Department of Civil Engineering

Course File

Disaster Management and Mitigation

(Course Code: CE862PE)

IV B.Tech II Semester

2023-24

Prepared by
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DISASTER MANAGEMENT and MITIGATION

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Int. Marks: 25 Ext. Marks: 75 Total Marks:100

IV Year B.Tech. CE - II Sem **L T/P/D C**
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(CE862PE) DISASTER MANAGEMENT AND MITIGATION

(PROFESSIONAL ELECTIVE-II)

UNIT-I:

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress &EnvironmentalDisasters.Differentapproaches&relationwithhumanEcology-LandscapeApproach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

UNIT-II:

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards - Planetary Hazards / Disasters - Extra Planetary Hazards /disasters-Planetary Hazards-Endogenous Hazards-Exogenous Hazards

UNIT-III:

EndogenousHazards-Volcaniceruption-Earthquakes-landslides-VolcanicHazards/Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmentalimpactsofvolcaniceruptions-EarthquakeHazards/disasters-CausesofEarthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes – Earthquake Hazards in India- Human adjustment, perception & mitigation of earthquake.

UNIT-IV:

Exogenous hazards / disasters - Infrequent events - Cumulative atmospheric hazards / disasters infrequent events: Cyclones -Lightning -Hailstorms

Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms(causes, distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/disasters :- Floods - Droughts - Cold waves - Heal waves Floods :- Causes of floods – Flood hazards India - Flood control measures (Human adjustment, perception & mitigation) Droughts :-Impacts of droughts - Drought hazards in India - Drought control measures - Extra PlanetaryHazards/Disasters-maninducedHazards/Disasters-Physicalhazards/Disasters-Soilerosion

Soil Erosion: Mechanics & forms of Soil Erosion - Factors 7 causes of Soil Erosion – Conservation measures of Soil Erosion.

Chemical hazards/disasters: Release of toxic chemicals, nuclear explosion–Sedimentation processes Sedimentation processes. Global Sedimentation problems - Regional Sedimentationproblems-Sedimentation&Environmentalproblems-CorrectivemeasuresofErosion&Sedimentation

Biological hazards/disasters: Population Explosion.

UNIT-V:

Emerging approaches in Disaster Management-Three stages

1. Pre-disaster Stage(preparedness)
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

Text Books:

1. Disaster Mitigation: Experiences and Reflections by Pradeep Sahni
2. NaturalHazards&DisastersbyDonaldHyndman&DavidHyndman-CengageLearning

Reference Books:

1. R.B.Singh(Ed)EnvironmentalGeography,HeritagePublishersNewDelhi,1990
2. Savinder Singh Environmental Geography, Prayag Pustak Bhawann1997
3. Kates,B.I&White,G.FTheEnvironmentasHazards,oxford,NewYork,1978
4. R.B.Singh(Ed)DisasterManagement,RawatPublication,NewDelhi,2000
5. H.K.Gupta(Ed)DisasterManagement,UniversitiesPress,India,2003
6. R. B. Singh, Space Technology for Disaster Mitigation in India (INCED), University ofTokyo,1994
7. Dr.Satender,DisasterManagementinHills,ConceptPublishingCo.,NewDelhi,2003
8. A. S. Arya Action Plan For Earthquake, Disaster, Mitigation in V. K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994
9. R.K. Bhandani An over view on Natural& Manmade Disaster &their Reduction, CSIR, New Delhi
10. M. C. Gupta Manuals on Natural Disaster Management in india, National Centre for Disaster Management, IIPA,NewDelhi,2001.

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TIME TABLE

IV B.Tech. II Semester

Day/Hour	9:30-10:20	10:20-11:10	11:20-12:10	12:10-1:00	1:40-2:25	2:25-3:10	3:15-4:00
Monday			DMM				
Tuesday	DMM						
Wednesday		DMM					
Thursday	DMM						
Friday			DMM				
Saturday							

Department of Civil Engineering

Vision of the Institute

To be a premier Institute in the country and region for the study of Engineering, Technology and Management by maintaining high academic standards which promotes the analytical thinking and independent judgment among the prime stakeholders, enabling them to function responsibly in the globalized society.

Mission of the Institute

To be a world-class Institute, achieving excellence in teaching, research and consultancy in cutting-edge Technologies and be in the service of society in promoting continued education in Engineering, Technology and Management.

Quality Policy

To ensure high standards in imparting professional education by providing world-class infrastructure, top-quality-faculty, and decent work culture to sculpt the students into Socially Responsible Professionals through creative team-work, innovation, and research.

Vision of the Department

To impart knowledge, skill, and excellence in civil engineering with a global perspective to enable the students as competent, qualitative & ethically strong engineers with an intuition to improve quality of life for the benefit of the society.

Mission of the Department

- To train the students in the civil engineering domain.
- To develop knowledge and skill to solve regional and global problems.
- To transform into qualitative and ethically strong professional engineers through research and Development.

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Program Educational Objectives (B.Tech. – CE)

Graduates will be able to

PEO1: To provide knowledge in mathematics, science, and engineering principles for a successful Career in sectors of civil engineering and allied industry and/or higher education.
PEO2: To develop an ability to identify, formulate, solve problems along with adequate analysis, Design, synthesizing and interpretation skills in civil engineering systems.
PEO3: To exhibit professionalism, ethics, communication skills and team work in their profession and engaged in lifelong learning of contemporary civil engineering trends.

Program Outcomes (B.Tech. – CE)

At the end of the Program, a graduate will have the ability to

PO 1: An ability to apply knowledge of mathematics, science, and engineering
PO 2: An ability to design and conduct experiments, as well as to analyze and interpret data
PO 3: An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability
PO 4: An ability to function on multidisciplinary teams
PO 5: An ability to identify, formulates, and solves engineering problems
PO 6: An understanding of professional and ethical responsibility
PO 7: An ability to communicate effectively
PO 8: The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
PO 9: A recognition of the need for, and an ability to engage in lifelong learning
PO 10: Knowledge of contemporary issues.
PO 11: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
PO 12: An ability to carry out research in different areas of Civil Engineering including latest technology like GIS/Remote Sensing resulting in design, development, analyze and journal publications and technology development.

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COURSE OBJECTIVES

On completion of this Subject/Course the student shall be able to:

S.No	Objectives
1	To provide the concept and characteristics of disaster management system.
2	To know the types of environmental hazards& disasters.
3	To have the knowledge of endogenous hazards and measures to control them.
4	To impart the knowledge of exogenous hazards and measures to control them.
5	To enable the students to understand the concept of emerging approaches in disaster management.

COURSE OUTCOMES

The expected outcomes of the Course/Subject are:

S.No	Outcomes
1.	Understand the need of disaster management system in India.
2.	Have the thorough knowledge of environmental hazards and disasters.
3.	Get the complete concept of endogenous hazards and their mitigation measures.
4.	Know the principles and measures to control exogenous hazards.
5.	Have the in-depth knowledge of emerging approaches in disaster management.

Signature of faculty

Note: Please refer to Bloom's Taxonomy, to know the illustrative verbs that can be used to state the outcomes.

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GUIDELINES TO STUDY THE COURSE / SUBJECT

Course Design and Delivery System (CDD):

- The Course syllabus is written into number of learning objectives and outcomes.
- Every student will be given an assessment plan, criteria for assessment, scheme of evaluation and grading method.
- The Learning Process will be carried out through assessments of Knowledge, Skills and Attitude by various methods and the students will be given guidance to refer to the text books, reference books, journals, etc.

The faculty be able to –

- Understand the principles of Learning
- Understand the psychology of students
- Develop instructional objectives for a given topic
- Prepare course, unit and lesson plans
- Understand different methods of teaching and learning
- Use appropriate teaching and learning aids
- Plan and deliver lectures effectively
- Provide feedback to students using various methods of Assessments and tools of Evaluation
- Act as a guide, advisor, counselor, facilitator, motivator and not just as a teacher alone

Signature of HOD

Date:

Signature of faculty

Date:

Department of Civil Engineering

COURSE SCHEDULE

The Schedule for the whole Course / Subject is:

S. No.	Description	Duration (Date)		Total No. of Periods
		From	To	
1.	**UNIT - I:** **Environmental Hazards & Disasters:** Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.	15/11/2023	08/12/2023	14
2.	**UNIT - II:** **Types of Environmental hazards & Disasters:** Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards - Planetary Hazards / Disasters - Extra Planetary Hazards / disasters - Planetary Hazards - Endogenous Hazards - Exogenous Hazards.	11/12/2023	28/12/2023	14
3.	**UNIT - III:** **Endogenous Hazards:** Volcanic eruption - Earthquakes - landslides - Volcanic Hazards / Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards / disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - Human adjustment, perception & mitigation of earthquake.	29/12/2023	29/01/2024	15
4.	**UNIT - IV:** **Exogenous hazards / disasters:** Infrequent events - Cumulative atmospheric hazards / disasters Infrequent events: Cyclones - Lightning – Hailstorms **Cyclones:** Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes, distribution human adjustment, perception & mitigation) **Cumulative atmospheric hazards/ disasters :-** Floods - Droughts - Cold waves - **Heal waves Floods :-** Causes of floods - Flood hazards India - Flood control measures (Human adjustment, perception & mitigation) Droughts :- Impacts of droughts - Drought hazards in India - Drought control measures - Extra Planetary Hazards / Disasters - man induced Hazards / Disasters - Physical hazards / Disasters - Soil erosion **Soil Erosion:** Mechanics & forms of Soil Erosion - Factors 7 causes of Soil Erosion - Conservation measures of Soil Erosion. **Chemical hazards / disasters:** Release of toxic chemicals, nuclear explosion – Sedimentation processes Sedimentation processes. Global Sedimentation problems - Regional Sedimentation problems - Sedimentation	30/01/2024	21/02/2024	15

	&Environmental problems - Corrective measures of Erosion & Sedimentation. **Biological hazards / disasters:** Population Explosion.			
5.	**UNIT - V:** **Emerging approaches in Disaster Management:** Three stages 1. Pre-disaster Stage (preparedness) 2. Emergency Stage 3. Post Disaster stage - Rehabilitation	22/02/2024	04/04/2024	13

Total No. of Instructional periods available for the course: 71 Hours

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SCHEDULE OF INSTRUCTIONS - COURSE PLAN

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Textbook, Journal)
1.	1	15.11.2023	1	Introduction to Disaster Management and mitigation	1,2,3,4,5 1,2,3,4,5	H. K. Gupta (Ed) Disaster Management and Mitigation
	2	16.11.2023	1	Unit-I Introduction to Environmental Hazards & Disasters	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	3	17.11.2023	1	Meaning of Environmental hazards	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	4	20.11.2023	1	Meaning of Environmental disaster, Meaning of Environmental stress	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	5	21.11.2023	1	Concept of Environmental Hazards	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	6&7	22.11.2023	2	Concept of Environmental stress and its types	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	8	23.11.2023	1	Concept of Environmental Disasters	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	9	24.11.2023	1	Different approaches & relation with human Ecology	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	10	28.11.2023	1	Landscape approach and relation with human ecology	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	11	04.12.2023	1	Ecosystem approach and relation with human ecology	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	12	05.12.2023	1	Perception approach and relation with human ecology	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	13	06.12.2023	1	Human ecology & its	1	H. K. Gupta (Ed)

				application in geographical researches	1	Disaster Management and Mitigation
	14	08.12.2023	1	Human ecology & its application in geographical researches	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
2.	1	11.12.2023	2	Unit-II Introduction to Types of Environmental Hazards and Disasters	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	2	12.12.2023	1	Natural hazards	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	3	13.12.2023	1	Natural Disasters	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	4	14.12.2023	1	Man induced hazards	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	5	15.12.2023	2	Man induced Disasters	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	6	18.12.2023	1	Planetary hazards	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	7	19.12.2023	1	Planetary disasters	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	8	20.12.2023	1	Extra planetary hazards	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	9	21.12.2023	1	Extra planetary disasters	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	10	22.12.2023	1	Endogenous Hazards	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	11	27.12.2023	1	Endogenous disasters	2 2	H. K. Gupta (Ed) Disaster Management

						and Mitigation
	12	28.12.2023	1	Exogenous hazards and disasters	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
3.	1	29.12.2023	1	Unit-III Endogenous Hazards	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	2	02.01.2024	1	Volcanoes- Causes and its types	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	3	03.01.2024	1	Volcanoes- Causes and its types	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	4	04.01.2024	1	Volcanic eruption	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	5	05.01.2024	1	Distribution of Volcanoes	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	6	09.01.2024	1	Effects of Volcanoes	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	7	10.01.2024	1	Earthquakes- its Causes	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	8	17.01.2024	1	Effects of Earthquakes	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	9	18.01.2024	1	Distribution of Earthquakes	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	10	19.01.2024	1	Revision of Unit-I & II	1,2,3 1,2,3	H. K. Gupta (Ed) Disaster Management and Mitigation
	11	22.01.20274	1	Revision of Unit-III (Half Syllabus)	1,2,3 1,2,3	H. K. Gupta (Ed) Disaster Management and Mitigation

	12	23.01.2024	1	Earthquakes hazards in India	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	13	24.01.2024	1	Human adjustment, perception & mitigation of earthquake	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	14	25.01.2024	1	Landslides- Causes (Naturally and Man induced)	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	15	29.01.2024	1	Mitigation measures	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
4.	1	30.01.2024	1	Unit-IV Exogenous Hazards or Disasters	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	2	01.02.2024	1	Infrequent Events- Cyclones, Lightning and Hail storms	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	3	02.02.2024	1	Types of Cyclones	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	4	05.02.2024	1	causes and effects of cyclones	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	5	06.02.2024	1	distribution and mitigation measures of cyclones	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	6	07.02.2024	2	Lightning and Hailstorms- causes and effects	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	7	08.02.2024	1	Cumulative atmospheric Hazards or Disasters	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	8	09.02.2024	1	Floods- Causes and Effects	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	9	12.02.2024	1	Distribution and mitigation	4	H. K. Gupta (Ed)

				measures of floods	4	Disaster Management and Mitigation
	10	13.02.2024	1	Droughts- Types, Causes and effects	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	11	14.02.2024	1	Physical Hazards/Disasters- Soil Erosion	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	12	15.02.2024	1	Sedimentation- Process, Problems and management	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	13	16.02.2024	1	Chemical Hazards/Disasters- Release of toxic chemicals	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	14	20.02.2024	1	Nuclear Explosion	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	15	21.02.2024	1	Biological hazards / disasters: Population Explosion	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
5.	1	22.02.2024	1	Unit-V Emerging approaches in Disaster Management	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
	2	27.02.2024	1	Pre disaster stage- Different stages	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
	3	29.02.2024	1	Mitigation planning in pre disaster stage	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
	4	05.03.2024	1	Role of Technology in disaster management	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
	5	07.03.2024	1	Emergency Stage- brief note	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
	6	12.03.2024	1	Impact of disasters to life and environment	5 5	H. K. Gupta (Ed) Disaster Management

						and Mitigation
	7	14.03.2024	2	Impact of disasters to life and environment	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
	8	19.03.2024	1	Post Disaster stage - Rehabilitation	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
	9	26.03.2024	1	Brief note on post disaster stage	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
	10	27.03.2024	1	Brief note on post disaster stage	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
	11	02.04.2024	1	Role of district and state administration in the disaster management process	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
	12	03.04.2024	1	Role of district and state administration in the disaster management process	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
	13	04.04.2024	1	Mitigation actions to be taken during post disaster stage	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation

Signature of HOD

Date:

Signature of faculty

Date:

Note:

1. Ensure that all topics specified in the course are mentioned.
2. Additional topics covered, if any, may also be specified in bold.
3. Mention the corresponding course objective and outcome numbers against each topic.

Department of Civil Engineering

SCHEDULE OF INSTRUCTIONS – UNIT-I PLAN

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Textbook, Journal)
1.	1	15.11.2023	1	Introduction to Disaster Management and mitigation	1,2,3,4,5 1,2,3,4,5	H. K. Gupta (Ed) Disaster Management and Mitigation
	2	16.11.2023	1	Unit-I Introduction to Environmental Hazards & Disasters	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	3	17.11.2023	1	Meaning of Environmental hazards	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	4	20.11.2023	1	Meaning of Environmental disaster, Meaning of Environmental stress	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	5	21.11.2023	1	Concept of Environmental Hazards	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	6&7	22.11.2023	2	Concept of Environmental stress and its types	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	8	23.11.2023	1	Concept of Environmental Disasters	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	9	24.11.2023	1	Different approaches & relation with human Ecology	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	10	28.11.2023	1	Landscape approach and relation with human ecology	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	11	04.12.2023	1	Ecosystem approach and relation with human ecology	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	12	05.12.2023	1	Perception approach and relation with human ecology	1 1	H. K. Gupta (Ed) Disaster Management

						and Mitigation
	13	06.12.2023	1	Human ecology & its application in geographical researches	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	14	08.12.2023	1	Human ecology & its application in geographical researches	1 1	H. K. Gupta (Ed) Disaster Management and Mitigation
	1	15.11.2023	1	Introduction to Disaster Management and mitigation	1,2,3,4,5 1,2,3,4,5	H. K. Gupta (Ed) Disaster Management and Mitigation

Signature of HOD

Date:

Signature of faculty

Date:

Note:

1. Ensure that all topics specified in the course are mentioned.
2. Additional topics covered, if any, may also be specified in bold.
3. Mention the corresponding course objective and outcome numbers against each topic.

Department of Civil Engineering

SCHEDULE OF INSTRUCTIONS – UNIT-II PLAN

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Textbook, Journal)
2.	1	11.12.2023	2	Unit-II Introduction to Types of Environmental Hazards and Disasters	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	2	12.12.2023	1	Natural hazards	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	3	13.12.2023	1	Natural Disasters	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	4	14.12.2023	1	Man induced hazards	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	5	15.12.2023	2	Man induced Disasters	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	6	18.12.2023	1	Planetary hazards	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	7	19.12.2023	1	Planetary disasters	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	8	20.12.2023	1	Extra planetary hazards	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	9	21.12.2023	1	Extra planetary disasters	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	10	22.12.2023	1	Endogenous Hazards	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation
	11	27.12.2023	1	Endogenous disasters	2	H. K. Gupta (Ed) Disaster Management

					2	and Mitigation
	12	28.12.2023	1	Exogenous hazards and disasters	2 2	H. K. Gupta (Ed) Disaster Management and Mitigation

Signature of HOD

Signature of faculty

Date:

Date:

Note:

1. Ensure that all topics specified in the course are mentioned.
2. Additional topics covered, if any, may also be specified in bold.
3. Mention the corresponding course objective and outcome numbers against each topic.

Department of Civil Engineering

SCHEDULE OF INSTRUCTIONS – UNIT-III PLAN

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Textbook, Journal)
3.	1	29.12.2023	1	Unit-III Endogenous Hazards	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	2	02.01.2024	1	Volcanoes- Causes and its types	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	3	03.01.2024	1	Volcanoes- Causes and its types	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	4	04.01.2024	1	Volcanic eruption	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	5	05.01.2024	1	Distribution of Volcanoes	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	6	09.01.2024	1	Effects of Volcanoes	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	7	10.01.2024	1	Earthquakes- its Causes	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	8	17.01.2024	1	Effects of Earthquakes	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	9	18.01.2024	1	Distribution of Earthquakes	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	10	19.01.2024	1	Revision of Unit-I & II	1,2,3 1,2,3	H. K. Gupta (Ed) Disaster Management and Mitigation
	11	22.01.20274	1	Revision of Unit-III (Half Syllabus)	1,2,3 1,2,3	H. K. Gupta (Ed) Disaster Management and Mitigation
	12	23.01.2024	1	Earthquakes hazards in India	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	13	24.01.2024	1	Human adjustment, perception & mitigation of earthquake	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation
	14	25.01.2024	1	Landslides- Causes (Naturally and Man induced)	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation

Department of Civil Engineering

	15	29.01.2024	1	Mitigation measures	3 3	H. K. Gupta (Ed) Disaster Management and Mitigation

Signature of HOD

Date:

Signature of faculty

Date:

Note:

1. Ensure that all topics specified in the course are mentioned.
2. Additional topics covered, if any, may also be specified in bold.
3. Mention the corresponding course objective and outcome numbers against each topic.

Department of Civil Engineering

SCHEDULE OF INSTRUCTIONS – UNIT-IV PLAN

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Textbook, Journal)
4.	1	30.01.2024	1	Unit-IV Exogenous Hazards or Disasters	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	2	01.02.2024	1	Infrequent Events- Cyclones, Lightning and Hail storms	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	3	02.02.2024	1	Types of Cyclones	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	4	05.02.2024	1	causes and effects of cyclones	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	5	06.02.2024	1	distribution and mitigation measures of cyclones	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	6	07.02.2024	2	Lightning and Hailstorms- causes and effects	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	7	08.02.2024	1	Cumulative atmospheric Hazards or Disasters	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	8	09.02.2024	1	Floods- Causes and Effects	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	9	12.02.2024	1	Distribution and mitigation measures of floods	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	10	13.02.2024	1	Droughts- Types, Causes and effects	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	11	14.02.2024	1	Physical Hazards/Disasters- Soil Erosion	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	12	15.02.2024	1	Sedimentation- Process, Problems and management	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	13	16.02.2024	1	Chemical Hazards/Disasters- Release of toxic chemicals	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation
	14	20.02.2024	1	Nuclear Explosion	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation

Department of Civil Engineering

	15	21.02.2024	1	Biological hazards / disasters: Population Explosion	4 4	H. K. Gupta (Ed) Disaster Management and Mitigation

Signature of HOD

Date:

Signature of faculty

Date:

Note:

1. Ensure that all topics specified in the course are mentioned.
2. Additional topics covered, if any, may also be specified in bold.
3. Mention the corresponding course objective and outcome numbers against each topic.

Department of Civil Engineering

SCHEDULE OF INSTRUCTIONS – UNIT-V PLAN

1	22.02.2024	1	Unit-V Emerging approaches in Disaster Management	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
2	27.02.2024	1	Pre disaster stage- Different stages	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
3	29.02.2024	1	Mitigation planning in pre disaster stage	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
4	05.03.2024	1	Role of Technology in disaster management	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
5	07.03.2024	1	Emergency Stage- brief note	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
6	12.03.2024	1	Impact of disasters to life and environment	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
7	14.03.2024	2	Impact of disasters to life and environment	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
8	19.03.2024	1	Post Disaster stage - Rehabilitation	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
9	26.03.2024	1	Brief note on post disaster stage	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
10	27.03.2024	1	Brief note on post disaster stage	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
11	02.04.2024	1	Role of district and state administration in the disaster management process	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation
12	03.04.2024	1	Role of district and state administration in the disaster	5 5	H. K. Gupta (Ed) Disaster Management

			management process		and Mitigation
13	04.04.2024	1	Mitigation actions to be taken during post disaster stage	5 5	H. K. Gupta (Ed) Disaster Management and Mitigation

Signature of HOD

Date:

Signature of faculty

Date:

Note:

1. Ensure that all topics specified in the course are mentioned.
2. Additional topics covered, if any, may also be specified in bold.
3. Mention the corresponding course objective and outcome numbers against each topic.

Department of Civil Engineering

LESSON PLAN (U-I)

Lesson No: 01 & 02 Duration of Lesson: 1hr 40 min

Lesson Title: Introduction to Disaster Management, and Environmental Hazards & Disasters

Instructional / Lesson Objectives:

- To make students understand about environmental hazard and disaster.
- To familiarize students the stress on environment and types of environmental stresses.
- To understand students different approaches related to human ecology.
- To provide information on Human ecology & its application in geographical researches.

