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M.P.A.-1

Understanding Natural Disasters

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By: Kshyama Sagar Meher



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QUESTION PAPER

June – 2023

(Solved)

UNDERSTANDING NATURAL DISASTERS

M.P.A.-1

Time: 2 Hours]

[Maximum Marks: 50

Note: Answer any five questions selecting at least two questions from each section. All questions carry equal marks.

SECTION-I

Q. 1. Analyse the regional and seasonal disaster profile of India.

Ans. Ref. See Chapter-1, Page No. 3, 'Disaster Profile of India: Regional and Seasonal'.

Q. 2. Write a note on the causes and impact of floods.

Ans. Ref. See Chapter-3, Page No. 14, 'Causes and Impacts'.

Q. 3. Examine the cyclone warning and forecasting system in India.

Ans. Ref. See Chapter-7, Page No. 49, 'Cyclone Warning and Forecasting System'.

Q. 4. Discuss the hazards and impact associated with an earthquake.

Ans. Ref. See Chapter-9, Page No. 66, 'Hazards and Impacts Associated with an Earthquake'.

Q. 5. Write short notes on each of the following:

(a) Space and time characteristics of drought.

Ans. Ref. See Chapter-5, Page No. 28, 'Space and Time Characteristics of Drought'.

(b) Disaster Management: Financial Arrangements.

Ans. Ref. See Chapter-2, Page No. 9, 'Disaster Management: Financial Arrangements'.

SECTION-II

Q. 6. Explain landslide disaster management in India.

Ans. Ref. See Chapter-11, Page No. 86, 'Landslide Disaster Management in India'.

Q. 7. Highlight upon the essential precautions to be taken in avalanche prone areas.

Ans. Ref. See Chapter-14, Page No. 109, 'Essential Precautions' and 'While on the Move in Avalanche Prone Area'.

Q. 8. Discuss the causes and impacts of heat waves.

Ans. Ref. See Chapter-17, Page No. 129, 'Causes and Impacts'.

Q. 9. Analyse the impact of global warming on:

(a) Agriculture, and

(b) Terrestrial ecosystem.

Ans. Ref. See Chapter-18, Page No. 137, 'Impacts of Global Warming/Climate Change'.

Q. 10. Write short notes on the following:

(a) Types of avalanches.

Ans. Ref. See Chapter-13, Page No. 98, 'Types of Avalanches'.

(b) Sea level rise : Response and strategies.

Ans. Ref. See Chapter-19, Page No. 147, 'Response Strategies'.



QUESTION PAPER

December – 2022

(Solved)

UNDERSTANDING NATURAL DISASTERS

M.P.A.-1

Time: 2 Hours]

[Maximum Marks: 50

Note: Answer any five questions selecting at least two questions from each section. All questions carry equal marks.

SECTION - I

Q. 1. Describe the meaning and types of natural disasters in India.

Ans. Ref. See Chapter-1, Page No. 1, 'Natural Disasters: Meaning and Nature' and 'Types of Natural Disasters in India'.

Q. 2. Explain the organisational structure of disaster management in India at the central and state levels.

Ans. Ref. See Chapter-2, Page No. 7, 'At the Central Level' and Page No. 8, 'At the State Level'.

Q. 3. What are the different types of droughts?

Ans. Ref. See Chapter-5, Page No. 27, 'Types of Droughts'.

Q. 4. Write a note on cyclone formation and structure.

Ans. Ref. See Chapter-7, Page No. 46, 'Cyclone Formation and Structure'.

Q. 5. Discuss the measures taken up by state government in post-earthquake, 1997 in Jabalpur.

Ans. Earthquakes takes heavy toll of life and property. Higher losses due to an earthquake are due to a combination of topography, frequent earthquake-related ground failures and the high population density. Earthquake losses also depend on construction practices and maintenance. Losses also depend on the time and season of occurrence of an earthquake. For example, the Jabalpur earthquake (May 23, 1997) and the Latur earthquake (September 30, 1993) had the magnitudes of the same order viz., 6.1 and 6.4 respectively, but 39 people lost their lives

in Jabalpur and 8000 people died in Latur. This is mainly because in Jabalpur, people were sleeping outdoors at the time of earthquake occurrence, while in Latur people were sleeping indoors in poorly built houses, built by stones and mud with very heavy mud roofs.

