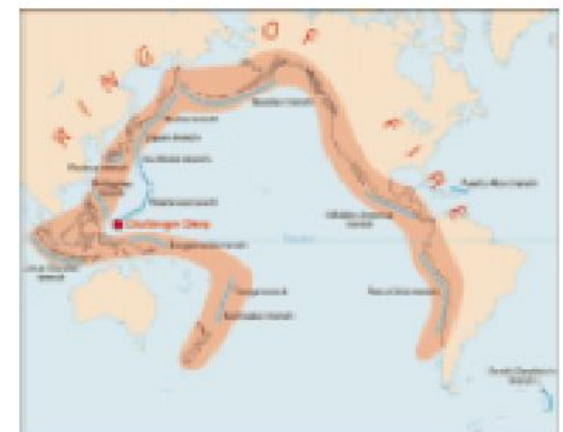


Mid Atlantic Ridge

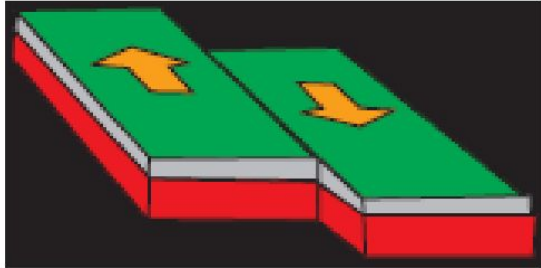
2. Convergent - where crust is destroyed as one plate dives under another.



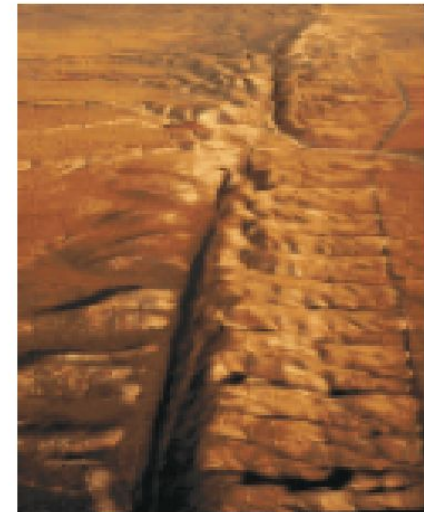
Ring of Fire and The Himalayan mountain range dramatically demonstrates one of the most visible and spectacular consequences of plate tectonics.



3. Transformational - where crust is neither produced nor destroyed as the plates slide horizontally past each other.

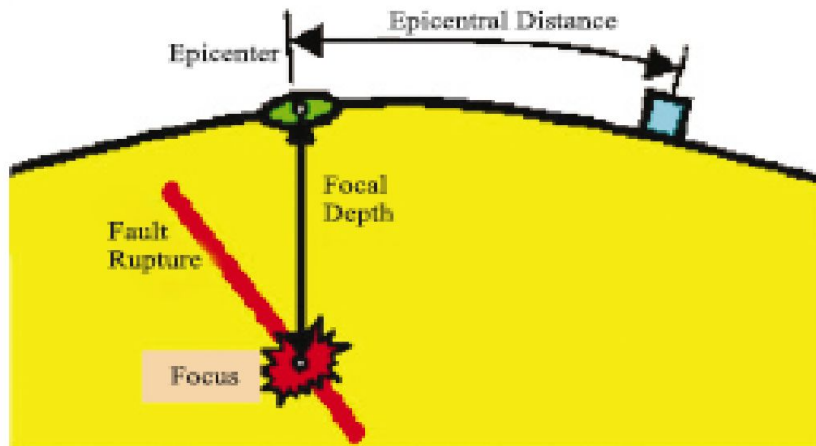


The San Andreas fault slicing through the Carrizo Plain in the Temblor Range east of the city of San Luis Obispo



San Andreas fault, California, U.S.A

The point of rupture is called the '*focus*' and may be located near the surface or deep below it. The point on the surface directly above the focus is termed as the '*epicenter*' of the earthquake (see Fig 2.1.3).



Earthquake vibrations occur in a variety of frequencies and velocities. The actual rupture process may last for a few seconds to as long as one minute for a major earthquake. The ground shaking is caused by 'body waves' and 'surface wave'.

Body waves (P and S waves) penetrate the body of the earth, vibrating fast. 'P' waves travel about 6 kilometers per hour and 'S' waves travel with a speed of 4 kilometers per hour.

Surface waves vibrate the ground horizontally and vertically. These long period waves cause swaying of tall buildings and slight waves motion in bodies of water even at great distances from the epicenter.

Earthquake magnitude or amount of energy released is determined by the use of a 'seismograph' which is an instrument that continuously records ground vibration.

Earthquakes can be of three types based on the focal depth:

- **Deep:-** 300 to 700 kms from the earth surface
- **Medium:-** 60 to 300 kms
- **Shallow:** less than 60 kms

An earthquake with a magnitude 7.5 on the Richter scale releases 30 times the energy than one with 6.5 magnitudes. An earthquake of magnitude 3 is the smallest normally felt by humans.