Teaching AIDS : Black Board
Time Management of Class :

05 min for taking attendance 80 min for lecture delivery 15 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4& 1, 3...)

Refer assignment – I & tutorial-I sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-I)

Lesson No: 03 & 04 Duration of Lesson: 1hr 40 min

Lesson Title: Meaning of Environmental hazards, Meaning of Environmental disaster, Meaning of Environmental stress

Instructional / Lesson Objectives:

- To make students understand about environmental hazard and disaster.
- To familiarize students the stress on environment and types of environmental stresses.
- To understand students different approaches related to human ecology.
- To provide information on Human ecology & its application in geographical researches.

Teaching AIDS : Black Board
Time Management of Class :

10 min for taking attendance
10 for revision of previous class
70 min for lecture delivery
10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment – I & tutorial-I sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-I)

Lesson No: 05, 06, and 07 Duration of Lesson: 2hr 30 min

Lesson Title: Concept of Environmental Hazards, Environmental stress and its types and, Concept of Environmental Disasters

Instructional / Lesson Objectives:

- To make students understand about environmental hazard and disaster.
- To familiarize students the stress on environment and types of environmental stresses.
- To understand students different approaches related to human ecology.
- To provide information on Human ecology & its application in geographical researches.

Teaching AIDS : Black Board
Time Management of Class :

10 min for taking attendance 10 for revision of previous class 120 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment – I & tutorial-I sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-I)

Lesson No: 08, 09 Duration of Lesson: 1hr 40 min

Lesson Title: Concept of environmental disasters, Different approaches relation with human ecology

Instructional / Lesson Objectives:

- To make students understand about environmental hazard and disaster.
- To familiarize students the stress on environment and types of environmental stresses.
- To understand students different approaches related to human ecology.
- To provide information on Human ecology & its application in geographical researches.

Teaching AIDS : Black Board
Time Management of Class :

05 min for taking attendance 05 for revision of previous class 85 min for lecture delivery 05 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment – I & tutorial-I sheets

Signature of faculty

Department of Civil Engineering
LESSON PLAN (U-I)

Lesson No: 10, 11 Duration of Lesson: 1hr 40 min

Lesson Title: Landscape approach and relation with human ecology, Ecosystem approach and relation with human ecology

Instructional / Lesson Objectives:

- To make students understand about environmental hazard and disaster.
- To familiarize students the stress on environment and types of environmental stresses.
- To understand students different approaches related to human ecology.
- To provide information on Human ecology & its application in geographical researches.

Teaching AIDS : Black Board
Time Management of Class :

10 min for taking attendance 10 for revision of previous class 70 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment – I & tutorial-I sheets

Signature of faculty

Department of Civil Engineering
LESSON PLAN (U-I)

Lesson No: 12, 13 Duration of Lesson: 1hr 40 min

Lesson Title: Perception approach Human ecology & its application in geographical researches

Instructional / Lesson Objectives:

- To make students understand about environmental hazard and disaster.
- To familiarize students the stress on environment and types of environmental stresses.
- To understand students different approaches related to human ecology.
- To provide information on Human ecology & its application in geographical researches.

Teaching AIDS : Black Board
Time Management of Class :

10 min for taking attendance 10 for revision of previous class 70 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment – I & tutorial-I sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-I)

Lesson No: 14 Duration of Lesson: 50 min

Lesson Title: Human ecology & its application in geographical researches

Instructional / Lesson Objectives:

- To make students understand about environmental hazard and disaster.
- To familiarize students the stress on environment and types of environmental stresses.
- To understand students different approaches related to human ecology.
- To provide information on Human ecology & its application in geographical researches.

Teaching AIDS : Black Board
Time Management of Class :

10 min for taking attendance 30 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment – I & tutorial-I sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-II)

Lesson No: 01, 02 Duration of Lesson: 2hr 30 min

Lesson Title: Introduction to Types of Environmental Hazards and Disasters, Natural hazards

Instructional / Lesson Objectives:

- To make students understand about the types of environmental hazards.
- To familiarize students on different natural and man made hazards.
- To understand students the planetary and extra planetary hazards.
- To provide information about the endogenous and exogenous hazards.

Teaching AIDS : Black Board

Time Management of Class :

10 min for taking attendance 10 for revision of previous class 120 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –II & tutorial-II sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-II)

Lesson No: 03, 04 Duration of Lesson: 1hr 40 min

Lesson Title: Natural Disasters, Man induced hazards

Instructional / Lesson Objectives:

- To make students understand about the types of environmental hazards.
- To familiarize students on different natural and man made hazards.
- To understand students the planetary and extra planetary hazards.
- To provide information about the endogenous and exogenous hazards.

Teaching AIDS : Black Board

Time Management of Class :

10 min for taking attendance
10 for revision of previous class
70 min for lecture delivery
10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –II & tutorial-II sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-II)

Lesson No: 05, 06 Duration of Lesson: 2hr 30 min

Lesson Title: Man induced Disasters, Planetary hazards

Instructional / Lesson Objectives:

- To make students understand about the types of environmental hazards.
- To familiarize students on different natural and man made hazards.
- To understand students the planetary and extra planetary hazards.
- To provide information about the endogenous and exogenous hazards.

Teaching AIDS : Black Board

Time Management of Class :

10 min for taking attendance
10 for revision of previous class
120 min for lecture delivery
10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –II & tutorial-II sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-II)

Lesson No: 07, 08 Duration of Lesson: 1hr 40 min

Lesson Title: Planetary disasters, extra planetary hazards

Instructional / Lesson Objectives:

- To make students understand about the types of environmental hazards.
- To familiarize students on different natural and man made hazards.
- To understand students the planetary and extra planetary hazards.
- To provide information about the endogenous and exogenous hazards.

Teaching AIDS : Black Board

Time Management of Class :

10 min for taking attendance
10 for revision of previous class
70 min for lecture delivery
10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –II & tutorial-II sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-II)

Lesson No: 09, 10 Duration of Lesson: 1hr 40 min

Lesson Title: Extra planetary disasters, Endogenous Hazards

Instructional / Lesson Objectives:

- To make students understand about the types of environmental hazards.
- To familiarize students on different natural and man made hazards.
- To understand students the planetary and extra planetary hazards.
- To provide information about the endogenous and exogenous hazards.

Teaching AIDS : Black Board

Time Management of Class :

10 min for taking attendance
10 for revision of previous class
70 min for lecture delivery
10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –II & tutorial-II sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-II)

Lesson No: 11, 12 Duration of Lesson: 1hr 40 min

Lesson Title: Endogenous disasters, exogenous hazards, exogenous disasters

Instructional / Lesson Objectives:

- To make students understand about the types of environmental hazards.
- To familiarize students on different natural and man made hazards.
- To understand students the planetary and extra planetary hazards.
- To provide information about the endogenous and exogenous hazards.

Teaching AIDS : Black Board

Time Management of Class :

10 min for taking attendance 80 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –II & tutorial-II sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-III)

Lesson No: 01, 02 Duration of Lesson: 1hr 40 min

Lesson Title: Endogenous Hazards, Volcanoes- Causes and its types

Instructional / Lesson Objectives:

- To make students understand the endogenous hazards.
- To familiarize students on volcanoes and volcanic eruptions.
- To understand students, the causes, affects and mitigation measures of earthquakes.
- To provide information about the types of landslides, causes and effect of landslide.

Teaching AIDS : Black Board

Time Management of Class :

10 min for taking attendance
80 min for lecture delivery
10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –III & tutorial-III sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-III)

Lesson No: 03, 04 Duration of Lesson: 1hr 40 min

Lesson Title: Volcanoes- Causes and its types, volcanic eruption

Instructional / Lesson Objectives:

- To make students understand the endogenous hazards.
- To familiarize students on volcanoes and volcanic eruptions.
- To understand students the causes, affects and mitigation measures of earthquakes.
- To provide information about the types of landslides, causes and effect of landslide.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 10 for revision of previous class 80 min for lecture delivery 05 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –III & tutorial-III sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-III)

Lesson No: 05, 06 Duration of Lesson: 1hr 40 min

Lesson Title: Distribution of Volcanoes, Effects of Volcanoes

Instructional / Lesson Objectives:

- To make students understand the endogenous hazards.
- To familiarize students on volcanoes and volcanic eruptions.
- To understand students, the causes, affects and mitigation measures of earthquakes.
- To provide information about the types of landslides, causes and effect of landslide.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 90 min for lecture delivery 05 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –III & tutorial-III sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-III)

Lesson No: 07, 08, and 09 Duration of Lesson: 2hr 30 min

Lesson Title: Earthquakes- its Causes, Effects of Earthquakes, and its distribution

Instructional / Lesson Objectives:

- To make students understand the endogenous hazards.
- To familiarize students on volcanoes and volcanic eruptions.
- To understand students the causes, affects and mitigation measures of earthquakes.
- To provide information about the types of landslides, causes and effect of landslide.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 05 for revision of previous class 130 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –III & tutorial-III sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-III)

Lesson No: 10, 11 Duration of Lesson: 1hr 40 min

Lesson Title: Revision of Unit-I, II, and Unit-III (Half Syllabus)

Instructional / Lesson Objectives:

- To make students understand the endogenous hazards.
- To familiarize students on volcanoes and volcanic eruptions.
- To understand students the causes, affects and mitigation measures of earthquakes.
- To provide information about the types of landslides, causes and effect of landslide.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 85 for revision of previous classes 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –III & tutorial-III sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-III)

Lesson No: 12, 13 Duration of Lesson: 1hr 40 min

Lesson Title: Earthquakes hazards in India, Human adjustment, perception & mitigation of earthquake

Instructional / Lesson Objectives:

- To make students understand the endogenous hazards.
- To familiarize students on volcanoes and volcanic eruptions.
- To understand students the causes, affects and mitigation measures of earthquakes.
- To provide information about the types of landslides, causes and effect of landslide.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 80 min for lecture delivery 15 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –III & tutorial-III sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-III)

Lesson No: 14, 15 Duration of Lesson: 1hr 40 min

Lesson Title: Landslides- Causes (Naturally and Man induced), Mitigation measures

Instructional / Lesson Objectives:

- To make students understand the endogenous hazards.
- To familiarize students on volcanoes and volcanic eruptions.
- To understand students the causes, affects and mitigation measures of earthquakes.
- To provide information about the types of landslides, causes and effect of landslide.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 10 for revision of previous class 80 min for lecture delivery 05 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –III & tutorial-III sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-IV)

Lesson No: 01, 02 Duration of Lesson: 1hr 40 min

Lesson Title: Exogenous Hazards or Disasters, Infrequent Events- Cyclones, Lightning and Hail storms

Instructional / Lesson Objectives:

- To make students understand about the exogenous hazards.
- To familiarize students on cyclones, floods, droughts and soil erosion and their effect on environment.
- To understand students about chemical hazards, effect of nuclear explosion, global sedimentation.
- To provide information about biological hazards such as population explosion.

Teaching AIDS : Black Board

Time Management of Class :

10 min for taking attendance 80 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –IV& tutorial-IV sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-IV)

Lesson No: 03, 04 Duration of Lesson: 1hr 40 min

Lesson Title: Types of Cyclones, causes and effects of cyclones

Instructional / Lesson Objectives:

- To make students understand about the exogenous hazards.
- To familiarize students on cyclones, floods, droughts and soil erosion and their effect on environment.
- To understand students about chemical hazards, effect of nuclear explosion, global sedimentation.
- To provide information about biological hazards such as population explosion.

Teaching AIDS : Black Board

Time Management of Class :

10 min for taking attendance 10 for revision of previous class 70 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –IV & tutorial-IV sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-IV)

Lesson No: 05, 06 Duration of Lesson: 1hr 40 min

Lesson Title: Distribution and mitigation measures of cyclones, Lightning and Hailstorms- causes and effects

Instructional / Lesson Objectives:

- To make students understand about the exogenous hazards.
- To familiarize students on cyclones, floods, droughts and soil erosion and their effect on environment.
- To understand students about chemical hazards, effect of nuclear explosion, global sedimentation.
- To provide information about biological hazards such as population explosion.

Teaching AIDS : Black Board

Time Management of Class :

10 min for taking attendance 80 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –IV & tutorial-IV sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-IV)

Lesson No: 07, 08 Duration of Lesson: 1hr 40 min

Lesson Title: Cumulative atmospheric Hazards or Disasters, Floods- Causes and Effects

Instructional / Lesson Objectives:

- To make students understand about the exogenous hazards.
- To familiarize students on cyclones, floods, droughts and soil erosion and their effect on environment.
- To understand students about chemical hazards, effect of nuclear explosion, global sedimentation.
- To provide information about biological hazards such as population explosion.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 05 for revision of previous class 80 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –IV & tutorial-IV sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-IV)

Lesson No: 09, 10 Duration of Lesson: 1hr 40 min

Lesson Title: Distribution and mitigation measures of floods, Droughts- Types, Causes and effects

Instructional / Lesson Objectives:

- To make students understand about the exogenous hazards.
- To familiarize students on cyclones, floods, droughts and soil erosion and their effect on environment.
- To understand students about chemical hazards, effect of nuclear explosion, global sedimentation.
- To provide information about biological hazards such as population explosion.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 05 for revision of previous class 80 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –IV & tutorial-IV sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-IV)

Lesson No: 11, 12, and 13 Duration of Lesson: 2hr 30 min

Lesson Title: Physical Hazards/Disasters- Soil Erosion, Causes and effects, and control measures of sedimentation and chemical hazards

Instructional / Lesson Objectives:

- To make students understand about the exogenous hazards.
- To familiarize students on cyclones, floods, droughts and soil erosion and their effect on environment.
- To understand students about chemical hazards, effect of nuclear explosion, global sedimentation.
- To provide information about biological hazards such as population explosion.

Teaching AIDS : Black Board

Time Management of Class :

10 min for taking attendance 130 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –IV & tutorial-IV sheets

Signature of faculty

Department of Civil Engineering

LESSON PLAN (U-IV)

Lesson No: 14, 15 Duration of Lesson: 1hr 40 min

Lesson Title: Nuclear explosions, biological hazards and population explosion

Instructional / Lesson Objectives:

- To make students understand about the exogenous hazards.
- To familiarize students on cyclones, floods, droughts and soil erosion and their effect on environment.
- To understand students about chemical hazards, effect of nuclear explosion, global sedimentation.
- To provide information about biological hazards such as population explosion.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 80 min for lecture delivery 15 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –IV & tutorial-IV sheets

Signature of faculty

Department of Civil Engineering
LESSON PLAN (U-V)

Lesson No: 01, 02 Duration of Lesson: 1hr 40 min

Lesson Title: Emerging approaches in Disaster Management, Pre disaster stage- Different stages

Instructional / Lesson Objectives:

- To make students understand about the emerging approaches in disaster management.
- To familiarize students on different stages in pre disaster stage.
- To understand students about the emergency stage in disaster management.
- To provide information about the post disaster stage and rehabilitation.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 10 for revision of previous class 80 min for lecture delivery 05 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –V& tutorial-V sheets

Signature of faculty

Department of Civil Engineering
LESSON PLAN (U-V)

Lesson No: 03, 04 Duration of Lesson: 1hr 40 min

Lesson Title: Mitigation planning in pre disaster stage, Role of Technology in disaster management

Instructional / Lesson Objectives:

- To make students understand about the emerging approaches in disaster management.
- To familiarize students on different stages in pre disaster stage.
- To understand students about the emergency stage in disaster management.
- To provide information about the post disaster stage and rehabilitation.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 10 for revision of previous class 80 min for lecture delivery 05 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –V & tutorial-V sheets

Signature of faculty

Department of Civil Engineering
LESSON PLAN (U-V)

Lesson No: 05, 06, and 07 Duration of Lesson: 2hr 30 min

Lesson Title: Emergency Stage- brief note, Impact of disasters to life and environment

Instructional / Lesson Objectives:

- To make students understand about the emerging approaches in disaster management.
- To familiarize students on different stages in pre disaster stage.
- To understand students about the emergency stage in disaster management.
- To provide information about the post disaster stage and rehabilitation.

Teaching AIDS : Black Board

Time Management of Class :

10 min for taking attendance 130 min for lecture delivery 10 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –V & tutorial-V sheets

Signature of faculty

Department of Civil Engineering
LESSON PLAN (U-V)

Lesson No: 08, 09, and 10 Duration of Lesson: 2hr 30 min

Lesson Title: Post Disaster stage – Rehabilitation, Brief note on post disaster stage

Instructional / Lesson Objectives:

- To make students understand about the emerging approaches in disaster management.
- To familiarize students on different stages in pre disaster stage.
- To understand students about the emergency stage in disaster management.
- To provide information about the post disaster stage and rehabilitation.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 10 for revision of previous class 120 min for lecture delivery 15 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –V & tutorial-V sheets

Signature of faculty

Department of Civil Engineering
LESSON PLAN (U-V)

Lesson No: 11, 12, and 13 Duration of Lesson: 2hr 30 min

Lesson Title: Role of district and state administration in the disaster management process, Mitigation actions to be taken during post disaster stage

Instructional / Lesson Objectives:

- To make students understand about the emerging approaches in disaster management.
- To familiarize students on different stages in pre disaster stage.
- To understand students about the emergency stage in disaster management.
- To provide information about the post disaster stage and rehabilitation.

Teaching AIDS : Black Board

Time Management of Class :

05 min for taking attendance 10 for revision of previous class 120 min for lecture delivery 15 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1, 2, 3, 4 & 1, 3...)

Refer assignment –V & tutorial-V sheets

Signature of faculty

Department of Civil Engineering
ASSIGNMENT – 1

This Assignment corresponds to Unit No. 1

Question No.	Question	Objective No.	Outcome No.
1	Write about environmental stress and its types?	1	1
2	Discuss the objectives and advantages of landscape approach and ecosystem approach with reference to disaster management.	1	1

Signature of HOD

Date:

Signature of faculty

Date:

Department of Civil Engineering

ASSIGNMENT – 2

This Assignment corresponds to Unit No. 2

Question No.	Question	Objective No.	Outcome No.
1	Demonstrate the classification of environmental hazards.	2	2
2	Illustrate any two exogenous hazards in detail.	2	2

Signature of HOD

Date:

Signature of faculty

Date:

Department of Civil Engineering

ASSIGNMENT – 3

This Assignment corresponds to Unit No. 3

Question No.	Question	Objective No.	Outcome No.
1	Explain the types of earth quakes and types of waves?	3	3
2	Explain the causes and effects of volcanoes?	3	3
3	Explain the common types of landslides?	3	3

Signature of HOD

Date:

Signature of faculty

Date:

Department of Civil Engineering

ASSIGNMENT – 4

This Assignment corresponds to Unit No. 4

Question No.	Question	Objective No.	Outcome No.
1	Outline the causes, effects and control measures of floods.	4	4
2	Explain about types of droughts and write the causes & effects.	4	4
3	Illustrate in detail about soil erosion and its effects.	4	4

Signature of HOD

Date:

Signature of faculty

Date:

Department of Civil Engineering

ASSIGNMENT – 5

This Assignment corresponds to Unit No. 5

Question No.	Question	Objective No.	Outcome No.
1	What is the Role of district and state administration in the disaster management process?	5	5
2	What are the different stages in disaster management? Explain briefly.	5	5
3	Discuss on emerging approaches of disaster management.	5	5

Signature of HOD

Date:

Signature of faculty

Date:

Department of Civil Engineering

TUTORIAL SHEET – 1

This tutorial corresponds to Unit No. 1 (Objective Nos.: 1, Outcome Nos.: 1)

Q1. The National Institute of Disaster Management (NIDM) was established on

a) September 23, 2002 b) August 14, 2001 c) October 16, 2003 d) August 14, 2004

Q2. The National Disaster Management Authority (NDMA) is headed by

a) Prime Minister of India b) President of India c) Governor of States d) Chief Minister of States

Q3. Disaster Management includes:

a) Mitigation b) Reconstruction c) Rehabilitation d) All of the above

Q4. The Disaster Management Act was made in

a) 2006 b) 2003 c) 2005 d) 2009

Q5. The word disaster comes from

a) Greek word b) Latin word c) French word d) German

Signature of HOD Signature of faculty

Date: Date:

Department of Civil Engineering

TUTORIAL SHEET – 2

This tutorial corresponds to Unit No. 2 (Objective Nos.: 2, Outcome Nos.: 2)

Q1. Which of the following is seasonally related hazard

a) Earthquake b) Volcanic eruption c) Terrorist attack d) None of the above

Q2. Which of the following is a man-made disaster

a) Terrorism b) Major fire c) Pollution d) All of the above

Q3. Bhopal Gas Disaster is a kind of

a) Natural disaster b) Manmade disaster c) Both a & b d) None of the above

Q4. Which of the following is a man-made hazard?

a) Floods b) Cyclone c) Drought d) Environmental Pollution

Q5. Which of the following is seasonally related hazard?

a) Earthquake b) Volcanic eruption c) Terrorist attack d) None of the above

Signature of HOD

Date:

Signature of faculty

Date:

Department of Civil Engineering

TUTORIAL SHEET – 3

This tutorial corresponds to Unit No. 3 (Objective Nos.: 3, Outcome Nos.: 3)

Q1.What is Ring of Fire?

a) Belt of volcanoes in the Circum Pacific region b) Belt of volcanoes in the mid-continental region

c) Belt of volcanoes in the mid-Atlantic region d) none of the above

Q2 Who is known as the father of modern seismology

a) Charles Richter b) R.D. Oldham c) W.M. Davis d) None of the above.