Also Ref. See Chapter-9, Page No. 67, 'Lessons Learnt'.

SECTION – II

Q. 6. Write a note on Landslides in Shivalik Hills.

Ans. Ref. See Chapter-12, Page No. 92, 'Landslides in Shivalik Hills'.

Q. 7. Explain the Avalanche Hazard Mitigation and Management Plans.

Ans. Ref. See Chapter-13, Page No. 99, 'Avalanche Hazard Mitigation and Management Plans'.

Q. 8. Explain the Volcanic Hazard Monitoring System.

Ans. Ref. See Chapter-15, Page No. 115, 'Hazard Monitoring'.

Q. 9. Highlight the causes of sea level rise.

Ans. Ref. See Chapter-19, Page No. 142, 'Sea Level Change: Causes'.

Q. 10. What are the reasons and impacts of changes in atmospheric ozone?

Ans. Ref. See Chapter-20, Page No. 152, 'Depletion (Loss) of Stratospheric Ozone' and 'Atmospheric Ozone'.

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Sample Preview of The Chapter

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UNDERSTANDING NATURAL DISASTERS

Understanding Natural Disasters



INTRODUCTION

Natural disasters cause considerable destruction, injuries and deaths. They derail normal life and the process of development. India is vulnerable to natural disasters because of the geo-climatic conditions. Floods and high winds account for about 60 per cent of all disasters. About 54 per cent of the India's landmass is vulnerable to earthquakes. In this chapter, we will know the meaning and nature of natural disasters.

CHAPTER AT A GLANCE

NATURAL DISASTERS: MEANING AND NATURE

Disaster denotes any extreme event, be it natural or man-made, which causes loss of life, property, infrastructure, essential services and means of livelihood to an extent that it becomes difficult to cope with. The United Nations defines natural disasters as the occurrence of a sudden or major misfortune, which disrupts the basic fabric and normal functioning of a society. The severity of a disaster is assessed on the basis of disruption to the normal pattern of life; impacts like loss of life and property, injury, hardship and adverse effects on health; community needs, specially shelter, food, clothing, medical assistance and social care; damage to infrastructure, buildings, communications and the requirements of rehabilitation. Poverty, high population density, weak infrastructure, proximity to river, sea or mountains, lack of cooperation within the community and poor governance increase the misery of the affected community.

TYPES OF NATURAL DISASTERS IN INDIA

India is vulnerable to a variety of disastrous events of geological, oceanic or climatic origin. The natural disasters expected in India on the basis of their origin are:

Wind and/or Water related natural disasters: Floods, droughts, cyclones and sunami.

Climate Related Disasters: Heat and cold waves, global warming, sea level rise and ozone depletion.

Mountain Area Disasters: Landslides and snow avalanches.

Geological Disasters: Earthquakes and volcanic eruptions.

(i) Earthquake: Earthquake happens due to a sudden geological event below the surface of the earth generating waves that travel far and wide and cause vertical and horizontal vibrations. It causes destruction. The severity of its impact depends on the magnitude of the earthquake, which depends on the amount of energy released at the spot, where the geological event took place. India is highly vulnerable to earthquakes.

Table: Damaging Earthquakes in India since 1950

Year	Region	Deaths
1950	Assam	1500
1988	N.Bihar	1,300
1993	Marathwada	10,000
2001	Gujarat	18,250

(ii) Volcanic Eruption: Volcano is like a vent or chimney, to the earth's surface, from a reservoir of molten rock, called magma, deep in the crust of the earth. Volcanoes do not always emit lava, steam or smoke. Many volcanoes remain asleep for decades or even longer. Sleeping volcanoes erupt suddenly. Short-term forecasts within hours or days may be made through volcano monitoring techniques. India is not much affected due to volcanoes. Two volcanoes in Indian territory are Narcondam and Barren Island, both in the Andamans, which have not caused any major damage.