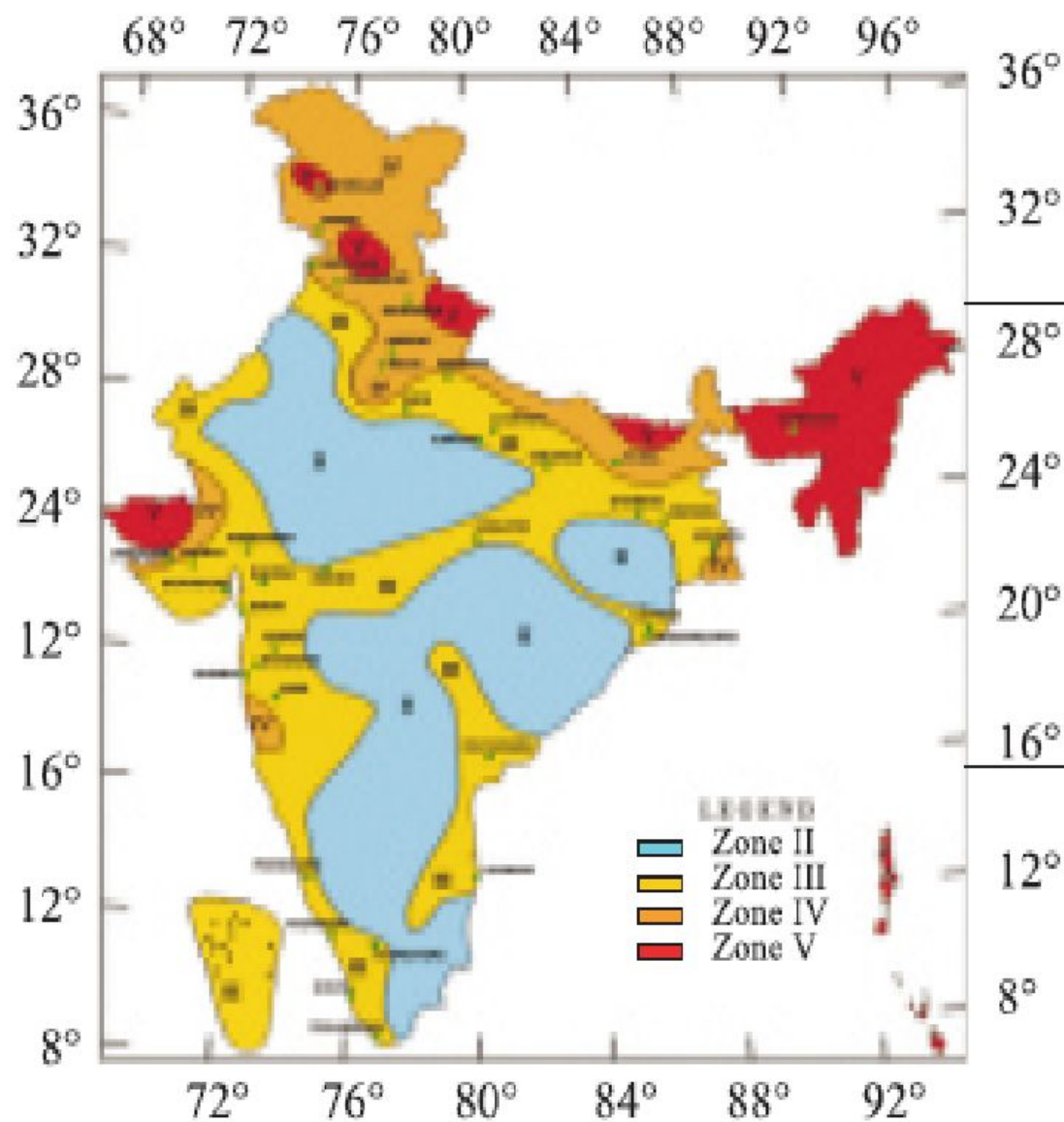
The largest earthquake that has been recorded with this system is 9.25

List of significant Earthquakes in India

Year	Location	Magnitude of 6+
1950	Arunachal Pradesh - China Border	8.5
1956	Anjar, Gujarat	7.0
1967	Koyna, Maharashtra	6.5
1975	Kinnaur, Himachal Pradesh	6.2
1988	Manipur - Myanmar Boarder	6.6
1988	Bihar - Nepal Border	6.4
1991	Uttarkashi - Uttar Pradesh Hills	6.0
1993	Latur - Maharashtra	6.3
1997	Jabalpur, Madhya Pradesh	6.0
1999	Chamoli, Uttar Pradesh	6.8
2001	Bhuj, Gujarat	6.9
2005	Muzaffarabad (Pakistan) Impact in Jammu & Kashmir	7.4

Distribution pattern of Earthquakes in India

- India falls quite prominently on the 'Alpine-Himalayan Belt'. This belt is the line along which the Indian plate meets the Eurasian plate.
- This being a convergent plate, the Indian plate is thrusting underneath the Eurasian plate at a speed of 5 cm per year.
- The movement gives rise to tremendous stress which keeps accumulating in the rocks and is released from time to time in the form of earthquakes.



Zone	Magnitude
Zone V	Very High Risk Quakes of Magnitude 8 and greater
Zone IV	High Risk Quakes upto Magnitude 7.9
Zone III	Moderate Risk Quakes upto Magnitude 6.9
Zone II	Seismic Disturbances upto Magnitude 4.9

Source: IS 1893 (Part 1) : 2002 (BIS)