Q3. Volcanoes are generally found where

a) Interpolates pull apart or are coming together b) Tectonic plates pull apart or are coming together
c) Earth's crust pulls apart or is coming together d) none of these pull apart or are coming together

Q4. Volcanic erupted material when inside the hill/earth/mountain it is called

a) Lava b) Magma c) Lahars d) None of these

Q5. The Richter scale expresses earthquakes

a) Magnitude b) Location c) Duration d) Depth

Signature of HOD

Date:

Signature of faculty

Date:

Department of Civil Engineering

TUTORIAL SHEET – 4

This tutorial corresponds to Unit No. 4 (Objective Nos.: 4, Outcome Nos.: 4)

Q1. Which of the following is not a man-made hazard?

a) Leakage of Toxic waste b) Wars and Civil Strife c) Drought d) Environmental Pollution

Q2. Cyclones occurring in North Atlantic Ocean are called

a) Typhoon b) Hurricanes c) Tornado d) None of the above

Q3. High intensity and long duration of rainfall in Tripura causes ---

a) Earthquakes b) Floods c) Landslides d) Cyclone

Q4. Tsunami's can occur only during

a) Evening b) Afternoon c) any time of the day or night d) Morning

Q5. Floods can be prevented by

a) Afforestation b) Cutting the forest c) Tilling the land d) Removing the top soil

Signature of HOD

Date:

Signature of faculty

Date:

Department of Civil Engineering

TUTORIAL SHEET – 5

This tutorial corresponds to Unit No. 5 (Objective Nos.: 5, Outcome Nos.: 5)

Q1. The National Disaster Management Authority (NDMA) is headed by

a) Prime Minister of India b) President of India c) Governor of States d) Chief Minister of States

Q2. Disaster Management includes:

a) Mitigation b) Reconstruction c) Rehabilitation d) All of the above

Q3. In India National Institute of Disaster Management is located at

a) Manipur b) Punjab c) Hyderabad d) New Delhi

Q4. Effective hazard management largely rely on

a) Govt. agencies b) Emergency responses c) Pre-disaster planning d) Volcanoes

Q5. In disaster management, mitigation measures involves

a) Governmental action and administration
b) Community action and administration
c) Military action and administration
d) None of the above

Signature of HOD

Signature of faculty

Date:

Date:

Department of Civil Engineering

EVALUATION STRATEGY

Target (s)

a. Percentage of Pass : 95%

Assessment Method (s) (Maximum Marks for evaluation are defined in the Academic Regulations)

a. Daily Attendance
b. Assignments
c. Online Quiz (or) Seminars
d. Continuous Internal Assessment
e. Semester / End Examination

List out any new topic(s) or any innovation you would like to introduce in teaching the subjects in this semester

Case Study of any one existing application

Signature of HOD

Date:

Signature of faculty

Date:

Department of Civil Engineering

COURSE COMPLETION STATUS

Actual Date of Completion & Remarks if any

Units	Remarks	Objective No. Achieved	Outcome No. Achieved
Unit 1	Completed on 08.12.2023	1	1
Unit 2	Completed on 28.12.2023	2	2
Unit 3	Completed on 29.01.2024	3	3
Unit 4	Completed on 21.02.2024	4	4
Unit 5	Completed on 04.04.2024	5	5

Signature of HOD

Date:

Signature of faculty

Date:

Department of Civil Engineering

Mappings

1. Course Objectives-Course Outcomes Relationship Matrix

(Indicate the relationships by mark "X")

Course-Objectives \ Course-Outcomes	1	2	3	4	5
1	H		L		
2		H		L	
3		M	H		
4				H	
5			M		H

2. Course Outcomes-Program Outcomes (POs) & PSOs Relationship Matrix

(Indicate the relationships by mark "X")

C-Outcomes \ P-Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
1		M	L	M	L	H		M	M	H	L	M	H	
2	H	H			H	M					M			H
3			L					M	L	H		L	H	
4		H	M	M		L		L		M			M	M
5	L	M		H	M	H		H	H			L		

Department of Civil Engineering

Rubric for Evaluation

Performance Criteria	Unsatisfactory	Developing	Satisfactory	Exemplary
	1	2	3	4
Research & Gather Information	Does not collect any information that relates to the topic	Collects very little information some relates to the topic	Collects some basic Information most relates to the topic	Collects a great deal of Information all relates to the topic
Fulfil team role's duty	Does not perform any duties of assigned team role.	Performs very little duties.	Performs nearly all duties.	Performs all duties of assigned team role.
Share Equally	Always relies on others to do the work.	Rarely does the assigned work - often needs reminding.	Usually does the assigned work - rarely needs reminding.	Always does the assigned work without having to be reminded
Listen to other team mates	Is always talking—never allows anyone else to speak.	Usually doing most of the talking-- rarely allows others to speak.	Listens, but sometimes talks too much.	Listens and speaks a fair amount.

ANURAG Engineering College

(An Autonomous Institution)

Ananthagiri (V&M), Suryapet (Dt), Telangana – 508206.

IV B.Tech II Semester I MID Examinations, January 2024

Branch: CIVIL **Max. Marks: 20**

Date: 11-01-2024 AN **Subject: Disaster Management and Mitigation** **Time: 90 Min.**

PART-A

Answer all the questions **5 X 1 M=5 Marks**

Q. NO	Question	Course Outcome	Bloom's Level
1.	Define hazard.	CO1	L1
2.	Define environmental stress.	CO1	L1
3.	Explain about exogenous hazards	CO2	L2
4.	Differentiate between planetary and extra planetary hazards.	CO2	L2
5.	List out types of volcanoes.	CO3	L1

PART-B

Answer the following **3 X 5 M=15 Marks**

Q. NO	Question	Course Outcome	Bloom's Level
6.	Describe clearly about landscape approach.	CO1	L3
	OR		
7.	Explain briefly the concept of environmental disasters.	CO1	L4
8.	Demonstrate the classification of environmental hazards.	CO2	L4
	OR		
9.	Explain about extra planetary hazards?	CO2	L3
10.	Discuss the causes and effects of volcanic eruptions.	CO3	L3
	OR		
11.	Describe the causes and effects of earthquakes.	CO3	L4

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IV B.Tech II Semester II MID Examinations, April 2024

Branch: CIVIL ENGINEERING **Max. Marks: 20**

Date:08-04-2024 AN **Subject: DISASTER MANAGEMENT AND MITIGATION** **Time: 90 Min.**

PART-A

Answer all the questions **5 X 1M=5 Marks**

Q.NO	Question	Course Outcome	Bloom's Level
1.	What is landslide?	CO3	L1
2.	State any four examples of man-induced hazards.	CO4	L2
3.	Define soil erosion.	CO4	L1
4.	What is disaster mitigation?	CO5	L2
5.	List out different stages of disaster management.	CO5	L1

PART-B

Answer the following **3 X 5M=15 Marks**

Q.NO	Question	Course Outcome	Bloom's Level
6.	Write the causes and controlling measures of landslides.	CO3	L3
	OR		
7.	Explain the mitigation measures of earthquakes.	CO3	L3
8.	Demonstrate cyclone, its causes and effects.	CO4	L4
	OR		
9.	Write about the soil erosion. its causes and effects.	CO4	L3
10.	Illustrate the post-disaster stage in disaster management.	CO5	L4
	OR		
11.	Write about preparedness phase and mitigation phase in disaster management.	CO5	L3

First Internal Examination Marks

Programme**: B Tech** Year: **IV** Course: **Theory** **AY: 2023-24**

Course: DISASTER MANAGEMENT AND MITIGATION Faculty Name: A. SHIVAKRISHNA

S.No.	H.T.No.	Mid - I	Assignment - I	Mid - I Total	Mid - II	Assignment - II	Mid - II Total	AVG
1	19C11A0117	16	5	21	18	5	21	23
2	20C11A0101	15	5	20	15	5	20	20
3	20C11A0102	16	5	21	14	5	19	20
4	20C11A0103	15	5	20	17	5	22	21
5	20C11A0104	16	5	21	16	5	21	21
6	20C11A0105	15	5	20	14	5	19	20
7	20C11A0107	10	5	15	09	5	14	15
8	20C11A0108	17	5	22	18	5	23	23
9	20C11A0109	16	5	21	14	AB	14	18
10	20C11A0111	9	5	14	8	AB	8	11
11	20C11A0112	13	5	18	14	5	19	19
12	20C11A0113	18	5	23	15	5	20	22
13	20C11A0114	19	5	24	20	5	25	25
14	20C11A0115	12	5	17	12	5	17	17
15	20C11A0116	18	5	23	14	5	19	21
16	20C11A0117	15	5	20	13	5	18	19
17	20C11A0118	18	5	23	18	5	23	23
18	20C11A0119	17	5	22	16	5	21	22

19	20C11A0120	11	05	16	10	AB	10	13
20	20C11A0121	16	5	21	18	5	23	22
21	20C11A0122	18	5	23	17	5	22	23
22	20C11A0124	16	5	21	AB	AB	AB	11
23	20C11A0125	19	5	24	20	5	25	25
24	20C11A0126	11	5	16	15	5	20	18
25	20C11A0127	19	5	24	20	5	25	25
26	21C15A0101	17	5	22	18	5	23	23
27	21C15A0102	16	5	21	16	5	21	21
28	21C15A0103	19	5	24	20	5	25	25
29	21C15A0104	17	5	22	16	5	21	22
30	21C15A0105	18	5	23	17	5	22	23
31	21C15A0106	19	5	24	19	5	24	24
32	21C15A0107	18	5	23	19	5	24	24
33	21C15A0108	14	5	19	19	5	24	22
34	21C15A0109	17	5	22	17	5	22	22
35	21C15A0110	18	5	23	18	5	23	23
36	21C15A0111	17	5	22	15	5	20	21
37	21C15A0112	18	5	23	14	5	19	21
38	21C15A0113	19	5	24	19	5	24	24
39	21C15A0114	17	5	22	17	5	22	22

40	21C15A0115	19	5	24	19	5	24	24
41	21C15A0116	19	5	24	19	5	24	24
42	21C15A0117	16	5	21	18	5	23	22
43	21C15A0120	19	5	24	20	5	25	25
44	21C15A0121	17	5	22	15	5	20	21

No. of Absentees: NIL

Total Strength: 44

Signature of Faculty

: **Signature of HoD**

ANURAG ENGINEERING COLLEGE

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(Approved by AICTE, New Delhi, Affiliated to JNTUH, Hyderabad, Accredited by NAAC with A+ Grade)

Ananthagiri (V & M), Kodad, Suryapet (Dist), Telangana.

Program		
B.Tech. ✓	M.Tech.	M.B.A.

HALL TICKET NO.										
2	0	C	1	1	A	0	1	1	2	

Course: D.M.M

Q.No. and Marks Awarded										
1	2	3	4	5	6	7	8	9	10	11
1½	1½	1	1	0		3½		2½		6

YEAR	SEMESTER	MID EXAMINATION
IV	II	I

Regulation: R18 | Branch or Specialization: Civil

Signature of Student: G. Rahul Chandra

Signature of invigilator with date: 11/04/24

Signature of the Evaluator: A. Ch

Maximum Marks: 20 | Marks Obtained: 13

(Start Writing From Here)

1) Hazard :-

the Action which is natural or manmade that causes economical, liveli-city, damage and other losses called Hazard

2) Environmental stress :-

the force that was generated by Natural or due to man-made actions called environmental stressers. these stressers cause volcanic eruptions, earthquakes, hurricans tycoons.

3) Exogenous hazards :-

the hazards that are on the surface of the earth and above it happens called Exogenous Hazards.

5) Types of volcanoes:

(i) ~~Dorm~~ Active

(ii) Dormet

(iii) Extinct

1)

planetary	extra planetary
* the hazards which happens inside the planet	* hazard happens outside planet
* which effects inside planet	* more effect outside planet.
* which causes heavy loss.	* which cause low loss
* which cause more	* here causes less

2) Environmental Disasters:

* Normally disasters are made by Natural and man made

* But environmental disasters are caused by environment due to changes in it.

* Some of environmental disasters are Tsunami, Cyclones, Earthquake.

* These are caused due to various natural

Tsunamis:-

These are caused due to the kinetic energy which is inside earth absorbed and due to that seismic waves are formed. These waves causes the tidal waves in the sea. that causes Tsunamis

Cyclones:-

these are by wind which has low pressure at down and high pressure at top that causes anti clock, clock wise direction. when the air gets heat that goes up with water vapour cold when cools the water get Release heat that cause cyclones.

Earth Quake:-

this is the movement of energy. Release from earth which was generated due to kinetic energy inside the earth, that gets high pressure and that leads to ea. movement in earth causes earth quakes.

3½

9) Extra planetary Hazards:-

* that hazards that happens outside of the planet

* these this hazards are happend to other space and planets.

* this Hazard will give less impact

* the chances are less to happen these extra planetary Hazards.

* these hazards are having low energy to impact

* so, this causes low damage or some times no damage to the objects

* these are much more differ from planetary Hazards

* these hazards are having specific examples.

* by the type of place these are divided into planetary, extra planetary Hazards

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Ananthagiri (V&M), Kodad, Suryapet (Dt). Telangana, Pin: 508 206.

DEPARTMENT OF CIVIL ENGINEERING

MID- I ASSIGNMENT

YEAR & SEMESTER:	IV & II
HALL TICKET NO:	19C11A0117
STUDENT NAME:	G. Uma Sankar
SUBJECT:	Disaster Management and Mitigation
SUBMISSION DATE:	10/01/2024

G. Uma Sankar
STUDENT SIGNATURE

FACULTY SIGNATURE

1) Write about environmental stress and explain its types?

Ans: The term "stress" means is a pressure., Environmental stress means any factor which causes stress on the environment.

The environmental stress may be define as pressure on the environment caused by human activities events.

⇒ loss of life, damage to property, economical like this effects will be occured. of environmental degradation.

⇒ Stresses that are found in our surroundings are called environmental stressors and it adversely affects the life a potential health hazard of any living organisms including plants.

$$S = P > R$$

here P = Pressure

R = Resources.

Types of environmental stress:

1) Physical stress
2) wild fire stress
3) chemical stress
4) Thermal stress
5) Radiation stress.

7. Biological stress

Physical stress:-

→ Physical stress is a disturbance in which there is an intense exposure to kinetic energy which causes damage to habitats and ecosystems. Examples include such disruptive events as hurricane a tornado, a seismic sea wave, the blast of a volcanic eruption an explosion.

Wildfire stress:

→ Wildfire is another disturbance, which involves uncontrolled combustion of the biomass of an ecosystem. A wildfire can be ignited by people lightning. A severe fire consumes much of the biomass of an ecosystem.

Chemical stress:

Chemical pollution occurs when med more substance occur in a concentration high enough to elicit physiological response in organisms, potentially causing toxicity and ecological change chemical stress includes pesticides, gases such as ozone & sulphate dioxide and toxic elements such as arsenic & mercury. this pollution caused by arsenic & Mercury.

Thermal stress:

→ thermal stress is caused by the release of heat into the

the environment, which result in ecological stress because species vary in their tolerances of temperature extremes. thermal stress may occur at natural springs, it also associated with discharge of hot water from power plant.

Radiation stress :- R·S is caused by excessive exposure to ionizing energy. the radiation may be emitted by nuclear waste, X-rays, ultraviolet energy.

Climatic stress :- climatic stress is associated with insufficient of temperature, moisture, solar radiation, wind of these.

Biological stress :- Biological stress are associated with interactions occuring among organisms., such as competition, herbivory predation disease for example, individuals of the same species may compete for essential resources that are limited in supply Exploitation can be anthropogenic as when humans harvest wild animals or it can be be natural Perhaps associated with defoliating insects causing pathogens

2) Explain about a) landscape approach b) Ecosystem approach related to human ecology.?

Ans: a) landscape approach:

-> A landscape approach is broadly defined as frame work to Integrate policy and practice for multiple land uses within a given area.

-> to ensure equitable and sustainable use of land while strengthening measure to mitigate and adapt to climate change.

-> it also aims to balance competing demands on land through implementation of adaptive and integrate management systems.

-> these include not only the physical characteristic features of the landscape itself, but all of the internal and external socio-economic and political drivers that affect land use particularly.

-> landscape approaches are primarily rooted in conservation and the science of landscape ecology.

Ecosystem approach:

→ Ecosystem approach of disaster management aims at planning designing and implementation of strategy to manage ecosystem and their services that will help is satisfying human livelihood needs.

→ Most of the disasters are caused due to neglect exploiation of Natural ecosystem.

→ well managed ecosystems can help to mitigate disasters like landslides cyclones floods.

→ ecosystem can act as first line of defense for community against disasters.

→ ecosystems focuses on sensitizing human community on importance of ecosystem and their contributions and responsibilites in protecting the sustaining the ecosystem.

3) Demonstrate the classification of environmental hy

b) Explain any two exogenous hazards in details?

Ans: Cyclones:

→ A cyclone is a large scale air mass that rotates around a strong centre of low atmosphere pressure.

→ A system of winds rotating inwards to an area of low barometric pressure, with an anticlockwise clockwise.

→ Cyclones have been on other outsides of the earth such as mars, Neptune.

→ Cyclones are also called as hurricanes and typhoons.

Causes of cyclones:

→ As we know that when water vaporizes it absorbs heats from the surroundings water vapour rises in the atmosphere where it's down. when water vapour changes back into liquid the heat is released into the atmosphere this warms the air around it.

→ the warm air tends to rise and causes a drop in the pressure the air moves from surrounding high pressure

from the earth's crust that create seismic waves.

→ Earthquake can range in size from those that are so weak that they cannot be felt to those violent enough to the people around and destroy whole world. they are measured using seismographs.

types of Earthquake:

→ the type of Earthquake depends on the region where it occurs & the geological make-up of that region.

the most common are

1) Tectonic Earthquake: these occurs in when rocks in the earth crust break due to geological forces created by Movement of tectonic plates.

2) volcanic Earthquake: these occur in conjunction with volcanic activity.

3) collapse earthquake: these are small earthquake in underground caverns and mines that are caused by seismic waves produced from the explosion of rock on the surface.

4) Explosion Earthquake: it result from the explosion of Nuclear and chemical devices. we can measure motion from Large tectonic earthquake using GPS because rocks on either side

DISASTER MANAGEMENT

UNIT-I
ENVIRONMENTAL HAZARDS AND DISASTERS

* The word disaster is derived from middle French word "desartre" and that from old Italian word "disastro"
* Which in turn comes from the ancient Greek word dus- bad, aster-Star?
* The root of the word disaster (bad star in Greek] comes from an astrological sense of a calamity balanced on the position of planets.

Disaster

* A disaster is a serious problem occurring a short or long period of time that causes wide spread human, material, economic or environmental loss.

EX: 170 people died in the disaster

Vulnerability + hazard= Disaster

Management

* The process of dealing with or controlling things or people
* Management is the coordination and administration of tasks to achieve a goal.
* Management process of setting goals, planning and controlling the organizing and leading the execution of any type of activity

Disaster Management

* Disaster management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness response and recovery in order to lessen the impact of disasters.
* Disaster management is a well planned technique for reducing hazards caused by disasters, however it does not avoid or eliminate hazards and it focuses on planning to minimize the impact of disasters.
* Disaster management refers to the conservation of lives and property during natural (or) manmade disasters
* Disaster management includes co-ordination, command and Control, fast assessment of damage, restoration of power telecommunication, surface transport, deployment of research& rescue teams, medical and Para-medical teams, arrangement of food & drinking water, setting up of temporary shelters, sanitation and hygiene identification etc, last but not the least maintenance of law and order is equally importance.
* India is especially vulnerable to natural disasters because of its unique geo-climatic condition, having recurrent floods, droughts, cyclones, earthquake and landslides.

1.0 Environmental Hazard

* Environmental hazards are those components of natural environment that have a great potential to cause harm to life, property and environment.
* Environmental hazards are caused by human involvement.
* A natural phenomenon occurring in populated area becomes in hazardous event.
* When this hazardous event causes unacceptably large number fatalities and enormous property damage. It is then considered a natural disaster.

Hazard

Something that has the potential to cause harm to people, property or the environment.

Risk

The chance or probability of that hazard causing harm or damage to people, property or the environment

Types of hazards

1. Physical
2. Chemical
3. Biological
4. Psychosocial

Physical hazard

* Any hazard that comes from environmental factors.

Ex: vibration, constant loud noise,

* The environment factors that can harm the body without necessarily touching

Ex:- Radiation, High Exposure to sunlight ultraviolet rays, temperature extremes- hot and cold.

Chemical hazard

* Any hazard that comes from a solid, liquid or gas element, compound or mixture that could cause health problems or pollution.

Ex: cleaning product, Pesticides, welding funes.

* Chemical hazards are present when a worker is exposed to any chemical preparation in the work place in any form [solid, liquid, gas]
* Even common solutions can cause illness, skin irritation or breathing problem

Ex: Beware of liquids like cleaning product, paints, acids, Solvents

* Vapors and fumes that come from welding or exposure to solvents.

Biological hazard

* A living or non living organism that have a potential to poses a threat to human health

Ex: fungi, Bacteria, malaria

* When these pathogens and diseases are transferred between organisms it's called an infectious disease

Ex: Blood and other body fluids

Psychosocial hazard

* Aspects of the work environment and the way that work is organized that are associated with psychiatric, Psychological and physical in injury or illness

Ex:- Stress, Bullying Drug and substances addiction, Sexual harassment.

* Hazard or stressors that cause stress (short-term effects] and strain [long-term effects].There are the hazards associated with workplace issues such as workload, lack of control, respect etc.

Causes of hazards

* Pollution
*Over population
* Land fills
* Deforestation

* Land disturbance

Effects of hazards

* Impact on human health
* Lose to biodiversity
* Ozone Layer depletion
*Loss of Tourism industry
* Economic Impact

2.0 Environmental Disaster

The environmental disaster can be defined as it is a catastrophic event or sudden event that leads to the huge loss of life and property.

Characteristics

* It has all of sudden event which happen without knowledge
* It the causes huge loss of life and property as well as to the entire environment.
* Disasters are occurring unpredictable. Therefore it is not possible to take precautions

Disasters are different in terms of

1. Nature of disasters- car accident, Fire, cyclone
2. Period of each disaster-- short -term, disaster, -Earthquake

Long term disaster-drought

3 Extent of damage- It can cause small damage-Accident

Huge damage-Atomic Power plant failures

Let's try to classify them

1. Natural disaster

Adverse event that results from natural process of the earth. It could be earthquakes, volcanous, flood, drought, cyclones etc.

2. Man-made disaster

This happens due to technologies growth

Ex: Industrial accidents, chemical spill, fire, war, crime, terrorist activities.

Natural disaster again classified into five types

1. Geophysical	2. Biological	3. Meteorological
Earthquakes	Epidemic	Local storm
Volcanoes	Infectious diseases	Tropical & Extra tropic Cyclones
Landslide (dry)	Insect bites	Tornadoes
Rock fall (dry)		

4. Hydrological	5. Climatologically
Tsunami	Heat wave
Flood	Cold wave
Hailstorm	Drought
Landslide (wet)	Forest fire
Rock fall (wet)	

* Manmade disaster can be accidental, and intentional
* Some of the disasters are catastrophic, which takes place all of sudden and cause great damage but the recovery is takes places in short time- tsunami

Ex: - Earthquake of Gujarat Latur but now life in this areas return to normal

* Some of the disaster impact for longer duration. Such disaster remains severe

Ex: - Desertification, various problem of crop, Global warming, rising level of oceans.

Causes of disaster

Natural disaster	Manmade disaster
Global warming	Negligence
Natural activities in the earth crust	Oil spilling
Mining	Nuclear bombing testing
Deforestation	Lack of fund, lack of education, lack of investment
Soil erosion	Terrorism
Pollution	
Land disturbance	
Over population	
Landfills	

Land disturbance - Any activities changes the physical condition of land form, vegetative cover and hydrology, create bare soil or otherwise may cause erosion or sedimentation

Pollution - It is the introduction to contaminants into the natural Environment that cause adverse change of ecosystem and health of human being

Air- It degrades the quality of air that we use for health purpose

Water- It degrades the quality of water than we use for drinking purpose

Land - It results in degradation of earth surface on a result of human activities.

Noise- It can cause irreparable damage to our ears when exposed to continuous large sound like horning of vehicles on a busy road

Global warming- It is the gradual heating of earth's surface, oceans, and atmosphere is caused by human activity, primarily the burning of fossil fuels &That pump carbon dioxide(CO_2),methane and other greenhouse gases into the atmosphere.

Mining- Excessive mining and slag piling destroyed and occupied land resources

- Mountain cutting and explosive hill - opening operations during mining induced geological disasters such as collapse, landslides and debris flows

- The underground mining caused damages to the ground water layers, which lead to geological disasters

Deforestation - Deforestation is the cutting down of trees to make way for more homes and industries.

- Raped growth in population & urban sprawl are two of the major cause of deforester on, apart from that use of forest land for agriculture, animal grazing, harvest for fuel wood & logging are some of the other causes & deforestation

Soil erosion- Soil erosion is the displacement of the upper layer of the soil. it is a form of soil degradation

-This natural process is caused by the dynamic activity of erosive agents that is water, ice, snow, air (wind), Plants, animals and humans.

Over population - More population simple meaning more demand for food, cloths, water, shelters.

- You need to more space to grow food & provide home to millions of people. This result on deforestation which is another factor of environment degradation.