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(iii) Landslides: Landslides are the mass movement of rock debris or mud down a slope under the influence of gravity dislodges earth material or because of heavy rainstorms, earthquakes and volcanic eruptions. Landslides are caused by poor ground conditions, geomorphic phenomena, heavy rainfall, earthquakes or undercutting of the base of slopes by rivers and quite often due to heavy spells of rainfall. In mountainous areas, landslides destroy the infrastructure, agriculture and dwellings, resulting in considerable loss of life and property besides blocking vital roads.

(iv) Snow Avalanche: Avalanche refers to the event in which a large mass of snow, ice, rock or other material moves swiftly down a mountain side or over a precipice and crushes everything on its path. Avalanche happens when the large mass of snow, ice and rock overcomes the frictional resistance of the sloping surface, either due to rain, melting of ice base or vibrations of any kind. Landslides and avalanches are events of mountain regions and are similar in nature and impact. The difference is that landslide cause fall of rock, soil and mud whereas avalanche involves snow, ice and rock. Landslides occur in smaller hills or rocky slopes but avalanches happen in high mountains with abundance of snow.

(v) Tsunami: Tsunami refers to sea waves generated by undersea earthquakes. Seawater moves in a violent and sudden motion ultimately breaking over land even at very long distances with great destructive power. The coasts are hit by very high waves of water, but high seas do not see much impact. Thus, tsunami does not affect ships on the high seas. Undersea earthquake causes abrupt vertical movement of ocean floor generating waves, which travel at high speed in the ocean and as they approach land, their speed decreases, while their height increases. It can cause large scale destruction to coastal areas.

(vi) Cyclone: Cyclones are destructive winds and copious rainfall, which causes flooding. Winds can exceed speeds of over 120 kmph forcing sea-water to accumulate ahead of the cyclone as it moves towards the coast. The accumulated enormous mass of sea-water strikes the coast as a giant sea wave with torrential rains and very strong winds. It causes widespread devastation to coastlines. This is also called hurricanes in America and typhoons in Japan. In India, there are two cyclone seasons — Pre-monsoon (April and May) and Post-monsoon (October and November). The east coast of India is more vulnerable to cyclones than the west coast.

(vii) Flood: Flood means inundation or accumulation of water due to an imbalance between inflow and outflow of water. Floods are caused by heavy rains, dam failures, rapid snow melts, river blockages or even bursting of water mains. Floods cause damage, deaths and injuries and create problems in drinking water supply and food shortages. About 40 million hectare area in India is vulnerable to floods. Floods can be flash floods, river floods and coastal floods. Flash floods happen in hill areas, when sudden very heavy rain over a limited area causes strong flow. Flash floods also happen when a temporary blockage in hilly areas impounds water, which when released suddenly creates the havoc. River floods happen due to heavy inflow of water from heavy rainfall, snowmelt and short intense storms. Flood in rivers is also caused by inadequate capacity within the banks of the river to contain high flows, riverbank erosion and silting of riverbeds, synchronisation of flood in the main and tributary rivers and flow retardation because of tidal and backwater effects. Coastal floods are caused because of tsunami or heavy rainfall from cyclones and the storm surge associated with a cyclone. High tide aggravates the situation.

(viii) Drought: Drought means a temporary reduction in water availability causing disastrous and long-term socio-economic impacts, which may last for months and years. Adverse water balance or scarcity of water to satisfy the normal needs of agriculture, livestock or human population cause drought. Prolonged drought can cause aridity or even desertification. Droughts are three types:

(i) Meteorological Drought: It happens when the monthly or seasonal rainfall over an area is appreciably below normal.

(ii) Hydrological Drought: It occurs when the water scarcity over an area causes reduction in the available water in surface water bodies and the water table also recedes. Prolonged meteorological drought causes hydrological Drought.

(iii) Agricultural Drought: It happens when the water scarcity causes partial or total loss of crops and affects agricultural activity.