Landfills- Landfills pollute the environment and destroy the beauty of the city, and landfills come within the city due to large amount of waste that get generated by households, industries, factories and hospitals.

Effects of disaster

Broadly speaking the effect of disasters is
Medical
Economic
Social
Environmental
Political
Administration area of life

Medical- There is no chance for recovery; others suffer from mental stress, injuries. Mental stress offered leads to social health issues.

Social- Demand for food, water, & other resources give rise to clashes in the society
The spreading of diseases often create unhealthy environment

Economic- Collapsing of bridges, buildings, road transport railways, etc. it cause great economical loss, &also it causes decrease in productivity & Increase in expenditure for recovery

Environmental- Disasters are also lead to pollution of land air, and water resources to causing various environmental problems.

Administration- There are problems in functioning of administration because stress on workers, failure of transportation system, and other facilities. It will damage to governmental system leads to Political problems as well.

3.0 Environmental stress

*The term "stress" means hardship or pressure

* Environmental stressors mean any agent or factor which causes stress on the environment.

* Environmental stress may be define as pressure on the environment caused by human activities [such as generation of pollution] or by natural events (such as occurrence of a drought]

* It is also called as pressure to the environment by any sudden event or phenomenon causing injury, loss of life, damage to property, social & economic disruptions of environmental degradation.

* Stressors that are found in our surroundings are called environmental stressors and it adversely affects the life or create a potential health hazard of any living organism including plants.

S=P >R
P= Pressure
R=Resource

Types of environmental stressors

There are seven types of environmental stressors. They are

1. Physical stress

Physical stress is a disturbance in which there is an intense exposure to kinetic energy, which causes damage to habitats and ecosystems. Examples include such disruptive events as a hurricane

or tornado, a seismic sea wave (tsunami), the blast of a volcanic eruption, an explosion, or trampling by heavy machinery or hikers.

2. Wildfire stress

Wildfire is another disturbance, which involves the uncontrolled combustion of the biomass of an ecosystem. A wildfire can be ignited by people, or naturally by lightning. A severe fire consumes much of the biomass of an ecosystem, but even a less-severe wildfire may kill many organisms by scorching and poisoning by toxic gases.

3. Chemical stress

Chemical pollution occurs when one or more substances occur in a concentration high enough to elicit physiological responses in organisms, potentially causing toxicity and ecological change. Chemical stressors include pesticides, gases such as ozone and sculpture dioxide, and toxic elements such as arsenic and mercury. Pollution may also be caused by excessive nutrients, which can distort productivity and other ecological functions. Note that the mere presence of a potentially toxic agent does not necessarily cause pollution. (The distinction between contamination and pollution is examined later in this chapter.)

4. Thermal stress

Thermal pollution is caused by the release of heat (thermal energy) into the environment, which results in ecological stress because species vary in their tolerance of temperature extremes. Thermal stress may occur at natural springs and submarine vents where geologically heated water is emitted. It is also associated with discharges of hot water from power plants.

5. Radiation stress

Radiation stress is caused by excessive exposure to ionizing energy. The radiation may be emitted by nuclear waste or explosions, or it can be diagnostic X-rays or solar ultraviolet energy.

6. Climatic stress

Climatic stress is associated with insufficient or excessive regimes of temperature, moisture, solar radiation, wind, or combinations of these.

7. Biological stress

Biological stressors are associated with interactions occurring among organisms, such as competition, herbivore, predation, parasitism, and disease. For example, individuals of the same or different species may compete for essential resources that are limited in supply. Herbivore, predation, parasitism, and disease are tropic interactions, in which one species exploits another. Exploitation can be anthropogenic, as when humans harvest wild animals or trees, or it can be natural, perhaps associated with defoliating insects or disease-causing pathogens.

Prevention of environmental stressors

a. Control of population

The continuous increase in Population leads to serious environmental problems. which creates imbalance in the ecosystem. Efficient measures should be required to control these problems like economic measures, family planning measures, administration measures etc.

b. Restricted use of pesticides

The excessive use of chemical fertilizers and pesticides by the farmers in agriculture sectors has resulted in the degradation of the environment quality and altered the ecological balance. Therefore the use of these chemicals, pesticides should be restricted.

c. A forestation

Planting trees is a great step towards the protection of our environment. It is very much important to plants trees because without plants and trees. we will not able to survive.

d. Use of solar energy

Solar energy creates clean and renewable power from the sun and benefits the environment with the use of solar energy we can replace current fossils fuels like coal and gas for generation of electricity that Produces air, water, land of Pollution.

e. Legal step

The government must take some initiative or legal actions to protect the environment, to protect the forest and to protect the wildlife also.

f. Pollution free vehicle

To make the air clean and pollution free it is required to use eco-friendly or environment friendly vehicles that produces less harmful gases and will not be harmful to the environment.

g. Conservation of Natural resources

We need to conserve the natural resources because they are limited only. So we need to take proper care that we use them properly and not waste them

h. Rapid growth of industrialization should be stopped

Rapid growth of industrialization leads to the destruction of forest. Unplanned urbanization, water wastage etc. Social management should be improved in the process of urbanization

i. Close relationship between man and Nature

The relationship between nature and man has been changing through time with the development of science and technology. Now it is important for man to understand how nature is important for us. Man needs to develop his love and respect for the nature and living things because the environment is very much important for us and without nature we cannot survive on earth.

4.0 Different Approaches and Relation with Human Ecology

Ecology: - Ecology is the scientific analysis and study of interactions among living organisms and their environment

Human ecology: - Human ecology is a study of the relationship between humans and their natural, social and built environment

Ecosystem: - An ecosystem is a community of living organisms in conjunction with non living components of their environment (air, water, mineral soil) interacting as a system.

Landscape Approach

* A Landscape approach is broadly defined as frame work to Integrate Policy and practice for multiple land uses within a given area.

* To ensure equitable and sustainable use of land while strengthening measures to mitigate and adapt to climate change.

* It also aims to balance competing demands on land through implementation of adaptive and integrated management systems.

* These include not only the physical characteristic features of the landscape itself, but all of the internal and external socio-economic and socio-political drivers that affect land use, particularly related to conservation forestry and agriculture.

* Landscape approaches seek to address the increasingly complex and widespread environmental, Social, Political challenges that transcend traditional management boundaries.

* Landscape approaches are primarily rooted in conservation and the science of landscape ecology.

Example:- For instance trees may be planted as hedgerows throughout agricultural fields, or to create shade in public parks ,or home gardens or plantations for productive purpose.

* A landscape can be defined as a socio ecological system that consists of a mosaic of natural and human-modified ecosystem, with a characteristic configuration of topography, vegetation, land use, water use, and settlements that is influenced by the ecological, historical, economic, and cultural Processes and activities of the area.

Water - how does the water behave in the landscape (upstream and downstream)

Soil - what are the different types of soil and soil Properties in the landscape approach

Ecosystem - what species of flora and fauna exist and what services do the ecosystem provided?

Climate Setting - what is the general climatologically context and how does this influence the ecological Processes in the landscape?

Economic- the markets, livelihoods and economic activities, investment and development patterns, infrastructure and the utilization of the ecosystem services in a land scope.

* Landscape approach to disaster management is a fast evolving concept in which both conservation and sustainable use of the components of biological diversity are taken into consideration.

The importance of landscape approach to disaster management and mitigation is due to the following,

1. Landscape ecology approach signifies manipulation of ecosystems based on conservation and sustainability

2. Involvement of communities in the decision-making process

3. Judicious exploitation of biodiversity to sustain healthy ecosystem that facilitates a decrease in the occurrence of natural disaster.

Ecosystem Approach

* Ecosystem approach of disaster management aims at Planning, designing and implementation of strategy to manage or restore ecosystems and their services that will help in satisfying human livelihood needs.

* Most of the disasters are caused due to neglect or uncontrolled exploitation of natural ecosystem.

* Well managed ecosystems can help to mitigate disasters like landslides, cyclones, floods.

* Ecosystem can act as first line of defense for vulnerable community against disasters.

* Ecosystem focuses on sensitizing human community on importance of ecosystem and their contributions and responsibilities in protecting the sustaining the ecosystem.

* No efforts to restore ecosystems after a major disaster can cause significant economic and environmental losses and impose hardships on already vulnerable community.

* The ecosystem approach promotes the integrated management of land, water and living resources in a way that achieves mutually compatible conservation and sustainable use, and delivers equitable benefits for people and nature.

* The ecosystem approach to disaster management involves effective management of land, water and living resources, and their contribution to reduce the risk and impact of disasters on the environment.
* It is a strategy to maintain a proper balance between the conservation and use of biological diversity in order to promote conservation and sustainable use in an equitable way.
* This is because of the fact that humans and their activities have a considerable effect on species and ecosystem diversity causing destruction, modification and fragmentation of habitat, introduction of exotic species, over harvesting and over exploitation as well as global climate change.
* The ecosystem approach to disaster management is especially important to professionals and practitioners involved in the fields of forestry, fisheries, farming, protected areas, urban planning etc.
The need to apply ecosystem approach to disaster management has several advantages,
1. Restoration of the ecosystem on which local livelihoods survive.
2 Prevention of disaster that can have a negative impact on ecosystem management and restoration
3. Increase in human well-being as resilient ecosystems help to recover the local communities for livelihood needs
4 Increased coalitions between non-environment groups for investment in eco-management and restoration.

Perception Approach

* Perception is the sensory experience of the world; it involves both recognizing environmental stimaluli and actions in response to these stimuli. Through the Perceptual process, we gain information about the properties and elements of the environment that are critical to our Survival
* Perception about people's behaviour during emergencies defines to a large extent, how authorities would plan resource allocation for community emergency response as well as develop and implement mitigation measures.

* Perception not only creates our experience of the world around us, it allows us to act within our environment.
* The perception approach to natural hazards or technological disaster management and mitigation is an interdisciplinary linkage involving experts in social influence, risk communication, media coverage, environmental perception, congnition,anxiety management, information processing, decision making and the psychological and psychosocial impacts of disaster.

A perception approach to disaster management has several benefits,

1. Sustenance of healthy ecosystems that facilitate the reduction of natural disasters
2. Sustainable use of existing and available renewable land resources
3. To safeguard dependence on livelihoods for the well-being of communities
4. Increase in the resilience of the ecosystem to avoid the occurrence of disasters

All types of vulnerabilities (physical, environmental, social and attitudinal) and risks can be minimized by adopting a holistic and integrated approach to disaster management.

5.0 Human Ecology and its Application in Geographical Researches

In any ecosystem, thermodynamics and biogeochemical cycles play an important role in transfer of energy and mass. The human ecosystem involves the fundamental interactions of ecology with the human social system. The human ecological relationship must be taken very seriously because humans are inevitably bound to the natural world and they form an integral component of ecosystems.

The human well-being depends on resilient ecosystem. The ongoing environmental degradation, increased frequency of extreme weather events, climate change and natural disaster are putting the human community at risk, especially, the elderly, women and children. Therefore, sustainable ecosystem management practices enable effective disaster prevention and thus, safety of the living communities. The human-ecological relationship can be strengthened by inventiveness and therefore a solution to environmental problems is by indulging in research activities.

Some of the areas of research disciplines include,

1. Geographical ecology of individual species, community and ecosystem levels
2 Impact of global environmental changes on plants, biodiversity and ecosystem processes
3. Interactions between land and atmosphere
4. Air pollution and urban climate
5. Understanding the linkage between biological, climatic, geologic and hydrological processes acting on the earth surface
6. Global biogeochemistry
7. Water quality on landscape ecosystem
8. Dynamics of avalanche and hazard assessment
9. Environmental history of water and forests
10. Historical geography of migration, modernity, and new world resettlement
11. Urban growth
12. Globalization and world cities
13. Geomorphologic processes
14. Spatial analysis, species distribution and ecosystem modeling by remote sensing.
15. Biogeochemistry of the natural environment.

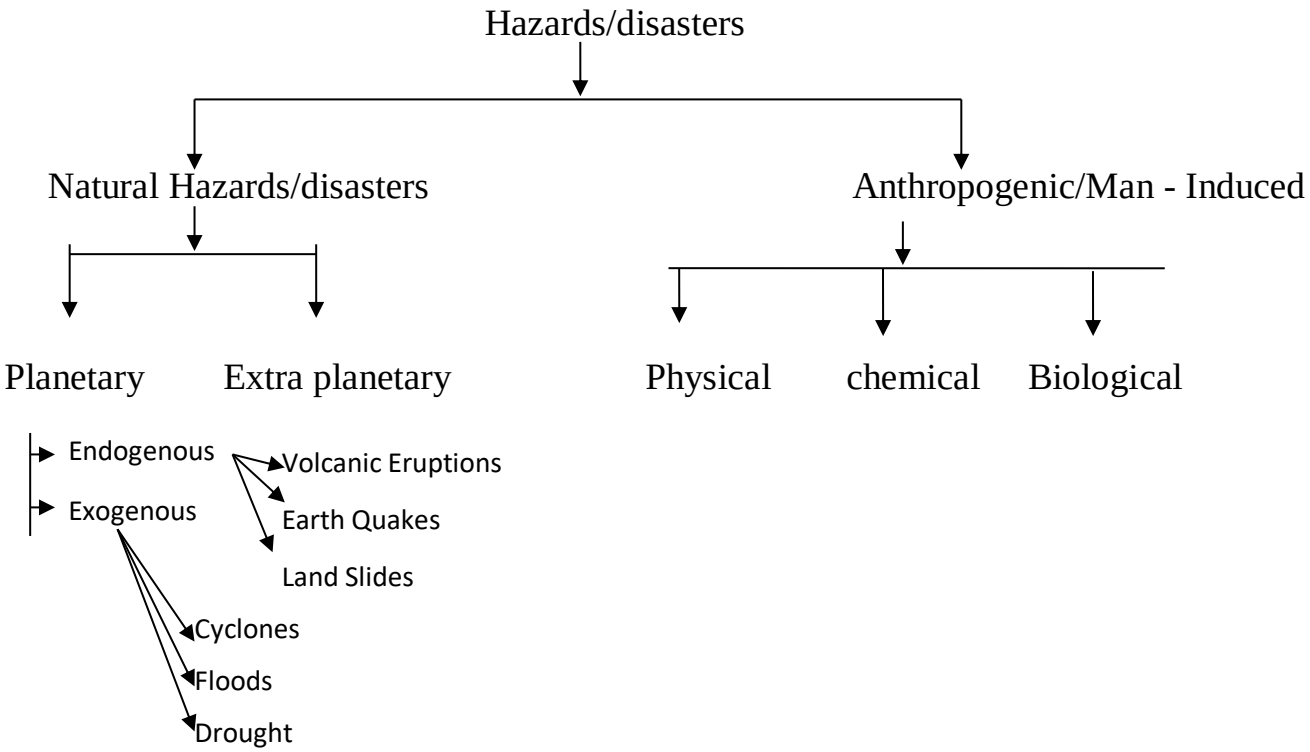
UNIT-II

TYPES OF ENVIRONMENT HAZARDS & DISASTERS

1.0 Environmental hazard

A hazard is refers to a natural or manmade event that has the potential to effect the all living organisms and the environment.

CLASSIFICATION OF ENVIRONMENT HAZARDS



- Apart, above man-induced hazards/disasters have some more hazards/disasters like
  - Nuclear accidents
  - Global warming
  - Terrorist Attacks,
  - Pollution
  - Societal hazards
  - Hazardous materials
  - Transportation accidents

2.0 DISASTER

It is a sudden or catastrophic event that causes wide spread and immeasurable damage, loss, destruction and devastation to life, property, economy, and environment.

- Disasters are classified into two types

1. **Natural disasters**
   a. Major natural disaster-flood, cyclone, drought, earthquake
   b. Minor natural disaster-cold waves, landslides, storms
2. **Man-made disasters**

a. Major manmade disaster-forest fires, epidemic deforestation, pollution,
b. Minor manmade disaster-road/train accidents, bomb blast, food poison

- Hazards/disasters can be classified into two types,
    1. Natural Hazards/disasters
    2. Man-made Hazards/disasters

1. **Natural Hazards disasters**

It is the effect of natural hazard

Ex- Cyclone, Earthquake, Tornado, Volcanic eruption Tsunami, Flood, Wild fire, Drought, Landslide, Avalanche

Natural disasters are again categorized into 2 types:

1. Planetary
2. Extra Planetary

Planetary Disasters /Hazards

Disasters /Hazards which occur in the planet.

Extra planetary Hazards/disasters

Disasters /Hazards which occurs outside the planet. I.e. In Space.

Planetary Disasters /Hazards

Classified into 2 types

1. Endogenous Disasters /Hazards.
2. Exogenous Disasters /Hazards.

Endogenous Disasters /Hazards

Disasters /Hazards which originate inside the surface of the earth are termed as endogenous hazard.

Ex: volcanoes, Earthquake, Landslides.

Exogenous Disasters /Hazards

Disasters /Hazards which originate above the surface of the earth (in the atmosphere) are called Exogenous Hazards.

Ex: Cyclones, Droughts, Floods, Lighting & Soil Erosion.

Endogenous Disasters /Hazards

1. EARTHQUAKES

- An earthquake is the shaking of the surface of the earth, resulting from the sudden release of energy from the earth's crust that creates seismic waves.
- The earth crust is made up of a number of large plates which are subjected to compression, tensile and shearing stress.

- Earthquakes can range in size from those that are so weak that they cannot be felt to those violent enough to the people around and destroy whole cities.
- They are measured using seismographs
- The size of an earthquake is measured using logarithmic base "Richter scale "also.
- The Valdivia earthquake also known as the great Chilean earthquake is the biggest earthquake ever recorded. It hit Chile on May 22, 1960 with a magnitude of 9.5 and a death toll of around 6000.

Causes of earthquakes

1. Volcanic Eruptions- The main cause of the earthquake is **volcanic eruptions**. Such type of earthquakes occurs in areas, with frequent volcanic activities. When boiling lava tries to break through the surface of the earth, with the increased pressure of gases, certain movements caused in the earth's crust. Movement of lava beneath the surface of the earth can also cause certain disruptions.

2. Tectonic Movements- The surface of the earth consists of some plates, comprising of the upper mantle. These plates are always moving, thus affecting the earth's crust. These movements categorized into three types: constructive, destructive, and conservative. Constructive is when two plates move away from each other, they correspond to mild earthquakes. When two plates move towards each other and collide, this is known as destructive plate boundaries.

3. Geological Faults-A geological fault is known as the displacement of plates of their original plane. The plane can be horizontal or vertical. These planes are not formed suddenly but slowly develop over a long period. The movement of rocks along these planes brings about tectonic earthquakes. These faults occur due to the impact of geological forces. The displacement of plates creates the fracturing of rocks, which releases a lot of energy. This type of earthquake can be disastrous.

4. Man-Made- The interference of man with nature can also become a cause of the earthquake. The disturbance of crustal balance due to heavy clubbing of water in dams can cause earthquakes. **Nuclear bombing** can send specific types of shockwaves throughout the surface of the earth, which can disturb the natural alignment of tectonic plates. Mining can also cause disturbance due to the extensive removal of rocks from different areas.

Effects of earthquakes

- Loss of Property
- **Ground Shaking-**Ground shaking is the most familiar effect of earthquakes. It is a result of the passage of seismic waves through the ground, and ranges from quite gentle in small earthquakes to incredibly violent in large earthquakes. Buildings can be damaged or destroyed, people and animals have trouble standing up or moving around, and objects can be tossed around due to strong ground shaking in earthquakes.
- **Ground Rupture-**Ground rupture is another important effect of earthquakes which occurs when the earthquake movement along a fault actually breaks the Earth's surface. Rupture causes problems for humans by, well, rupturing things; pipelines, tunnels, aqueducts, railway lines, roads, and airport runways which cross an area of active rupture can easily be destroyed or severely damaged.
- **Landslides-**Landslides are caused by earthquakes both by direct rupture and by sustained shaking of unstable slopes. They can easily destroy buildings in their path, or block roads and railroad lines, or take hilltop homes with them as they tumble.
- Tsunamis-Tsunamis, which are popularly -- and incorrectly -- known as ``tidal waves,'' are a grave hazard to many parts of the world, particularly around the Pacific Ocean basin. Tsunamis are a series of water waves caused when the seafloor moves vertically in an earthquake (which is why they are uncommon in California earthquakes -- most CA earthquakes are strike-slip, with little or no vertical motion) and which can travel vast distances in a short period of time. Tsunami speeds in the deep ocean have been measured at more than 700 km/hr, comparable to some jet planes, and when tsunamis reach shallow water near the coast, they can reach heights of more than 27 meters (90 feet)! Remember that tsunamis are a series of waves, and may start with a gentle withdrawal of water, followed by a very abrupt arriving wave, followed by another withdrawal, etc. The safest thing to do if you hear a tsunami is coming is to move to higher ground away from the beach as quickly as possible.
- **Liquefaction, Subsidence, and Related Effects-**Liquefaction and subsidence of the ground are important effects which often are the cause of much destruction in earthquakes, particularly in unconsolidated ground. Liquefaction is when sediment grains are literally made to float in groundwater, which causes the soil to lose all its solidity. Subsidence can then follow as the soil recompacts. Sand blows, or sand volcanoes, form when pressurized jets of groundwater break through the surface. They can spray mud and sand over an area a few meters across. All of these effects pose a grave danger to buildings, roads, train lines, airport runways, gas lines, etc. Buildings have actually tipped over and sunk partway into liquefied soils, as in the 1964 Niigata earthquake in Japan. Underground gas tanks and septic tanks (yuck!) have been known to float to the surface through liquefied soils. All told, liquefaction and associated effects resulted in more than $20 billion damage in the 1995 Kobe earthquake, and similar levels of damage are possible in US port facilities during a large earthquake.

- **Fires-**Fires are a major source of damage after earthquakes. Ground rupture and liquefaction can easily rupture natural gas mains and water mains, both contributing to the ignition of fires and hindering the efforts to control them. Shaking also contributes to starting fires, by knocking down power lines, spilling flammable liquids from storage containers, and tossing hot coals from barbeques and stoves.

VOLCANIC ERUPTION

- Volcanic eruptions refers to the process by which solid, liquid, gaseous material from the earth's crust (earth's interior) are ejected on the surface of the earth through an opening or vent.
- The molten, semi-solid state of rock is called magma. When present below the surface and lava when on the surface.
- Lava and other materials reach the surface to form extrusive landforms of various sizes.
- A volcano is a rupture in the crust of a planetary- mass object, such as Earth, that allows hot lava, volcanic ash, and gases to escape from a magma chamber below the surface.
- A volcano is a mountain that opens downward to a pool of molten rock below the surface of the earth. When pressure builds up, eruptions occur. Gases and rock shoot up through the opening and spill over or fill the air with lava fragments.
- Eruptions can cause lateral blasts, lava flows, hot ash flows, mudslides, avalanches, falling ash and floods. Volcano eruptions have been known to knock down entire forests. An erupting volcano can trigger tsunamis, flash floods, earthquakes, mudflows and rock falls.
- The biggest volcanic eruption was Mount Tambour on April 10, 1815, it heard over2000 km away and had a death toll of around 71,000. Due to the explosion 1816 became known as "The Year without summer".

Causes of volcanic eruptions

- Buoyancy of the magma
- Pressure from the exploded gases in the magma and
- The injection of a new batch of magma into an already filled magma chamber.

Effects of volcanic eruptions

- Reduction of water quality
- Loss of life and economy
- Fewer periods of rain
- Crop damages
- Destruction of vegetation

- Cause of Earthquakes
- Cause of tsunamis

LANDSLIDES

- Landslides are sudden and quick movements of rock and soil down a steep slope.
- Landslides are movement of land down a slop by gravity
- They can be trigged by rain, floods, earthquakes, as well as and man made factors such as slope grading or mining.
- Landslides have the potential to happen any where a steep slope is present
- Landslides are movement of hand down a slope by gravity.
- Landslides are Mother Nature's way of redistributing land.
- They can be triggered by rain, floods &earthquakes as well as andManmade factors such as slope grading or mining.
- Landslides have the potential to happen anywhere a steep slope is present.

Causes of Landslides

- Water or rain fall
- Earthquakes
- Volcanic activity
- Intense Deforestation
- Mining or surface quarrying
- Vibrations from machinery
- Blasting

Effects of Landslides

- Property damage
- Injury
- Death and adversely affect a variety of resources
- For example, water supplies, fisheries, sewage disposal systems, forests, dams, and roadways can be affected for years after a slide event.
- Cost to repair structures
- Loss of property value
- Disruption of transportation routes

Mitigation measures

- Avoid excessive exploration of natural resources
- Promote a forestation
- Soil erosion should be avoided on cliff
- Embankment construction
- Drains and pipe lines should be clear as surface drainage of water on the slope

Exogenous Hazards/disasters

CYCLONES

- A cyclone is a large scale air mass that rotates around a strong centre of low atmosphere pressure.
- A system of winds rotating inwards to an area of low barometric pressure, with an anticlock wise (Northern hemisphere) clock wise (Southern hemisphere).
- A cyclone is an area of closed, circular fluid motion. It has low pressure on the inside and high pressure on the outside.
- The center of the storm is called the eye and it has the calmest water and the lowest pressure
- Cyclones have been on other outside of the earth such as mars, Neptune.
- Cyclones are also called as hurricanes, and typhoons.
- 2017 north –Indian ocean cyclone caused at a lowest pressure of 976 hypa.8.8 billion $ damage. 761 deaths.
- The 1999 Orissa cyclone was the strongest storm to hit the Indian coast, as wellas the strongest in the basin till date, with a minimum central pressure of 912 mbar.
- The biggest cyclone recorded is the Bola cyclone. It hit the coast of today's Bangladesh in 1970 with a death toll of around 500,000.

Causes of cyclones

- As we know that when water vaporizes, it absorbs heat from the surroundings. Water vapour rises in the atmosphere where it cools down. When water vapour changes back into liquid the heat is released into the atmosphere. This warms the air around it.
- The warm air tends to rise and causes a drop in the pressure. The air moves from surrounding high-pressure areas to the central low-pressure area. This cycle is repeated. The chain of events leads to the formation of very low-pressure system surrounded by with very high-speed winds. This weather condition is a **cyclone**.

Effects of cyclones

- The buildings collapse and houses get blown away.
- Flooding of low lying coastal areas.
- Roads and rail transport get blocked by food water.
- Power supply failure or power outages.
- Contamination of water from dead animals and rotting food.
- Damage to installations.
- Damage to communication system.
- Disruption of international shipping activities.

FLOODS

- A flood an overflow of water that submerges land. Flood as temporary covering by water of land.
- Covering of land by water.
- About 35 million hectares of land is prone to floods.
- In India only 18% of rain water is stored in dams, reservoirs, while the rest of it goes into the sea
- Flooding may occur as an overflow of water from water bodies such as a river, lake or ocean in which the water overtops resulting in some of the water escaping its usual boundary.
- Floods can also occur in rivers when the flow rate exceeds the capacity of river channel particularly at bends in the water way.
- Floods often cause damage to hums and business if they are in natural flood plane of rivers.
- Some floods develop slowly while others such as flash floods can develop in just a few minutes without signs of rain.
- Gujarat state of India was affected by the flood in July 2015 resulted in 72 deaths. 20 billion property damage.
- One of the biggest floods in the world is probably the Yellow river in China 1887 which killed between around 900,000.

Causes of floods

Flood is usually a result of natural causes. It may also be caused by man-made factors. It causes huge damage to life and property. There are many different causes leading to flooding. Some prominent among them include:

- Massive Rainfall
- Overflowing of the Rivers
- Collapsed Dams
- Snowmelt
- Deforestation
- Climate change
- Drainage system/basins

Effects of floods

- Primary effects

The primary effects of flooding include loss of life and damage to buildings and other structures, including bridges, sewerage systems, roadways, and canals.

- Floods also frequently damage power transmission and sometimes power generation, which then has knock-on effects caused by the loss of power. This includes loss of drinking water treatment and water supply, which may result in loss of drinking water or severe water contamination. It may also cause the loss of sewage disposal facilities. Lack of clean water combined with human sewage in the flood waters raises the risk of waterborne diseases, which can include typhoid, guardian, cryptosporidium, cholera and many other diseases depending upon the location of the flood.
- Damage to roads and transport infrastructure may make it difficult to mobilize aid to those affected or to provide emergency health treatment.
- Flood waters typically inundate farm land, making the land unworkable and preventing crops from being planted or harvested, which can lead to shortages of food both for humans and farm animals. Entire harvests for a country can be lost in extreme flood circumstances. Some tree species may not survive prolonged flooding of their root systems.

Mitigation measures to control floods

- Construction proper flow channels
- Improving drainage
- Preventing overbank spilling by constructing embankments and flood walls
- Wetland management
- Develop long-term sustainable water management strategies
- Risk management to minimize the short term and long term effects of flooding
- Pre-disaster management such as relief, flood fighting, education
- Post-disaster management measures such as relief, search and rescue, medical and flood insurance

DROUGHT

- A drought is a period of below average precipitation in a given region, resulting is prolonged shortages in water supply whether atmospheric, surface water or ground water.
- A Drought can last for monthsor years or may be declared after as few as 15 days.
- Drought has substantial impact on eco system and agriculture and ecosystem of the effected region and harm to the local economy.
- Prolonged droughts have caused mass migrations.
- The most prolonged drought ever in the world recorded history occurred in "Atacama" desert chilli (400 yrs).

Types of droughts

People tend to define droughts in three main ways

1. **Meteorological drought**-it occurs when there is a prolonged time with less than average precipitation. Meteorological drought usually precedes the other kinds of drought.
- Meteorology is a branch of the atmospheric sciences which includes atmospheric chemistry and atmospheric physics, with a major focus on weather forecasting. The study of meteorology dates back millennia, though significant progress in meteorology did not occur until the 18th century.

2. **Agricultural drought**-itaffects crop production or the ecology of the range. This condition can also arise independently from any change in precipitation levels when either increased irrigation or soil conditions and erosion triggered by poorly planned agricultural endeavours cause a shortfall in water available to the crops. However, in a traditional drought, it is caused by an extended period of below average precipitation.
3. **Hydrological drought**-it is brought about when the water reserves available in sources such as aquifers, lakes and reservoirs fall below a locally significant threshold. Hydrological drought tends to show up more slowly because it involves stored water that is used but not replenished. Like an agricultural drought, this can be triggered by more than just a loss of rainfall. For instance, around 2007 Kazakhstan was awarded a large amount of money by the World Bank to restore water that had been diverted to other nations from the Aral Sea under Soviet rule. Similar circumstances also place their largest lake, Balkhash, at risk of completely drying out.

Causes of droughts

- Precipitation deficiency
- Dry season
- Erosion and human activities
- Climatic changes
- Change in water quality

Effects of droughts

- Environmental effects
- Loss of biodiversity
- Economic losses include lower agricultural, forests
- Effects vary according to vulnerability. For example, subsistence farmers are more likely to migrate during drought because they do not have alternative food-sources. Areas with populations that depend on water sources as a major food-source are more vulnerable to famine.
- Drought can also reduce water quality, because lower water-flows reduce dilution of pollutants and increase contamination of remaining water-sources. Common consequences of drought include:
- Diminished crop growth or yield productions and carrying capacity for livestock
- Dust bowls, themselves a sign of erosion, which further erode the landscape
- Dust storms, when drought hits an area suffering from desertification and erosion
- Habitat damage, affecting both terrestrial and aquatic wildlife
- Hunger – drought provides too little water to support food crops.
- Malnutrition, dehydration and related diseases
- Mass migration, resulting in internal displacement and international refugees
- Reduced electricity production due to reduced water-flow through hydroelectric dams
- Shortages of water for industrial users

TORNADOES (TWISTERS)

- A tornado is a violently rotating column of air that is touching both the ground and a cumulonimbus cloud.
- Tornado conditions are caused when the different temperatures and humidity meet to form thunder clouds.
- Twisters can attain speed up to 100 miles an hour.

- The biggest tornado recorded was the hallam,Nebraska tornado on may 22, 2004.it was around 2.5 miles big and had a death of around 160.

Causes of tornadoes

- Tornadoes are caused by the thunder forms being extremely large, unstable and with wind shear in the lower region of the atmosphere.
- Instability refers to the hot and humid conditions in the lower atmosphere and cooler conditions in the upper atmosphere.

Effects of tornadoes

- Tornadoes effect the environment by destroying buildings and trees. Tornadoes also kill animals, which affect the food chain and disrupt the whole environment.
- Tornadoes destroy our farms, which mean there will be food shortages around the surrounding area.
- After everything is destroyed, humans have to rebuild.

TSUNAMI

- A tsunami is also called as seismic sea wave or tidal waves.
- Tsunami is a series of huge seismic sea waves caused by any disturbance that displaces a large water column in a water body from equilibrium position.
- The disturbance can be in the form of seismic activity sub marine landslides or cosmic impacts. This phenomenon generally occurs when the oceanic plate hits a continental plate and generates pressure.
- The heavier oceanic plates slide under the lighter continental plate to cause an earthquake.
- Violent under water earthquakes are very common in deep ocean trenches.

- Tsunamis are very destructive and cause enormous loss to life and property.

Causes of tsunamis

- Earthquakes-it can be generated by movements along fault zones associated with plate boundaries.
- Landslides-which occurs along with the coast can force large amounts of water into the sea, disturbing the water and generate a tsunami.
- Magnitude and depth of earthquake.
- Amount of vertical motion of the sea floor.
- Velocity of motion of sea floor.
- Transfer of energy from the earths crust to ocean water.

Effects of tsunamis

- Loss of human and animal life ,increasing instant death, injury, illness
- Millions of dollars in financial loss
- Psychological effects
- A permanent change to the landscape
- Devastating property damage
- Contamination of water and soil
- Severe flooding causes to damages drain system

WILDFIRE

- Wildfire is an uncontrolled fire in an area of combustible vegetation occurring in rural areas
- Depending on the type of vegetation present a wildfire can also be classified more specifically as a
  1. Brush fire
  2. Desert fire
  3. Forest fire
  4. Grass fire

5. Hill fire
6. Peat fire
7. Vegetation fire 

Causes of wildfire

- Natural –dry climate, lightening, volcanic eruption
- Human activity-open burning, dropping burning substances such as cigarettes, any other human related activities that can create a spark
- Burning debris-burn yard waste in may places
- Un attended campfires-things out of control and can cause wildfires
- Equipment failure or engine sparks
- Fire works

Effects of wildfire

- Wildfire take away homes, wildfire as well as vegetation
- The soil in the area of the wildfire has been completely destroyed
- Animals loss their lives
- Trees and plants are gone as well produce oxygen
- To much water in the soil can cause erosion
- Large amount of smoke are released into the air-breath and air pollution
- Income and jobs are lost for workers

AVALANCHES

- It is also called as snow slide
- An avalanches is a mass of snow that slides rapidly down on inclined slope such as mountainside or the roof of a building
- Avalanches are triggered by either natural forces i.e. precipitation, wind drifting snow, rapid temperature changes or human activity

Causes of avalanches

- Steep slope
- Snow cover
- Weak layer
- Trigger

Effects of avalanches

- Damage to life and property
- Flash floods
- Economic impact
- Road network system blocked
- Effect on agriculture

Factors influencing on avalanches production

- Weather conditions-temperature, wind and heavy snowfall during storms most likely cause avalanches
- Snowfall-snowfall exerts pressure on the existing snow pack break
- Temperature-temperature rises ,upper layer decreases and snowpack decreases ,it creates avalanches
- Wind-direction of wind on the mountain slope produces avalanches

MAN INDUCED DISASTERS

- We are now living in a civilized society the days of illiteracy and ignorance have gone.
- Man has much more progress in the field of science and technology.
- Man has created wealth out of natural resources for comfortable living.
- Man has cut forests; recklessly to clear the land for cultivation ad along with this environmental degradation has taken place, which also affects his life.
- Man is becoming his own energy because he has also created weapons humanity, which further being sorrow and suffering to mankind.

Types of mankind disasters

- Nuclear accidents
- Biological disasters
- Chemical disasters
- Terrorist attacks
- Global warming
- Pollution

Apart, above man-induced hazards/disasters have some more hazards/disasters like

- Societal hazards
- Hazardous materials
- Transportation

NUCLEAR ACCIDENTS

One of the scariest things about, no power is when something goes wrong and an accident occurs.

- Radiation is released into the environment and people get hurt.
- Nuclear weapons are thus far more destructive and harmful to the society than any other weapon.
- Developed countries believe that nuclear energy will be used only for peaceful purposes.
- We can hope this to be true, last we face another Hiroshima and Nagasaki situation.
- Nuclear radiation keeps on showing its effect for a considerable period of time, even after its explosion and those who survive become mental and physical wrecks due to impact of nuclear radiation.
- In case of nuclear explosion, nothing much can be done. Some precautions however may be taken.
- We should stay inside keeping doors and windows shut to protect ourselves against nuclear radiation.
- We should keep ourselves informed about government plants and should act in accordance with official communication.
- Nuclear activity may affect our health and cause nausea, giddiness, vomiting etc., medical help should be taken.
- The first two atomic bomb were used by the USA to end the war against Japan in 1945.
- The first one was called little boy and dropped by a flight called Enola gay on Hiroshima with a death toll of around 166,000 on 6 august 1945.
- The second was named the fat man and wad dropped by a plane called boxcar on Nagasaki with a death toll of around 80,000 on 9 august 1945.

- If Japan did not surrender the USA planned too continue dropping atomic bombs until they did.

CHEMICAL DISASTERS

- By their nature, the manufacture, storage and transport of chemicals are accident waiting to happen.
- Chemicals can be corrosive, toxic and they may react, often explosively.
- The impacts of chemical accidents can be deadly for both human being & environment.
- Chemical disasters are also caused by industrial accidents.
- The poisonous gases spread in the atmosphere and the people who inhale the same air face dangerous consequences.
- Those industries which use hazardous chemicals (or) produce such chemicals (or) produce such chemicals should have contingency action plan to help if such a disaster takes place.
- Such industries should have timely warning systems. So that people can immediately takes safety measures such as locking of their houses and taking the family &animals away to a safe place.
- Safety measures and checkups in the factory and critical analysis of working condition of factory will help to take family measures check any disaster.
- Vizag gas leak-The Vizag gas leak, was an industrial accident that occurred at the LG Polymers chemical plant in the R. R. Venkatapuram village of the Gopalapatnam neighbourhood, located at the outskirts of Visakhapatnam, Andhra Pradesh, India, during the early morning of 7 May 2020
- Bhopal gas leak-**Bhopal gas tragedy** was a gas leak incident on the night of 2–3 December 1984 at the Union Carbide India Limited (UCIL) pesticide plant in Bhopal, Madhya Pradesh, India. It is considered among the world's worst industrial disasters.Over 500,000 people were exposed to methyl isocyanate (MIC) gas. The highly toxic substance made its way into and around the small towns located near the plant.

BIOLOGICAL DISASTERS

- Biological disaster spreads through the organism that is developed in the form of bacteria (or) microbes.
- Biological agent spread fast in the environment &then makes an attack on the human beings.

- The people inhale these members. When these microbes fund themselves a host body they start effecting immune systems of the body.
- Microbes also enter the human body through open wounds or cuts.
- The attack of these microbes is generally slow but once they are spread in the body it becomes it becomes difficult to control them. It takes the life if the effected persons.
- Whenever we learn or hear of type of damage of these diseases through official announcement on radio or TV, we should be cautious about these diseases and should adopt preventive and protective measures.

GLOBAL WARMING

- Global warming is the rise of average temperature of earth's atmosphere.
- Warming of climate system is unequivocal and scientists are more than 95% certain that it is primarily caused by increasing concentrations of green houses gases produced by human activities burning of fossil fuels and deforestation.
- These findings are recognised by national sciences academics of all major industrialized nations. The effects of increase in global temperature include arise in sea levels and a change in the amount and pattern of precipitation as well as probable expansion of subtropical deserts.
- Other likely Effects of warming include a more frequent occurrence of extreme weather events including heat waves, heavy rainfall & ocean acidification and species extinction.
- Also effects humans. The effects include the threat to food security from decreasing crop yields & loss of habit from industrialized nations.

TERRORIST ATTACKS

- A surprise attack involving deliberate use of violence against civilians in the hope of attaining political or religious aims. This is done through intimidation.

Worst Terrorist Attacks:

- Mumbai terrorist attack is also known as November 26 (or) 26/11/2008 and this terrorist attack targeted India's largest city Mumbai it was actually a series of '10' coordinates shooting and bombing attacks across Mumbai by Islamic terrorist who are believes to have come from Pakistani sea water and backed by ISI, Pakistani secret service agency. It affected the Indo-Pak relation immensely.
- 9/11 is the big act of terrorism on US

- On September 11th, 2001, 4 flights were hi- jacked 2 of them hit the twin towers in New York and third flight hit pentagon, in Washington DC killing
- 4th flight, passengers attacked the hi-jackers and crashed the flight down.
- 4th flight was believed to have a target of White house or the Capitol.
- In 2008 terrorist attack occurred in various places like Jharkhand (India) 6 died, Bulawayo (Zimbabwe) 2 died, sria 8 died, Farah (Afghanistan) 15 died etc.

POLLUTION:

- Pollution is introduction of contaminants into natural environment that cause adverse change pollution can take the form of chemical substances or energy such as noise, heat (or) light.
- Pollutants the components of pollution can be either foreign substance or naturally occurring contaminants.
- The black smith institute issues an annual list of world's worst polluted place.
- In 2007 issues the 10 top nominees are located in Azerbaijan, china, Peru, Russia, Ukraine & Jambi.
- The major forms in pollution are listed below:

Air pollution: The release of chemicals and particulates into atmosphere.Release of chloroform carbons, Nitrogen oxide produced by industry.

Light pollution: Includes over illumination and astronomic interference.

Noise pollution: It includes road way noise, air craft noise, and industrial noises.

Soil contaminants: occurs when chemicals are released by spill or underground leakage among them most significant contaminants are hydro carbons, heavy metals, herbicides, pesticides and chlorinated hydro carbons.

- Radioactive contamination resulting from 20^{th} century activities in atomic physics such as nuclear power generation and nuclear weapons, research, manufacture.

Thermal pollution: It is a temperature change in natural water bodies caused by human influence such as water as coolant in a power plant.

Water pollution: By the discharge of waste water into surface waters, discharges of untreated domestic waste, release of waste and contaminants into surface runoff.

In October 2001 there was a change of anthrax germs being used as biological weapons.

- Anthrax was cause of death for some people in USA.
- Anthrax is deadly disease caused by bacillus most common in sheep and cattle that also affects mankind.

In December 1984 the leakage of gas from union carbide factor at Bhopal in Madhya Pradesh caused 2500 deaths and more than 3 lakh people of Bhopal suffered the disastrous effect of poisonous gas.

- The worst type of man-made is caused the use of nuclear weapons on august 6th 1945 an atom bomb was dropped on "Hiroshima" in Japan which divested the entire town killing 65000 people and injuring nearly 69000 people.
- On August 9th 1945 another atom bomb was dropped on "Nagasaki" this bomb killed nearly 39000 people and injured more than 25000.

SOCIETAL HAZARDS

- A failure to notice or by purposeful intent by human inaction or neglect, consequences as a result of little or no pre-emptive actions to prevent a hazard from occurring.
- Although not everything is within the scope of human control, there is anti- social behavior and crimes committed by individuals or groups that can be prevented by reasonable apprehension of injury or death.
- Criminality
- Terrorism
- War
- Industrial Hazards
- Engineering Hazards
- Waste Disposal
- Power Outage
- Fire

1. CRIMINALITY

- Behavior which puts others at risk of injury or death is universally regarded as criminal and is a breach (breaking) of the law for which the appropriate legal authority may impose some form of penalty, such as imprisonment, a fine, or even execution.
- Understanding what makes individuals act in a way that puts others at risk has been the subject of much research in many developed countries.

Causes

- Poverty
- Parental neglect
- Low self-esteem
- Alcohol and drug abuse

Effects

- Anger
- Depression
- Fear
- Flashbacks to the offence

2. TERRORISM

- The common definition of terrorism is the use or threatened use of violence for the purpose of creating fear in order to achieve a political, religious, or ideological goal.
- Targets of terrorist acts can be anyone, including private citizens, government officials, military personnel, law enforcement officers, fire fighters, or people serving in the interests of governments.

Causes

- Directly inspire more people to the cause(revolutionary acts)
- Independence or separatist movements
- Environmental protection(eco terrorism)
- Responding to a violent act(tit-for-tat actions)
- Financial rewards
- Mental health disorder

Effects

- Impacts on individuals, communities, and society
- Long term tension and strain
- Changes in human health related behaviours
- Loss of tourism industry
- Loss of economy
- Psychological hazards

3. WAR

- War is a conflict between relatively large groups of people, which involves physical force inflicted by the use of weapons.
- Warfare has destroyed entire cultures, countries, economies and inflicted great suffering on humanity. Other terms for war can include armed conflict, hostilities, and police action.
- Acts of war are normally excluded from insurance contracts and sometimes from disaster planning.

Causes

- Contact and salience
- Opposing interests and capabilities
- Non libertarian enemies
- Significant change in the balance of powers

Effects

- Destroys communities and families
- Disrupts the development of the social and economic fabric of nations
- Long term physical and psychological harm to children and adults as well as reduction in material

4. INDUSTRIAL HAZARDS

- Industrial accidents resulting in releases of hazardous materials usually occur in a commercial context, such as mining accidents. They often have an environmental impact but also can be hazardous for people living in proximity.
- The Bhopal disaster (dec 3, 1984) saw the release of methyl isocyanine into the neighboring environment seriously affecting large numbers of people. It is probably

the world's worst industrial accident to date.

Causes

- Hot work
- Flammable liquids and gases
- Equipment and machinery
- Electrical hazards
- Combustible dust

Effects

- Toxic waste
- Community impact
- Health effect
- Loss of life and property

5. ENGINEERING HAZARDS

- Engineering hazards occur when structures used by people fail or the materials used in their construction prove to be hazardous.

Causes

- Design flaws
- Material failures
- Extreme conditions and environments

Effects

- Economy

- Loss of life and property
- Structural collapse
- Manufacturing accidents

6. WASTE DISPOSAL

- In managing waste many hazardous materials are put in the domestic and commercial waste stream. In part this is because modern technological living uses certain toxic or poisonous materials in the electronics and chemical industries.
- Which, when they are in use or transported, are usually safely contained or encapsulated and packaged to avoid any exposure?
- In the waste stream, the waste products exterior or encapsulation breaks or degrades and there is a release and exposure to hazardous materials into the environment, for people working in the waste disposal industry, those living around sites used for waste disposal or landfill and the general environment surrounding such sites.