(ix) Heat Wave and Cold Wave: Heat wave and cold wave are spells of extreme surface air temperatures over a region for rather prolonged periods of several days or few weeks. Heat wave is caused when the maximum temperature overshoots in the hot weather months (March to June). Cold wave

is caused when the minimum temperature falls appreciably below normal. Both the phenomena lead to very considerable discomfort, illness, epidemics and deaths.

(x) Global Warming: Global warming refers to increase in greenhouse gases (carbon dioxide, methane, nitrous oxide and others) retarding cooling of the earth's surface at nights and causing increase in the minimum temperature globally. Global warming is a natural disaster because it involves the atmosphere in general and is global in nature and its impacts are global even if the human activity is local or regional.

(xi) Sea Level Rise: Sea level rises because of the melting of glaciers, permafrost, ice caps on the poles and mountain peaks and increased temperature. It poses serious problems to the inhabitants of coastal and island areas and affects their socio-economic well-being. Sea level rise threatens the very existence of many islands and coastal towns and cities.

(xii) Ozone Depletion: Ozone depletion lowers the total amount of ozone in Earth's atmosphere (the ozone layer) and a much larger springtime decrease in stratospheric ozone around Earth's polar regions. The main cause of ozone depletion is manufactured chemicals, especially manufactured halocarbon refrigerants, solvents, propellants and foam-blowing agents. Ozone layer saves human, animal and plant life on the earth from the harmful effects of ultraviolet radiation.

DISASTER PROFILE OF INDIA: REGIONAL AND SEASONAL

India is vulnerable to various types of natural disasters due to widely varying climatic, geographical and geological conditions.

(i) Regional Disaster Profile of India: North India including the Himalyan mountainous region and the Indo-Gangetic plains has highly variable topography. It has the tallest mountains and perennial rivers. It is also the zone of collision of two major tectonic plates — the Indian plate and the Asian plate. North India is also characterised by spells of hot, cold and rainy weather and these attributes can vary within wide limits creating unusual situations. The region is vulnerable to natural disasters like earthquakes, landslides, avalanches, floods, droughts, heat and cold waves.

East and North East India are also prone to earthquakes, landslides, floods and droughts. West Bengal gets affected by cyclones. The central parts also face a highly variable rainfall regime in time and space. Floods and droughts are the major disasters. Goa and

Maharashtra suffer from heavy to very heavy rain fury due to the combined effect of depressions and the topography of the Western ghats. Odisha also suffers considerably from heat waves.

The peninsular India including Andhra Pradesh, Karnataka, Tamil Nadu and Kerala suffers from cyclones, floods and droughts. Telangana and Rayalaseema are highly rain-deficient areas and suffer drought conditions often. Andaman and Nicobar Islands are vulnerable to earthquakes, heavy rains and occasionally cyclones. Lakshadweep islands are coral islands and thus are only a few centimeters above the sea level.

(ii) Seasonal Disaster Profile of India: India has four distinct seasons:

- (i) Winter season (December, January and February);
- (ii) Pre-monsoon or Hot Weather season (March, April and May);
- (iii) Monsoon season (June to September) and
- (iv) Post-monsoon season (October, November).

(i) Winter Season (December, January and February): Himalayan ranges get copious amounts of rain and snow during this season. The weather phenomena called 'western disturbances' brings in strong winds with rain. The mountainous areas are also prone to snow avalanches and landslides. Cold waves occur usually. Heavy fog affects aviation and hail damages crops and orchards in the plains of the northern India.

(ii) Pre-monsoon or Hot Weather Season (March to May): Cyclones over the Bay of Bengal and the Arabian Sea affect the coastal region. The eastern coast is more vulnerable to cyclones. The cyclones pose serious risk to the oil exploration outfits in the Arabian Sea. Cyclone also affects Gujarat adversely and causes rain and floods in Rajasthan.

(iii) Monsoon Season (June to September): The entire country faces floods during this period. Landslides are also a common feature in hilly areas. Some areas also face drought due to scanty rainfall.