Causes

- Domestic, commercial, industrial, municipal, and agricultural wastes
- Increase in the quantity of solid waste is due to overpopulation

Effects

- Soil ,water, air pollution
- Creation of a green house gas effect
- Harm to marine and wildfire
- Effect on human health
- Loss of tourism industry

7. POWER OUTAGE

- A power outage (also called a power cut, a power blackout, power failure or a blackout) is a short- term or a long-term loss of the electric power to a particular area.
- Power failures are particularly critical at sites where the environment and public safety are at risk. Institutions such as hospitals, sewage treatment plants, mines, shelters and the like will usually have backup power sources such as standby generators, which will

automatically start up when electrical power is lost.

Types

1. **Transient fault**-loss of power typically caused by a fault on power lines
2. **Brownout**-it is a drop in voltage in an electrical power supply. Dimming experienced by lighting when the voltage sags
3. **Blackout**-it is the total loss of power to an area

Causes

- Faults at power stations
- Damage to electric transmission lines
- A short circuit
- Fuse or circuit breaker operation
- Weather condition
- Vehicles

Effects

- Loss of life
- Electrical surges
- Equipment loss
- Economy impact

8. FIRE

- Bush fires, forest fires, and mine fires are generally started by lightning, but also by human negligence.
- They can burn thousands of square kilometers.
- If a fire intensifies enough to produce its own winds and "weather", it will form into a firestorm. 

Causes

- Physical damage through burning
- Needs a source of ignition(cigarettes)
- Heating
- Faulty wiring
- Curious children's

Effects

- A massive loss of money and lives
- Property damage, instant death
- Polluting the air with emissions harmful to human health

HAZARDOUS MATERIALS

- Toxic metals
- Radioactive materials
- CBRNs

1. TOXIC METALS

- Many metals and their salts can exhibit toxicity to humans and many other organisms. Such metals include Lead, Cadmium, Copper, Silver, Mercury etc.
- Toxicity can refer to the effect on a organism such as an animal, bacteria or plant as well as the effect on a substructure of the organism such as a cell or an organ such as the liver.
- Toxic materials may enter the body in different ways, the most common route of exposure is through inhalation(breathing it into the lungs)

2. RADIOACTIVE MATERIALS

- Radioactive materials produce ionizing radiation which may be very harmful to living organisms.
- Damage from even a short exposure to radioactivity may have long term adverse health consequences
- It consist of different materials such uranium, thorium, plutonium and any of there decay product such as radium and radon
- Natural radioactive elements are presenting very low concentrations in earths crust and are brought to the surface through human activities such as oil and gas exploration or mining

3. CBRN

- CBRN is a catch-all acronym for chemical, biological, radiological, and nuclear. The term is used to describe a non-conventional terror threat that, if used by a nation, would be considered use of a weapon of mass destruction.
- This term is used primarily in the United Kingdom. Planning for the possibility of a CBRN event may be appropriate for certain high-risk or high-value facilities and governments.

TRANSPORTATION HAZARDS

- Aviation
- Rail
- Road
- Space
- Sea

1. AVIATION

- An aviation incident is an occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations, passengers, or pilots.
- The category of the vehicle can range from a helicopter, an airliner, or a space shuttle.
- Aviation began in the 18th century with the development of the hot air balloon. An apparatus capable of atmospheric displacement through buyoncy

Causes

- **Pilot error**-the most common cause of aviation accidents which accounts for approximately half of plane crashes
- **Mechanical defects**-a defect or failure in any one of these system can lead to a dangerous situation. These can include malfunction defects, inadequate repairs and equipment replacement.
- **Weather problems**-just as driving becomes more dangerous in bad weather heavy rain storms, fog, and snow can make it more difficult for airplanes

- **Air traffic controller error**-air traffic controllers must coordinate with many different planes at once and often must take factors such as weather and fuel into consideration when scheduling take offs and landings

Effects

- Loss of life and property
- Pollution
- Economy impact

2. RAIL

- The special hazards of travelling by rail include the possibility of a train crash which can result in substantial loss of life.
- Incidents involving freight traffic generally pose a greater hazardous risk to the environment.

Causes

- Improper maintenance of rail road tracks
- Faulty equipment
- Collision with another train
- Mechanical malfunction
- Collides with cars and trucks
- Weather problems

Effects

- Environmental impact
- Economy impact
- Loss of life and property

3. ROAD

- Traffic collisions are the leading cause of death, and road-based pollution creates a substantial health hazard, especially in major conurbations.
- A road accident refers to any accident involving at least one road vehicle occurring on a road open to public circulation and in which at least one person is injured or killed.

Causes

- Distracted driving
- Drunk and drive
- Speeding or reckless driving
- Weather conditions
- Bad road conditions
- Breaking the traffic rules

Effects

- Economic loses to individuals and their families
- People suffer non-fatal injuries
- Disability
- Mental anguish, fear

4. SPACE

- Accidents can occur on the ground during launch, preparation, or in flight, due to equipment malfunction or the naturally hostile environment of space itself.
- An additional risk is posed by (unmanned) low-orbiting satellites whose orbits eventually decay due to friction with the extremely thin atmosphere.
- If they are large enough, massive pieces travelling at great speed can fall to the Earth before burning up, with the potential to do damage.

Causes

- Mechanical defects
- Weather problems
- Improper maintenance

- Mechanical malfunction

Effects

- Bone and muscle deterioration
- Radiation
- Temperature
- Physociological effects

SEA TRAVEL

- Ships can sink, capsize or crash in disasters. Perhaps the most infamous sinking was that of the Titanic which hit an iceberg and sank, resulting in one of the worst disasters in history.

Causes

- Inexperience and lack of training
- Reckless behavior
- Poor decision making or negligence
- Pressure and stress of job duties
- Weather conditions

Effects

- Erosion of beaches and bluffs
- Loss of coastal wet lands
- Increased flooding and storm damage
- Inundation of low laying areas

GEOMAGNETIC STORMS

- A geomagnetic storm (commonly referred to as a solar storm) is a temporary disturbance of the Earth's magnetosphere caused by a solar wind shock wave and/or cloud of magnetic field that interacts with the Earth's magnetic field. The increase in the solar wind pressure initially compresses the magnetosphere.
- The solar wind's magnetic field interacts with the Earth’s magnetic field and transfers an increased energy into the magnetosphere.

- During the main phase of a geomagnetic storm, electric current in the magnetosphere creates a magnetic force that pushes out the boundary between the magnetosphere and the solar wind.
- The disturbance in the interplanetary medium that drives the storm may be due to a solar coronal mass ejection (CME) or a high speed stream (co- rotating interaction region or CIR) of the solar wind originating from a region of weak magnetic field on the Sun's surface.

EFFECTS OF GEOMAGNETIC STORM

- Disruption of electrical systems
- Communications
- Navigation systems
- Satellite hardware damage
- Mains electricity grid
- Geologic exploration
- Pipelines
- Radiation hazards to humans
- Effect on animals

METEORITE IMPACTS

- Meteorites are naturally occurring objects in space which are generally remnants of asteroids and comets.
- A meteorite is a solid piece of debris from an object such as a comet, asteroid or meteoroid. That originates in outer space and survives it passage through the atmosphere to reach the surface of a planet or moon.
- When the original object enters the atmosphere various factors such as friction, pressure, and chemical interaction with the atmospheric gases cause it to heat up and radiate energy. It then becomes a meteor and forms a fireball, also known as a shooting star or falling star.
- When such extra planetary objects strike the earth’s surface, then it forms a bowl-shaped depression with a raised on the following factors, size of the impacting object, velocity of the impacting object and angle at which the object strikes like earth’s surface.

They have been categorized into three types,

1. Stone Meteorites
2. Iron Meteorites
3. Stony-iron Meteorites

EFFECTS OF METEORITE IMPACTS

The effects of an impact of a large extra terrestrial object on the earth’s surface are,

- Massive earthquake
- Widespread wildfires
- Blocking of solar radiation due to large quantities of dust in the atmosphere.
- Decrease in the rate of photosynthesis in plants leading to disruption of all ecosystems.
- Acidification of water

UNIT-III

ENDOGENOUS HAZARDS

Endogenous Hazards / Disasters

Disasters /Hazards which originate inside the surface of the earth are termed as endogenous hazard.

Ex: volcanoes, Earthquake, Landslides.

1.0 VOLCANIC ERUPTION

- Volcanic eruptions refers to the process by which solid, liquid, gaseous material from the earth's crust (earth's interior) are ejected on the surface of the earth through an opening or vent.
- The molten, semi-solid state of rock is called magma. When present below the surface and lava when on the surface.
- A volcano is a rupture in the crust of a planetary- mass object, such as Earth, that allows hot lava, volcanic ash, and gases to escape from a magma chamber below the surface.
- A volcano is a mountain that opens downward to a pool of molten rock below the surface of the earth. When pressure builds up, eruptions occur. Gases and rock shoot up through the opening and spill over or fill the air with lava fragments.
- Eruptions can cause lateral blasts, lava flows, hot ash flows, mudslides, avalanches, falling ash and floods. Volcano eruptions have been known to knock down entire forests. An erupting volcano can trigger tsunamis, flash floods, earthquakes, mudflows and rock falls.
- The biggest volcanic eruption was Mount Tambour on April 10, 1815, it heard over2000 km away and had a death toll of around 71,000. Due to the explosion 1816 became known as "The Year Without Summer".

DIFFERENT STAGES OF VOLCANOES

Scientists have categorized volcanoes into three main categories:

1. Active

2. Dormant

3. Extinct

- **Active:** An active volcano is one which has recently erupted and there is a possibility that it may erupt soon.
- **Dormant:** A dormant volcano is one which has not erupted in a long time but there is a possibility it can erupt in the future.
- **Extinct:** An extinct volcano is one which has erupted thousands of years ago and there's no possibility of eruption.

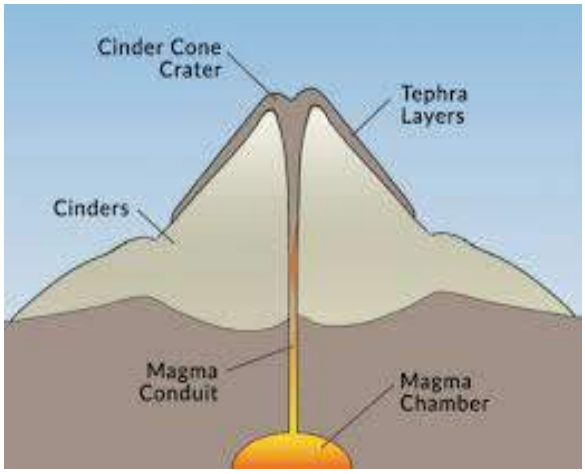
TYPES OF VOLCANOES

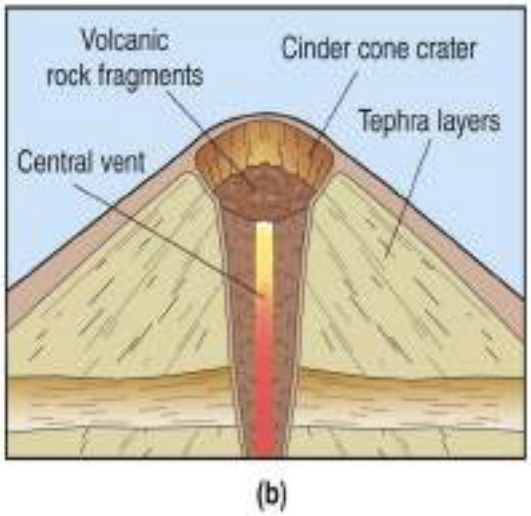
When magma erupts at the surface it can form different types of volcanoes depending on the viscosity, or stickiness, of the magma, the amount of gas in the magma, and the way in which the magma reached the surface.

Volcanoes are grouped into 4 types

- Cinder cone volcanoes
- Composite volcanoes
- Shield volcanoes
- Lava volcanoes

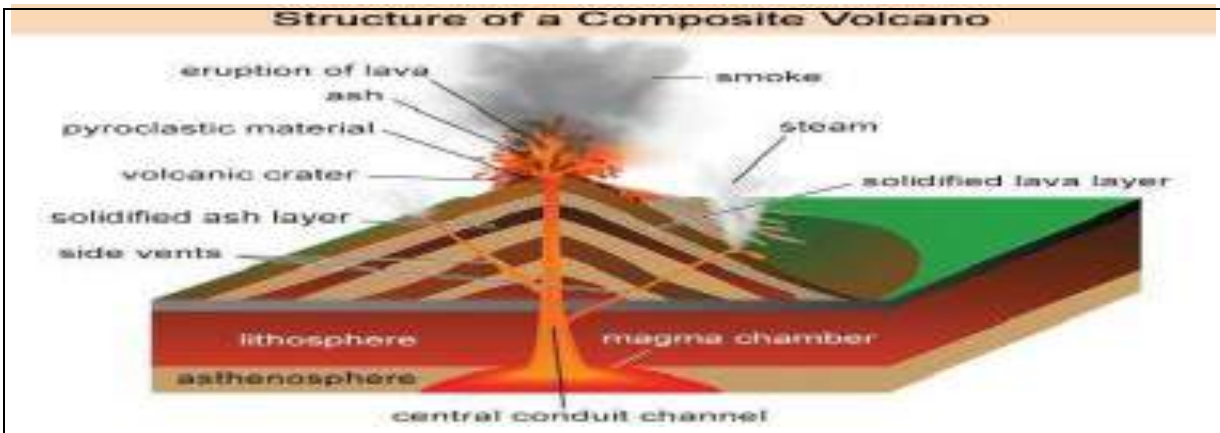
- **Cinder cone volcanoes:** It is the simplest type of volcano. They are built from particles and lava, ash; volcanic bombs are ejected from a single vent. As the gas charged lava is blown violently into the air, it breaks into small fragments that solidify and fall as cinders around the vent to form a circular or oval cone. Cinder cones are circular or oval cones made up of small fragments of lava from a single vent that have been blown into the air, cooled and fallen around the vent. Most cinder cones have a bowl-shaped crater at the summit and rarely rise more than a thousand feet or above their surroundings.



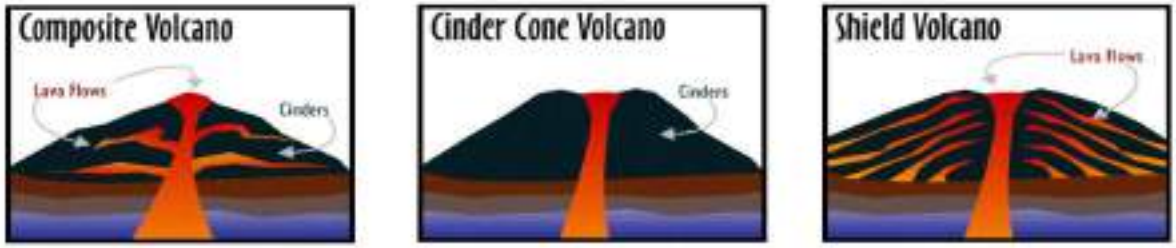


(b)

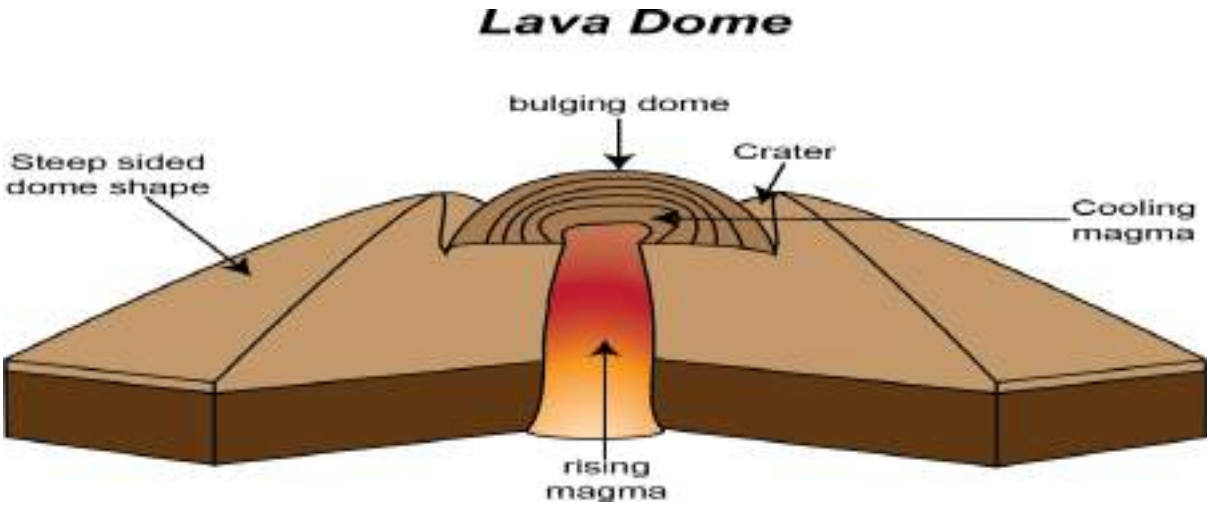
- **Composite volcanoes:** Composite volcanoes are steep-sided volcanoes composed of many layers of volcanic rocks, usually made from high-viscosity lava, ash and rock debris. Some of the Earth's grandest mountains. They are typically steep sided symmetrical cones of large dimension built of alternating layers of lava flows, volcanic ash, cinders and bombs and may rise as much as 8000 feet above their bases.



- **Shield volcanoes:** A shield volcano is a type of volcano usually built almost entirely of fluid lava flows. Shield volcanoes are volcanoes shaped like a bowl or shield in the middle with long gentle slopes made by basaltic lava flows. Basalt lava flows from these volcanoes are called flood basalts.



- **Lava Domes:** Lava domes are formed when erupting lava is too thick to flow and makes a steep-sided mound as the lava piles up near the volcanic vent. The eruption of mount set. Helens in 1980 was caused in part by a lava dome shifting to allow explosive gas and steam to escape from inside the mountain. Volcanic domes commonly occur within the craters or on the flanks of large composite volcanoes.



TYPES OF VOLCANIC ERUPTION

There are 3 different types of eruptions

- Magmatic eruption
- Phreatomagmatic eruption
- Phreatic eruption
- **Magmatic eruption:** Which involve the decompression of gas within magma that propels it forward direction.

- **Phreatomagmatic eruptions:** Is another type of volcanic eruption, driven by the compression of gas with in magma, the direct opposite of the process powering magmatic activity.
- **Phreatic eruption:** which is driven by the superheating of steam via contact with magma; these eruptive types often exhibit no magmatic release, instead causing the ((granulation of existing rock.

TYPES OF LAVA

Lava can be categorized into 3 types

- **Mafic:** Silica poor (45-52%) Mafic or basaltic lavas are typified by their high ferromagnesian content, and generally erupt at temperatures in excess of 950 °c (1,740 °f). Basaltic magma is high in iron and magnesium, and has relatively lower aluminium and silica, which taken together reduces the degree of polymerization within the melt.
- **Intermediate:** Silica composition (53-65%) Intermediate or andesitic lavas are lower in aluminum and silica, and usually somewhat richer in magnesium and iron. Intermediate lavas form andesine domes and block lavas, and may occur on steep composite volcanoes, such as in the Andes. Poorer in aluminum and silica than felsic lavas, and also commonly hotter (in the range of 750 to 950 °c (1,380 to 1,740 °f)), they tend to be less viscous.
- **Felsic**: Contains more than 65% of silica The high viscosity and strength are the result of their chemistry, which is high in silica, aluminum, potassium, sodium, and calcium, forming a polymerized liquid rich in feldspar and quartz, and thus has a higher viscosity than other magma types. Felsic magmas can erupt at temperatures as low as 650 to 750 °c (1,202 to 1,382 °f). Unusually hot (>950 °c; >1,740 °f)

Causes of volcanic eruptions

- **The buoyancy of the magma:** As rock inside the earth melts, its volume increases producing a melt that is less dense than the surrounding rock. This lighter magma then rises toward the surface by virtue of its buoyancy. finally, the magma reaches the surface and erupts.
- **The pressure from the gases in the magma:** Magmas also contain dissolved volatiles such as water, sulfur dioxide and carbon dioxide. Experiments have shown that the amount of a dissolved gas in magma at atmospheric pressure is zero, but rises with increasing pressure.
- **Injection of new magma into a chamber that is already filled with :** This injection forces some of the magma in the chamber to move up in the conduit and erupt at the surface.

Effects of volcanic eruptions

Positive effects

- Geothermal energy is where heat from within the Earth is used to generate electricity.
- Geothermal energy can be generated in areas where magma lies close to the surface. This is good for increasing our renewable energy use.
- The lava and ash deposited during an eruption breaks down to provide valuable nutrients for the soil. This creates very fertile soil which is good for agriculture
- The dramatic scenery created by volcanic eruptions attracts tourists. This brings income to an area.

Negative effects

- The volcanic ash resulting from the eruption can get carried away to long distances and deposit as a layer. The effects of volcanic ash depending on the thickness of the layer deposited is represented in a tabular form

Thickness of ash layer	Effects

< 1mm	Irritation to lungs and eyes, closure of airports
1-5mm	Damage to buildings, dust pollution, power outages, electric shock circuits
5-100mm	Damage to crops and pasture, collapse of buildings
100-300mm	Collapse of buildings
>300mm	Death of livestock and wildfire, damage to telephone and power lines.

- Volcanoes are dangerous. They can kill people and damage property.
- Economic activity can suffer as it is hard for businesses to operate after an eruption.
- If the ash and mud from a volcanic eruption mix with rain water or melting snow, fast moving mudflows are created. These flows are called lahars.
- Lava flows and lahars can destroy settlements and clear areas of woodland or agriculture.
- Human and natural landscapes can be destroyed and changed forever.

Mitigation measures of volcanic eruption

- To construct barriers against lava flows
- Cooling lava with sea water.
- Possibility to prevent the generation of lahars is artificial draining of crater lakes.
- Fatalities and economic losses can be reduced if associated with a well monitoring system including early warning and land use planning; a culture of prevention is introduced with all levels of the society.
- A careful analysis of the history of a volcano is the most important method, in assessing the long-term probability of the occurrence of a specific eruption type and its eruptive energy.

- For potentially dangerous volcanic regions, emergency plans must be worked out, particularly evacuation plans for the population in case of immediate danger. Disaster prevention exercises, as already carried out in Japan, are useful as well.

DISTRIBUTION OF VOLCANOES

Volcanoes are distributed in well-defined zones or belts. There are as follows,

- **The Circum Pacific Belt:** This zone starts from the Andes of South America, Central America, Mexico, Cascade Mountains of wastern United States, the Aleutian Islands, Kamchatka, the Kuril Isles, Japan, Philippines, Celebes, New Guinea, the Solomon Islands, New Caledonia, New Zealand and Hawaii Islands. This zone surrounds the Pacific Ocean basin, hence it is popularly referred to as the "Pacific Ring of Fire."
- **The Mid Continental Belt:** This belt of volcanism includes the Alpine mountain chain, Mediterranean Sea, (Stromboli , Vesuvius, etna etc) volcanoes of the Aegean Sea, Mt. Ararat , Elburz and Hindukush. The Mid continental belt is also known as the volcanic zones of convergent continental plate margins.
- **The Mid Atlantic Belt :** This zone is near the centre of the Atlantic Ocean basin with volcanoes in Iceland, Ascension Island, Tristan southern tip of Africa.

RING OF FIRE

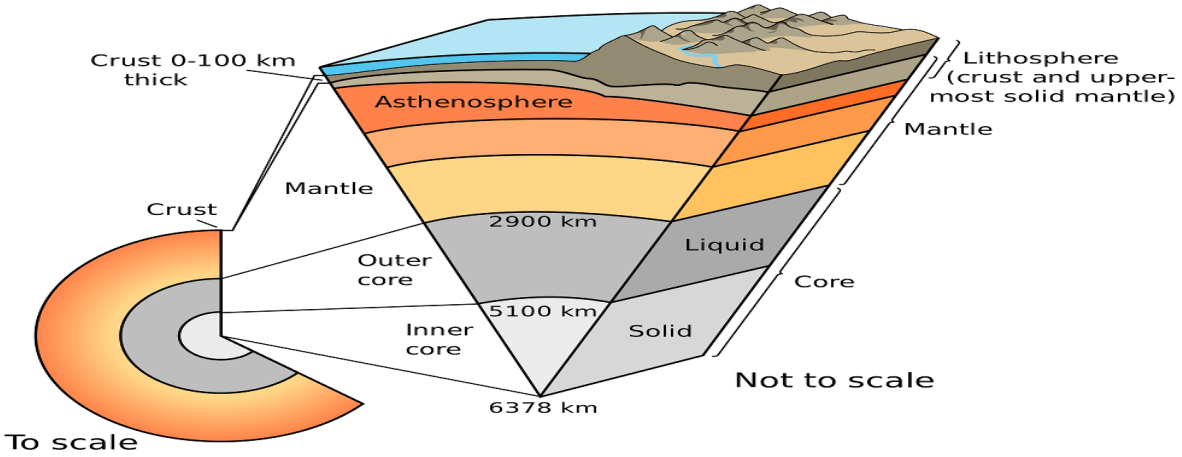
- The ring of fire or sometimes called the circum pacific Belt is composed of a long chain of volcanoes and other tectonically active structures surrounding Pacific Ocean.

- It is one of the most geologically active a reason earth and is a place for frequent earthquakes and powerful volcanic eruptions.
- There are 452 active and dormant volcanoes with in the ring of fire and many of them were created through the tectonic process of subduction which happens when dense ocean plates collide with and slide under the lighter continental plates.
- As the melted material or magma from the ocean floor enters the earth's interior it raises to the nearby surface as lava which forms volcanoes.
- About 90% of the world's earthquakes and 81% of the world's largest earthquakes occur along ring of fire.
- In fact, all but three of 25 largest volcanic Eruption in the world in the last 11,700 years occurred at volcanoes in the ring of fire.
- The ring of fire is also home to the Mariana trench which is the deepest ocean trench.
  Major volcanoes along the ring of fire, Out of 452 volcanoes found along with ring of fire here are the major, most active and most dangerous ones

2.0 EARTHQUAKES

- An earthquake is the shaking of the surface of the earth, resulting from the sudden release of energy from the earth's crust that creates seismic waves.
- Earthquakes can range in size from those that are so weak that they cannot be felt to those violent enough to the people around and destroy whole cities.
- They are measured using seismographs
- The size of an earthquake is measured using logarithmic base "Richter scale" also.

EARTH LAYERS



1.CRUST: The crust is the outermost layer of the planet, the cooled and hardened part of the Earth that ranges in depth from approximately 5-70 km. This layer makes up only 1% of the entire volume of the Earth. The thinner parts are the oceanic crust, which underlies the ocean basins at a depth of 5-10 km. Whereas the oceanic crust is composed of dense material such as iron magnesium silicate igneous rocks (like basalt).

2. LITHOSPHERE: It is the rigid outer part of the earth with thickness varying between 10-200 kilometres. It includes the crust and upper part of the mantle. The lithosphere is broken into tectonic plates and moment of these tectonic plates because large scale changes in the earth's geological structure. The source of heat that drives plates tectonics is the heat leftover from the planets formation as well as the radio active decay of uranium, plutonium, thorium and potassium in earth crust.

3. ASTHENOSPHERE: The layer below the rigid lithosphere is a zone of asphalt like consistency called the asthenosphere. The asthenosphere is the part of mantle that flows and moves the plates of earth. It lies just below the lithosphere extending upto 20-200km.

4. THE MANTLE: It forms about 83% of the earth's volume and holds 67% of the earth's mass. The density of the upper mantle varies between 2.9g/cm3 and 3.3 g/cm3. The density ranges from 3.3g/cm3 to 5.7 g/cm3 in the lower mantle. The mantle is composed of silicate rocks that are rich in iron and magnesium relative to the overlay crust.

5. OUTER CORE: The outer core, which has been confirmed to be liquid (based on seismic investigations), is 2300 km thick, extending to a radius of ~3,400 km. In this region, the density is estimated to be much higher than the mantle or crust, ranging between 9,900 and 12,200 kg/m^3. The outer core is believed to be composed of 80% iron, along with nickel and some other lighter elements. The temperature of the outer core ranges from 4,300 K (4,030 °C; 7,280 °F) in the outer regions to 6,000 K (5,730 °C; 10,340 °F) closest to the inner core.

6. INNER CORE: The inner core extends from the centre of the earth to 5100 km below the earth surface. The inner core generally believed to be composed primarily of iron and some nickel. Earth's inner core relates slightly faster relative to the rotation of the surface. The solid inner core is to hot to held a permanent magnetic field. The density of the inner core ranges from 12.6 g/cm3 to 3 g/cm3.

TERMS RELATED TO EARTHQUAKE

- **Focus:** The focus or hypo centre of an Earthquake is where the Earthquake originated from, usually underground on the fault zone.
- **Epicenter:** The epicenter of an Earthquake is the point on the surface of the earth directly above the epicenter.
- **Fault Plane:** A Fault is a weak point within a tectonic plate where pressure from beneath the surface can break through and causing shifting in an Earthquake.
- **Magnitude:** Magnitude is used to describe the size of the earthquake.There are a number of different ways to calculate the magnitude of an earthquake, including the Richter scale. Scientists also use the moment magnitude scale, which calculates the magnitude of an earthquake based on physical properties such as the area of movement along fault plane.
- **Seismology:** seismology is the study of the earthquakes, people who study earthquakes are called seismologists.

- **Aftershocks:** Aftershocks are smaller earthquakes that occur after the main earthquake in the same area. They are caused by the area readjusting to the fault movement, and some may be result of continuing movement along the same fault zone.
- **Foreshock:** foreshock are smaller earthquakes occur in the same area as a larger earthquake that follows: Not all earthquakes have foreshocks or aftershocks. Sometimes a series of similar sized earthquake swarm happens over months without being followed by a significantly larger earthquake.
- **Tectonic plate:** The outer layer (crust) of the earth is divided into sections called tectonic plates.
- **Seismology:** A branch of science focused on the study of earthquake and seismic activity.
- **Seismic waves:** waves of energy caused either by earthquakes, by massive man-made explosions or volcanoes.
- **Seismometer:** An instrument that deletes the intensity, direction of duration of earthquakes of other grand movements such as explosions.
- **Seismographs:** when the earth trembles, the device takes the reading produced by a seismometer and produces a seismogram (which is a graph that looks like a squiggly line).

TYPES OF EARTHQUAKES

The type of earthquake depends on the region where it occurs and the geological make-up of that region. The most common are

- Tectonic
- Volcanic
- Explosions
- Collapse
- **Tectonic earthquakes**: These occur when rocks in the earth's crust break due to geological forces created by movement of tectonic plates.
- **volcanic earthquakes:** These occur in conjunction with volcanic activity.
- **Collapse earthquakes :** These are small earthquakes in underground caverns and mines that are caused by seismic waves produced from the explosion of rock on the surface.
- **Explosion earthquakes:** It result from the explosion of nuclear and chemical devices. We can measure motion from large tectonic earthquakes using GPS because rocks on either side of a fault are offset during this type of earthquake.

The type of earthquake depends on depth of focus/hypocenter of the earthquake

- **Shallow or Normal:** The focus point of the earthquake is less than 60km.

- **Intermediate:** The focus point of the earthquake is lies between 60-300km.
- **Deep:** The focus point of the earthquake is lies between 300-700km.

TYPES OF WAVES

The different types of waves occurring during an earthquake are broadly categorized into two mainly types

- Body waves
- Surface waves

- **Body waves :** Body waves can travel through the interior layers of the earth. They are of two kinds

1. P - waves or primary waves: These are fastest kind of seismic waves sent out by an earthquake when the rocks are pushed or pulled forward or backward. These waves can travel through any type of material including fluid and it can travel nearly 1.7 times faster than s-waves. The typical speed are 330 m/sec in air, 1450 m/sec in water, about 5000 m/sec in granite.

2. S -wave or secondary waves: These are second fastest waves sent out by an earthquake when the rocks shake from side to side. I.e horizontal and vertical movements at right angles to the direction of the movement of waves. S waves can travel only through fluids (liquids and gases). S waves are slower than P wave and speeds are typically around 60% of that P waves in any given material.

- **Surface waves:** It travel along the surface of the earth. These waves cause enormous damage and destruction to life and property on the earth surface . The surface waves are of two kinds

1. L-waves or love waves: The frequency of love waves is lower than the p and s waves. They produce horizontal motion of the ground from side to side. They usually slightly faster than Rayleigh waves,about 90% of the S wave velocity and have largest amplitude.

2. Rayleigh waves: These waves roll along the ground and move earth surface up and down and back and front in an elliptical rotational pattern.

MEASUREMENT OF EARTHQUAKE

- The vibrations of the earthquake are measured at seismograph stations using special instruments called seismograms and the geographical reprenstation of these vibrations is called as seismograph
- The instrument consists of a stationary part and a mobile part. The mobile part of the instruments moves along with the vibrations of the earthquake.
- The vibration recording device is isolated from the rest of the earth using the principle of inertia. The recording device is attached to a heavy mass suspended by a spring which records the vibrations on the paper attached to the earth.
- The magnitude of the earthquake is measured on the Richter scale, named in the honour of the discovers Charles Richter and Gutenberg in 1935.
- The Richter scale is a base 0-10 logarithmic scale, which converts the amplitude of the largest recorded seismic wave to a numeric magnitude value.
- The mercalli intensity scale is another method to characterize the effects of earthquake it measures the severity of the earthquake based on human experiences.
- Whenever an earthquake strikes, huge amount of energy is released from the earth interiors the Richter scale and energy released in an earthquake inter related to and represented by the following equation

$$E = 11.8 + 1.5\ M$$

Where E = energy released in ergs

M = Richter magnitude

Causes of earthquakes

1. Volcanic Eruptions- The main cause of the earthquake is **volcanic eruptions**. Such type of earthquakes occurs in areas, with frequent volcanic activities. When boiling lava tries to break through the surface of the earth, with the increased pressure of gases, certain movements caused in the earth's crust. Movement of lava beneath the surface of the earth can also cause certain disruptions.

2. Tectonic Movements- The surface of the earth consists of some plates, comprising of the upper mantle. These plates are always moving, thus affecting the earth's crust. These movements categorized into three types: constructive, destructive, and conservative. Constructive is when two plates move away from each other, they correspond to mild earthquakes. When two plates move towards each other and collide, this is known as destructive plate boundaries.

3. Geological Faults-A geological fault is known as the displacement of plates of their original plane. The plane can be horizontal or vertical. These planes are not formed suddenly but slowly develop over a long period. The movement of rocks along these planes brings about tectonic earthquakes. These faults occur due to the impact of geological forces. The displacement of plates creates the fracturing of rocks, which releases a lot of energy. This type of earthquake can be disastrous.

4. Man-Made- The interference of man with nature can also become a cause of the earthquake. The disturbance of crustal balance due to heavy clubbing of water in dams can cause earthquakes. Nuclear bombing can send specific types of shockwaves throughout the surface of the earth, which can disturb the natural alignment of tectonic plates. Mining can also cause disturbance due to the extensive removal of rocks from different areas.

Effects of earthquakes

- **Ground Shaking-**Ground shaking is the most familiar effect of earthquakes. It is a result of the passage of seismic waves through the ground, and ranges from quite gentle in small earthquakes to incredibly violent in large earthquakes. Buildings can be damaged or destroyed, people and animals have trouble standing up or moving around, and objects can be tossed around due to strong ground shaking in earthquakes.
- **Ground Rupture-**Ground rupture is another important effect of earthquakes which occurs when the earthquake movement along a fault actually breaks the Earth's surface. Rupture causes problems for humans by, well, rupturing things; pipelines, tunnels, aqueducts, railway lines, roads, and airport runways which cross an area of active rupture can easily be destroyed or severely damaged.
- **Landslides-**Landslides are caused by earthquakes both by direct rupture and by sustained shaking of unstable slopes. They can easily destroy buildings in their path, or block roads and railroad lines, or take hilltop homes with them as they tumble.
- **Tsunamis**-Tsunamis are a series of water waves caused when the seafloor moves vertically in an earthquake and which can travel vast distances in a short period of time. Tsunami speeds in the deep ocean have been measured at more than 700 km/hr, comparable to some jet planes, and when tsunamis reach shallow water near the coast, they can reach heights of more than 27 meters (90 feet).
- **Liquefaction, Subsidence, and Related Effects-**Liquefaction and subsidence of the ground are important effects which often are the cause of much destruction in earthquakes, particularly in unconsolidated ground. Liquefaction is when sediment grains are literally made to float in groundwater, which causes the soil to lose all its solidity. Subsidence can then follow as the soil recompacts. Sand blows, or sand volcanoes, form when pressurized jets of groundwater

break through the surface. They can spray mud and sand over an area a few meters across. All of these effects pose a grave danger to buildings, roads, train lines, airport runways, gas lines, etc. Underground gas tanks and septic tanks (yuck!) have been known to float to the surface through liquefied soils.

- **Fires-**Fires are a major source of damage after earthquakes. Ground rupture and liquefaction can easily rupture natural gas mains and water mains, both contributing to the ignition of fires and hindering the efforts to control them. Shaking also contributes to starting fires, by knocking down power lines, spilling flammable liquids from storage containers, and tossing hot coals from barbeques and stoves.

Mitigation measures of earthquake

- Constructing earthquake-resistant community buildings and buildings (used to gather large groups during or after an earthquake) like schools, hospitals, prayer halls, etc., especially in seismic zones of moderate to higher intensities.
- Retrofitting of weak structures in highly seismic zones.
- Getting communities involved in the process of disaster mitigation through education and awareness.
- Networking of local NGOs working in the area of disaster management.
- Recovery of dead bodies and their disposal.
- Medical care for the injured.
- Supply of food and drinking water.
- Temporary shelters like tents, metal sheds etc.
- Repairing lines of communication and information.
- Restoring transport routes.
- Quick assessment of destruction and demarcation of destroyed areas, according to the grade of damage.

Distribution of earthquakes

- Earthquakes are likely to occur in any part of the world. But it's frequency of occurrence is relatively more in the areas of faulting and folding or crustal weakness. Worldwide studies on earthquake have shown that earthquakes are concentrated in the following zones.

  1. Circum Pacific earthquake zone: The belt includes all the coastal areas around the vast Pacific Ocean. This belt extends as an isostatically sensitive zone through the wast of Alaska, Aleutian, Islands, Japan, Philippines, New Zealand, North and South America. This zone accounts for 68% of all earthquakes on the surface of the earth. The most talked about earthquake areas in this zone include japan,chile, California,and Mexico.

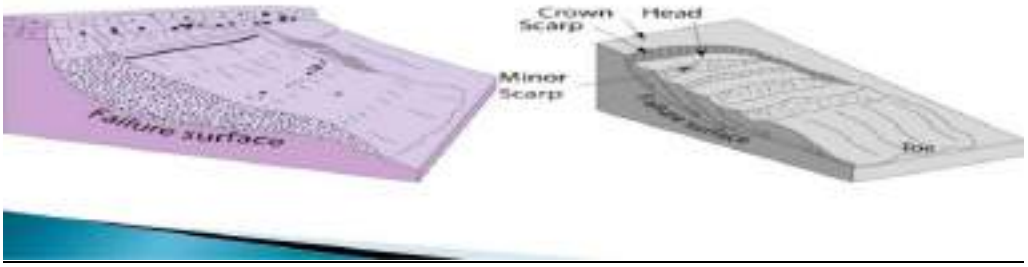
  2. **Mediterranean and Asiatic earthquake belt:** This belt begins from Alps mountain range and passes through turkey, Caucasus range, Iran, Iraq, Himalayan mountains and Tibet to china. One of its branches passes through Mongolia and lake Baikal and another branch extends to Myanmar. About 31% of world's earthquakes are located in this region.

3.0 LANDSLIDES

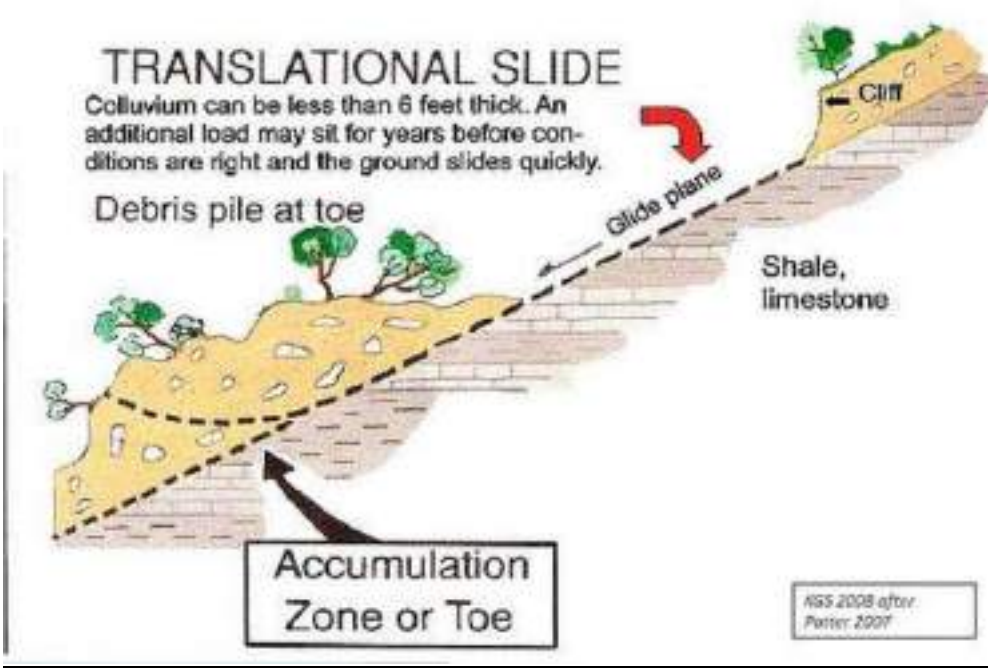
- Landslides are sudden and quick movements of rock and soil down a steep slope.
- Landslides are movement of land down a slop by gravity
- They can be trigged by rain, floods, earthquakes, as well as and man made factors such as slope grading or mining.
- Landslides have the potential to happen any where a steep slope is present
- Landslides are movement of hand down a slope by gravity.
- Landslides are Mother Nature's way of redistributing land.
- They can be triggered by rain, floods &earthquakes as well as andManmade factors such as slope grading or mining.
- Landslides have the potential to happen anywhere a steep slope is present.

COMMON TYPES OF LANDSLIDES

- Rotational slides
- Translational slides
- Rock Fall
- Rock toppling
- Lateral spreading
- Debris flow
- **ROTATIONAL SLIDES:** A slide type landslide is a down-slope movement of material that occurs along a distinctive surface. If this slip surface is curved the slide said to be rotational. The slip surface of a rotational landslide tends to be deep. Rotational slides move along a surface of rupture that is curved and concave.

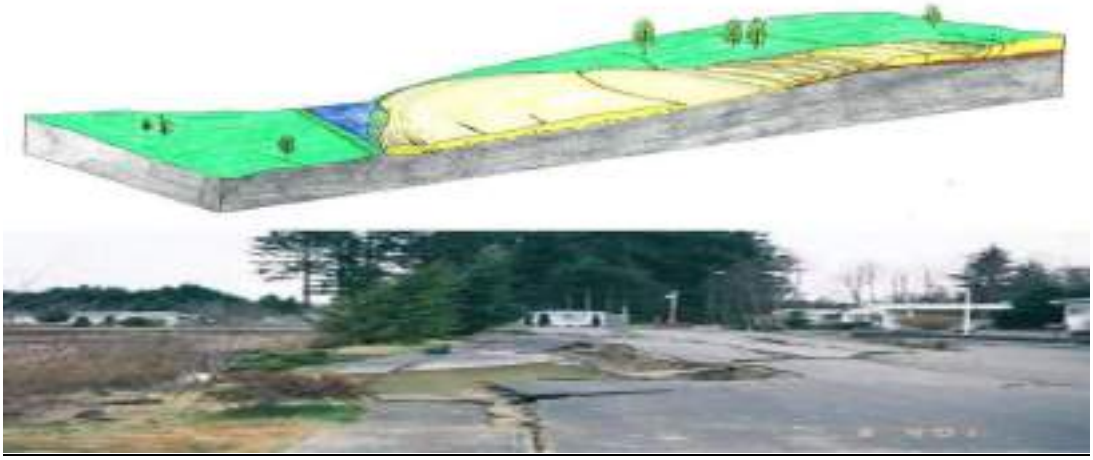


- **TRANSLATIONAL SLIDES:** A slide-type landslide is a down-slope movement of material that occurs along a distinctive surface of weakness such as a fault, joint or bedding plane. If the slip surface is straight then it is termed translational or planar.



- **ROCK FALL:** A rock fall is the natural downward motion of a detached block or series of blocks with a small volume involving free falling, bouncing, rolling, and sliding. The mode of failure differs from that of a rockslide.

- **ROCK TOPPLING:** Rock toppling occurs when one or more rock units rotate about their base and Collapse.
- **LATERAL SPREADING:** Lateral spread or flow are terms referring to landslides that commonly form on gentle slopes and that have rapid fluid-like flow movement, like water. Lateral spreading occurs when the soil mass spreads laterally and this spreading comes with tensional cracks in the soil mass.



- **DEBRIS FLOW:** Debris flows are geological phenomena in which water-laden masses of soil and fragmented rock rush down mountainsides, funnel into stream channels, entrain objects in their paths, and form thick, muddy deposits on valley floors.

Causes of Landslides

- **Gravity**: Gravity works more effectively on steeper slopes, but more gradual slopes may also be vulnerable.
- **Geological factors**: Many slides occur in a geologic setting that places permeable sands and gravels above impermeable layers of silt and clay, or bedrock. Water seeps downward through the upper materials and accumulates on the top of the underlying units, forming a zone of weakness.
- **Heavy and prolonged rainfall:** storm water runoff saturates soils on steep slopes or infiltration causes a rapid rise in groundwater levels. As water tables rise, some slopes become unstable that cause landslide.
- **Earthquakes**: When plate tectonics move the soil that covers moves with it. When earthquakes occur on areas with steep slopes, many times the soil slips causing landslides. Furthermore, ashen debris flows caused by earthquakes can also trigger mass movement of soil.
- **Forest fire:** fires cause soil erosion and induce floods and landslides due to the destruction of the natural vegetation.
- **Volcanoes**: Strato volcanoes are prone to sudden collapse, especially during wet conditions. The conditions commonly prevail after volcanic eruptions that kill vegetation over extensive and spread loose volcanic rocks over the landscape.
- **Inappropriate drainage system:** Natural drainage lines on slopes are blocked by terracing/ contour bounding adopted to prevent soil erosion and to enhance percolation during dry season for cultivation, without adequate provision for surface drainage of excess storm water during high intensity rains increase the landslide vulnerability.

- **Cutting & deep excavations on slopes**: Developmental activities like construction of buildings, road cutting, embankments, cut and fill structures causes modification of natural slopes, blocking of surface drainage, loading of critical slopes and withdrawal to toe support promoting vulnerability of critical slopes.