(iv) Post Monsoon Season (October and November): The cyclonic activity is usually more pronounced during this period as compared to that in the pre-monsoon season. The southern states of Andhra Pradesh (coastal areas), Karnataka, Tamil Nadu and Kerala receive considerable rainfall from the northeast monsoon and face floods.

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EFFECTS OF DISASTERS

Disasters cause enormous damage and deaths, destroy food sources, spread disease and epidemics and create unemployment. They unsettle the entire rhythm of life of the affected community. Enormous physical, financial and motivational resources bring the impoverished and demoralized community back on rails. The direct effects are damage to houses, equipment, crops, infrastructure (bridges and roads) and loss of life. Malnutrition, disease and migration are the indirect effects. Emergency relief costs, care for evacuees, clean-up after flood or clearance after landslides or avalanches and wages and sales lost due to business interruption are main economic impacts.

Disasters also causes long-term problems like deforestation, desertification and soil degradation over vast stretches of land. Agriculture suffers severe setback. Affected people migrate to other places. It affects social life and economic activities. It halts developmental activities. Physically weak groups including children, pregnant and lactating mothers, the aged and infirm suffer the most such circumstances.

EFFORTS TO MITIGATE DISASTERS

Mitigation activities or the efforts to reduce the adverse effects of a disaster on people, structures and socio-economic systems during and after a disaster can be structural and non-structural. The structural activities are physical steps like construction of dams, bridges, disaster-resistant buildings, to protect against disasters. Non-structural activities are development of land-use plans, zoning laws, training and warning.

The success of mitigation strategy depends on the support of all stakeholders including the people, governments, non-governmental organisations, academic and research organisations, and the media. 'Culture of prevention' and 'Spirit of cooperation' through awareness, knowledge, training and proper use of new technologies can minimize the impact of disasters.

National Disaster Management Authority has been constituted under the Chairmanship of the Prime Minister. The state governments have established similar disaster management authorities at the state level. At global level, the UN General Assembly in 1989 launched a far-reaching global programme to save lives and reduce the adverse impacts of natural disasters. The decade 1990-2000 was declared the International Decade for Natural Disaster Reduction (IDNDR). IDNDR plans that all countries should develop and prepare comprehensive national assessments of risks

from natural hazards and these assessments should be considered in preparing development and mitigation plans.

After completion of IDNDR programme in 2000, the International Strategy for Disaster Reduction (ISDR) was adopted to upgrade the awareness into realistic action plans; ensuring commitment from public authorities; creating disaster conscious and disaster resistant communities thus reducing loss of lives and socio-economic losses.

UNIT END QUESTIONS

Q. 1. List the natural disaster phenomena likely in the Indian subcontinent. Describe the regional and seasonal profile of any two disasters.

Ans. India has been traditionally vulnerable to natural disasters because its unique geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides have been a recurrent phenomenon. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought. In the decade 1990-2000, an average of about 4344 people lost their lives and about 30 million people were affected by disasters every year. The loss in terms of private, community and public assets has been astronomical.

Hot Waves: and cold waves are two disasters that have affected parts of the country.

Hot waves In recent days, India has got highly affected by a new form of natural calamities i.e. flowing of hot waves again in the east coast, killing the thousands of people in the Northern and Eastern parts of the country like, Uttar Pradesh, Bihar, Rajasthan, Gujarat, Orissa and Andhra Pradesh. The flow of hot waves is also known as 'Sun-stroke,' which in fact, is common in our country during summer (April to June). In Odisha, alone about 151 people died of 'Sun-stock' in 1999. The worst sufferers are physically weaker persons, Old men and women and the children.

Cold Waves: The incidents of death due to cold waves during winter (November to February) occurs in higher and lesser Himalayas especially in the States of Uttaranchal, Sikkim, Himachal Pradesh and Northern Parts of West Bengal including Darjeeling.

Q. 2. Prepare a list of natural disasters, which are affecting your area and explain their impacts.

Ans. Due to low pressure in the atmosphere and frequent formation of whirls; cyclones take place