Effects of Landslides

- **Lead to economic decline:** Landslides have been verified to result in destruction of property. If the landslide is significant, it could drain the economy of the region or country. After a landslide, the area affected normally undergoes rehabilitation. This rehabilitation involves massive capital outlay.
- **Decimation of infrastructure:** The force flow of mud, debris, and rocks as a result of a landslide can cause serious damage to property. Infrastructure such as roads, railways, leisure destinations, buildings and communication systems can be decimated by a single landslide.
- **Loss of life:** Communities living at the foot of hills and mountains are at a greater risk of death by landslides. A substantial landslide carries along huge rocks, heavy debris and heavy soil with it. This kind of landslide has the capacity to kills lots of people on impact.

- **Affects beauty of landscapes:** The erosion left behind by landslides leaves behind rugged landscapes that are unsightly. The pile of soil, rock and debris downhill can cover land utilized by the community for agricultural or social purposes.
- **Impacts river ecosystems:** The soil, debris, and rock sliding downhill can find way into rivers and block their natural flow. Many river habitats like fish can die due to interference of natural flow of water. Communities depending on the river water for household activities and irrigation will suffer if flow of water is blocked.

Mitigation measures

- Avoid excessive exploration of natural resources
- Promote a forestation
- Soil erosion should be avoided on cliff
- Embankment construction
- Drains and pipe lines should be clear as surface drainage of water on the slope

UNIT-IV

EXOGENOUS HAZARDS

EXOGENOUS HAZARDS

- Hazards which originate above the surface of the earth (in the atmosphere) are called exogenous hazards.

  E.g. Drought, Rainfall, Snowfall, Winds, Hailstorm

1.0 RARE EVENTS

- Rare events are events that occur with low or high frequency, and the term is often used in particular reference to infrequent or hypothetical events that have potentially widespread impact and which might destabilize society.
- Rare events encompass natural phenomena (major earthquakes, tsunamis, hurricanes, floods, asteroid impacts, solar flares, etc.).
- Anthropogenic hazards (warfare and related forms of violent conflict, acts of terrorism, industrial accidents, financial and commodity market crashes, etc.), as well as phenomena for which natural and anthropogenic factors interact in complex ways (epidemic disease spread, global warming-related changes in climate and weather, etc.).

2.0 ATMOSPHERIC HAZARDS/DISASTERS

- Atmospheric hazards include things such as oxygen deficiencies, dusts, chemical vapors, welding fumes, fogs, and mists that can interfere with the bodies ability to transport and utilize oxygen, or that have negative toxicological effects on the human body.
- Before entry into most confined spaces, a multi-gas meter is commonly used to determine levels of oxygen, carbon monoxide, hydrogen sulfide, and the concentration of combustible gas. Other types of meters and sensors are available to detect concentration of specific gases (chlorine, sulfur dioxide, etc.) If needed.
- The most common atmospheric hazards associated with confined spaces are

  A. Oxygen Deficiency

  B.Oxygen Displacement

  C. Flammable Atmospheres

  D. Toxic Gases

- **Oxygen Deficiency:** Low levels of oxygen can be caused by the consumption of oxygen during open flame operations such as welding, cutting, or brazing. In addition, low levels of oxygen can be present

in manholes that are located near garbage dumps, landfills and swampy area where fermentation has caused the consumption of oxygen.

- **Oxygen Displacement:** Some types of gases will "push" or displace oxygen from a confined space. An example of this is nitrogen. Nitrogen is commonly used to purge some types of tanks. If a person were to enter into the space before the nitrogen was properly removed and vented from the tank, death could result in a matter of minutes.
- **Flammable atmosphere:** Three components are necessary for an atmosphere to become flammable: fuel, oxygen, and a source of ignition. Some confined spaces my contain solvents, fuel oil, gasoline, kerosene, etc. Which provide the fuel for combustion? In order for an atmosphere to become flammable, it must have the proper mixture of fuel and oxygen. If the concentration of a specific gas is below the lower explosive limit (LEL) it is too lean to burn. If the concentration is above the upper explosive limit (UEL) it is too rich to burn.
- **Toxic Gases:** Toxic gases can be present in a confined space because the type of manufacturing process uses toxic substances as part of the production process, or biological and chemical "breakdown" of the product being stored in a tank, and from maintenance activities (welding) being performed in the confined space.

  Common types of toxic gases encountered in confined spaces are:

  Solvents - many solvents, such as kerosene, gasoline, paint strippers, degreasers, etc. Are not only flammable, but if inhaled at high concentrations can cause central nervous system (CNS) effects. CNS effect can include dizziness, drowsiness, lack of concentration, confusion, headaches, coma and death.

  Hydrogen sulfide - "sewer gas" a colorless gas with the odor of rotten eggs. Excessive exposure has been linked to many confined space deaths. Hydrogen sulfide causes a loss of our sense of smell, causing people to mistakenly think that the gas has left the space. Hydrogen sulfide inhibits the exchange of oxygen on the cellular level and causes asphyxiation.

  Carbon monoxide - is an odorless, colorless gas that is formed by burning carbon based fuels (gas, wood). Carbon monoxide inhibits the bodies ability to transport oxygen to all parts of the body.

3. 0 LIGHTNING

- Lightning is bright electrical flashes that occur in the sky. They take place when there is a thunderstorm, as well as during volcanic eruptions.
- The lightning spark occurs mostly between clouds but can also occur between the cloud and air, or between the cloud and ground.
- Lightning can travel very quickly, with speeds of more than 60,000 meters per second. Lightning is responsible for a number of deaths every year.
- Lightning is beautiful as it lights up the sky but it is also dangerous!

Types of lightning

There are 3 types

- **Intra cloud (IC):** Intra-cloud lightning is another common type of lightning and occurs when there are both positive and negative charges within the same cloud. These charges become large enough and cause a giant spark between them like static electricity.
- **Cloud to cloud (CC) or Inter cloud**: This starts and ends between two different functional thundercloud units.
- **Cloud to ground (CG):** Cloud-to-ground lightning is the most dangerous from of lightning among all types of lightning. Cloud-to-ground lightning occurs when negatively charged electrons on the bottom

of the cloud travel towards positive charged ground below. This type of lightning strike tall objects such as buildings, trees, electricity poles and cause damage to a great extent.

Ex: antenna, cell tower.

Various forms of lightning

Different forms of lightning includes

- **Streak lightning:** It is the most common type of lighting with a multiple zigzag pattern.
- **Forked lightning:** In this type, streak lightning's splits into two branches
- **Ribbon lightning:** The streak lightning appears as horizontal bands and look like parallel successive strokes.
- **Bead lightning:** Lightning disintegrates into small segments or beads which lasts for about 0.5 seconds.
- **Sheet lightning:** Lightning discharge appears as white sheet against the cloud.
- **Heat lightning:** Heat lightning, sometimes known as silent lightning, is a misnomer used for the faint flashes of lightning on the horizon or other clouds from distant thunderstorms that do not appear to have accompanying sounds of thunder.
- **Ball lightning:** They look like balls of luminous, white or colored spheres of the size of fruit, varying in diameter from 4-8 inches.

CAUSES OF LIGHTNING

- Now from the information provided above we will take a closer look at how lightning works using for example the Cloud-to-Ground Lightning. First, due to the colliding and rubbing of many water droplets and ice crystals in thunderstorm cloud this creates a static electrical charge. After a while, the whole cloud fills up with electrical charges. Thus, causing areas of negative and positive charges to develop within the thunderstorm. The positive charges form at the top of the cloud and the negative charges form at the bottom of the cloud.
- The positive and negative electrical charges in the cloud then separate from each other, where the positively charged snow crystals moves to the upward top section of the storm cloud while the heavier negative charge ice crystals and water droplets drop to the lower section of the cloud. Once these positive and negative electric fields become large enough, a giant spark called lightning occurs between two charges within the cloud.

EFFECTS OF LIGHTNING

In general, lightning has three measurable effects on the surrounding environment.

- First, there is direct effect of a lightning strike itself, in which structural damage or even physical harm can result.
- When lightning strikes a tree, it vaporizes sap, which can result in the trunk exploding or a large branches snapping off and falling to the ground.
- When lightning strikes sand, soil surrounding the plasma channel may melt, forming tubular structures called fulgurites.
- Buildings or fall structures hit by lightning may be damaged as the lightning seeks unintended paths to ground.
- About roughly 90% of people struck by lightning survive, humans or animals struck by lightning may suffer severe injury due to internal organ & nervous system damage.
- High energy radiation also results from a lightning strike.

- These include x-rays and gamma rays, which have been confirmed through observations using electric field & x-ray detectors, & space-based telescopes.
- Thunder: The electrostatic discharge of terrestrial lightning superheats the air to plasma temperatures along the length of 30000 discharge channel in short duration.
- Light travels about 300000000m/s (30cr). Sound travels through 343m/s.
- Air quality: the very high temperatures generated by lightning leads to significant local increases in ozone and oxides of nitrogen.
- Each lightning flash produce 7 kg of Nox by 90% and ozone by 30%.

MITIGATION MEASURES OF LIGHTNING

Lightning dissipaters are to be placed in lightning prone areas.

- **Avoid being outdoors:** Lightning is nothing but a large spark of electricity that is trying to find the easiest and shortest path to the ground. Logically, it could hit the highest point, typically an isolated tall tree, telephone pole or a person who is standing up.
- **Do not take shelter under a tall tree:** It is unsafe to take shelter under an isolated tall tree, as it could attract lightning and pass it on to us. If caught in a forest, it is better to be either in a clearing or near the shortest trees—these are less likely to attract lightning.
- **Avoid being at high altitudes:** For the same reason, being at a hilltop or rooftop at such a time is considered risky. If caught in such a situation, we should quickly move to low-lying areas whenever possible. Lightning travels along vertical surfaces to seek the ground, hence standing just below the overhanging edge of a cliff is also considered dangerous.
- **Do not lie down on the ground:** It is dangerous to lie down on the ground in an attempt to escape from lightning, as the electric charge from a nearby strike will spread horizontally along the ground.
- **Avoid fences and wires:** Lightning can also reach us through ‘conduction’, which is from contact with metallic objects such as a wire fence, plumbing or landline that is connected to the telephone pole. Staying away from such objects is therefore important.
- **The metal myth:** Contrary to popular belief, there is no need to remove metallic objects from our body. Getting rid of items such as jewellery and watches does not protect us from lightning strike. At best, doing so might reduce the risk of skin burns in the unlikely event of our being hit. Considering the big picture, this advantage is therefore of questionable value.

4.0 HAILSTROMS

- Hail is a form of precipitation consisting of solid ice that forms inside thunderstorm updrafts. Hail can damage aircraft, homes and cars, and can be deadly to livestock and people.

How does hail form

- Hailstones are formed when raindrops are carried upward by thunderstorm updrafts into extremely cold areas of the atmosphere and freeze. Hailstones then grow by colliding with liquid water drops that freeze onto the hailstone’s surface. If the water freezes instantaneously when colliding with the hailstone, cloudy ice will form as air bubbles will be trapped in the newly formed ice. However, if the water freezes slowly, the air bubbles can escape and the new ice will be clear. The hail falls when the thunderstorm's updraft can no longer support the weight of the hailstone, which can occur if the stone becomes large enough or the updraft weakens.
- Hailstones can have layers of clear and cloudy ice if the hailstone encounters different temperature and liquid water content conditions in the thunderstorm. The conditions experienced by the hailstone can change as it passes horizontally across or near an updraft. The layers, however, do not occur simply due to the hailstone going through up and down cycles inside a thunderstorm. The winds inside a

thunderstorm aren't simply up and down; horizontal winds exist from either a rotating updraft, like in supercell thunderstorms, or from the surrounding environment's horizontal winds. Hailstones also do not grow from being lofted to the top of the thunderstorm. At very high altitudes, the air is cold enough (below -40°F) that all liquid water will have frozen into ice, and hailstones need liquid water to grow to an appreciable size.

How does hail fall to the ground

- Hail falls when it becomes heavy enough to overcome the strength of the thunderstorm updraft and is pulled toward the earth by gravity. Smaller hailstones can be blown away from the updraft by horizontal winds, so larger hail typically falls closer to the updraft than smaller hail. If the winds near the surface are strong enough, hail can fall at an angle or even nearly sideways! Wind-driven hail can tear up siding on houses, break windows and blow into houses, break side windows on cars, and cause severe injury and/or death to people and animals.

IMPACTS OF HAILSTORM

- **Hazardous For Aircraft:** A hailstorm is extremely hazardous for aircraft, which can be seriously damaged if caught in the middle of a severe hailstorm. Flights can also suffer damage upon landing on runways with accumulated hail. In August 2018, an Aeromexico flight crashed on takeoff during a hailstorm in northern Mexico. Fortunately, despite a fire in the plane, the passengers and crew managed to successfully escape.
- **Hazardous For Driving:** Hail is not only harmful to aircraft in the sky, but also equally dangerous for automobiles on the road. Falling hailstones can shatter windows and windshields of vehicles. Visibility is also greatly reduced during a hailstorm and roads become slippery. Therefore, driving during a hailstorm can be extremely dangerous.
- **Hailstones Can Damage Property:** Hailstorms are highly destructive in nature. Since hailstones fall from great heights at high speeds, they can easily penetrate through glass-roofed structures or skylights. Although metallic surfaces are less prone to damage by hailstones, dents are often created by the falling ice. The metallic bodies of automobiles can also get dented by hail. Thus, a severe hailstorm can lead to economic losses in terms of damage to buildings and vehicles.
- **Hailstorms Destroy Crops:** Perhaps one of the most destructive effects of hailstorms can be observed on farms. A hailstorm with powerful winds can physically damage crops across large areas. The falling hailstones and strong winds bend and break plants and strip them of leaves and bark. Thus, farmers suffer heavy losses during such storms. Months of hard work by farmers can be destroyed almost instantly.
- **Hailstorms Can Also Kill People And Animals:** It is possible for hailstones of significant size to kill an adult who is unable to find cover during a hailstorm. Massive hailstones are known to cause fatal head trauma or concussions. It is believed that about 200 to 600 nomads of a tribe died in Roopkund, Uttarakhand, India, during a severe hailstorm centuries ago. Their recently discovered skeletons with head injuries appear to support this historical account.

HUMAN ADJUSTMENTS – MITIGATION TO REDUCE THE RISK OF HAILSTORMS

- Hailstorms are expected only during certain seasons like February, march, September and October. So we must need to arrange the awareness programmers to people about how to get shelter from Hailstorm when they are outdoors.
- Warnings need to be issued via televisions, social media if it is forecasted by the weather department

- It is necessary to have people , buildings and other things like vehicles protected from the damage caused by hailstorm.
- Establish centers to provide temporary accommodation for houseless people.
- Shelters must be provided for emergency vehicles like ambulance, fire service vehicles etc
- People must be alerted about the forecasts through media like radio and television.
- Alerts can be given through SMS for outdoor workers who may not have access to the televisions or radio.
- People must be educated about the disaster. People must gain knowledge through which they can protect themselves from the hailstorm.
- The buildings in hailstorm prone areas must be designed in such a way that withstand hailstorm. Proper parking areas must be provided, roofs must be strong enough to withstand the force of hailstorm.

5.0 CYCLONE

A cyclone is a large scale air mass that rotates around a strong center of low atmospheric pressure. Cyclones are powerful and violent windstorms, in which wind moves very fast in a circular direction around a low pressure area.

The wind blows in anti clockwise circle in the northern hemisphere and clockwise in the southern hemisphere.

Cyclones are known by various names in different parts of the world

Nomenclature	**Region of the world**
Typhoons	China Sea, Pacific Ocean
Hurricanes	Caribbean Sea, Atlantic Ocean
Tornados	Southern part of USA
Willy – willies	Australia
Tropical Cyclones	Indian Ocean

CATEGORISE OF CYCLONES:

Cyclones are categorized according to wind spreads and the damage they cause.

Category 1 cyclone: wind speeds between 90 and 125 km/hr, some noticeable damage to houses and trees.

Category 2: wind speeds between 125 and 164 km/hr, damage to houses and significant damage to crops and trees.

Category 3: wind speeds between 165 – 224 km/hr, structural damage to houses, extensive damage to crops and up rated trees, upturned vehicles and destruction of buildings.

Category 4: wind speeds between 225 – 279 km/hr, power facture and much damage to cities and villages.
Category 5: wind speeds over 280 km/hr, widespread damage.

TYPES OF CYCLONES

Generally cyclones are two types

Warm-core cyclones: These type of cyclones are warm at the centre and cold near the edges.
Cold-core cyclones: These type of cyclones are coldest at the centre than near the edges.

Based on structure on the area of origin

Tropical cyclones: Cyclones that form between the tropics of cancer and Capricorn are called tropical cyclones.
Temperature cyclones: Cyclones develop over temperature zones and high latitude regions are called temperature cyclones. They are also known as mid-latitude cyclone, frontal cyclone and extra tropical cyclone.
Cyclones have been categorized by the Indian Meteorological Department into the following types of disturbances based on the wind speed.

Surface wind speed (Km/h)	Type of disturbance
Less than 31	Low Pressure
31-49	Depression
49-61	Deep depression
61-88	Cyclone storm
88-117	severe cyclonic storms
117-220	Very severe cyclonic storms
>221	Super cyclone

FORMATION OF CYCLONES

Warm water, moist warm air, and light upper-level winds are the key ingredients to the formation of hurricanes. Hurricanes begin when masses of warm, moist air from oceans surfaces starts to rise quickly, and collide with masses of cooler air. The collision prompts the warm water vapor to condense, eventually forming storm clouds and dropping back as rain. During the condensation process, latent heat is emitted. The latent heat warms the cool air above, leading it to rise and pave the way for warmer, humid air coming from below the ocean.

As the process goes on, more warm moist air is attracted into the mounting storm, and much more heat is moved from the ocean surface to the atmosphere. This constant heat exchange develops a wind pattern that spins around a fairly calm center that mimics water spinning down a drain.

If conditions remain the same, which means there is enough fuel for the storm to continue developing, the rotating storm will continue to get powerful, eventually becoming a hurricane. When the hurricane continues to strengthen and become strong enough, an opening at the center known as the eye forms.

The eye is a clear circular center of the storm. The strongest winds occur near the eye, which means the winds get strong as you approach the eye. The eye wall is the area surrounding the eye, and it has much stronger winds than the eye. When a stronger hurricane develops, winds can reach speeds of up to 200 miles per hour. If the storms lose energy, it means they have reached cooler waters or hit the shores, and they start to weaken and eventually die off.

STRUCTURE OF TROPICAL CYCLONES

The main parts of a tropical cyclone are the eye, the eye wall and the rain bands. Air spirals in toward the center in a counter- clockwise pattern in the northern hemisphere clockwise direction in the southern hemisphere.

The eye

It's situated in the core of the hurricane. On average, the eye has a diameter of 20 to 40 miles across. Huge storms like typhoons that occur in the Pacific may encompass average eye diameter of 50 miles. The whole storm spins around the eye. The inside of the eye is characterized by calm winds, clear skies, and low air pressure.

The eye wall

The eye wall is the area surrounding the eye. Its average diameter ranges from 5 to 30 miles wide. The eye wall harbors the most powerful and destructive winds. Also, the heaviest rains are found here.

Rain bands

This is a collection of dense clouds forming a spiral that wraps around the eye wall. They are responsible for the pinwheel appearance of the hurricane. These dense groups of storms spin slowly anticlockwise. Their average width ranges from 50 to 300 miles long. On certain occasions, the eye and the bands are concealed by higher level group of clouds making it daunting for weather forecasters to utilize satellite imagery to keep an eye on the storm.

EFFECTS OF CYCLONES

Positive effects

Drought relief

The vast amount of rainfall that comes along with hurricanes provides a great deal of relief from drought conditions. The rains can go as far as several hundreds of miles from the epicenter of the storm. A typical example is the 2012 remnants of the Hurricane Isaac, which contributed to about 5 inches of rainfall to the Corn Belt fields in Midwest United Sates.

Heat relief

Hurricanes develop on top of tropical and subtropical waters. If the water temperature increases, the hurricane development also increases. If the cooling effects of annual hurricanes are not experienced, it means the tropical and subtropical regions would continually heat up, resulting in multiplication of intensity and quantity of storms. The sea surface is able to cool if a hurricane forms because of the vertex integration of the oceans layers instigated by the frictional force exerted by hurricane winds on the ocean's surface. This frictional force causes the violent mixing of layers, driving colder water high up the surface. This blocks warm water necessary for hurricanes require to last.

Archaeological benefit

The strength of hurricanes has benefitted archaeologists by unearthing the remains of downed airplanes, shipwrecks and other historical relics in tidal locations where debris, silt, and sand, are washed away by the storm surge. For example, Hurricane Isaac exposed the fragments of the Rachel in 2012. The Rachel was a Schooner built in the course of the First World War.

Negative Effects

Impact on ecosystem

Plants and animals can be exterminated during hurricanes because of the devastating winds, storm surges, and flooding. Animals that rely on these creatures as a source of food may die if an alternative source is not found. Beaches bear the biggest brunt of hurricanes; they get eroded when storms reach the shorelines. Creatures that thrive on beaches can be washed away by severe hurricanes. Also, sediment erosion and deposition normally impact coral reefs and oyster beds. The introduction of salt water by hurricanes to nearby freshwater streams and lakes leads to enormous fish kills and destruction of lakeside habitat.

Agricultural impact

Hurricanes can mightily affect agriculture. For instance, the products of hurricanes such as heavy rains and strong winds can damage crops and kill livestock. The greater fear for most farmers is contamination of crops by water originating from floods. The heavy rains and flooding result in filling and causing overflow of hog lagoons. This overflowing water can contaminate certain crop species. This phenomenon could also lead to loss of harvest as a result of dramatic effect of flooding of seeds. Agricultural losses due to hurricanes can go up to $40 million dollars depending on the size and intensity of hurricanes.

Effect on humans

Hurricane winds can do a whole lot of destruction. However, waves, storm surges, rain and river floods can also contribute to massive destruction. The amount of damage caused hinges on many factors including the size of the storm, intensity, and its angle approach. Collapsing building can lead to injury and death, but the biggest impacts of hurricane occur after the storm. Destroyed property and infrastructure often take years to restore, and this impacts individuals' economic status.

MITIGATION MEASURES FOR CYCLONES

FLOOD:

Flood is an overflow of water that submerges land that is usually dry.
Flooding may occur as an overflow of water from water bodies, such as river, lake or ocean, in which the water overtops or breaks levees, resulting in some of that water escaping its usual boundaries, or it may occur due to an accumulate of rainwater on saturated ground in an aerial flood.

TYPES OF FLOODS

Riverine flood: The majority of floods recorded globally are due to rivers overflowing as a result of long-lasting precipitation in the river basin, melting snow & ice can also contribute to flooding.
Flash floods: Flash floods generally occur due to local high-intensity precipitation in hilly or mountainous areas. The short warning time makes them difficult to predict.

Discharges during flash floods are often much higher than normal flows in water courses. Flash floods are particularly dangerous unsteep slopes.

Coastal floods: Areas along the coast may be flooded due to tsunami, hurricanes or land unusually high tides. Also long-term phenomenon like subsidence and sea-level rise can lead to the gradual encroachment of the sea.

urban floods: The urban area is paved with roads etc and discharge of heavy rain can't absorbed into the ground due to drainage constraints leads to flooding of streets, underpasses, low lying areas & storm drains.

Stagnant and urban floods: Extreme rainfall in towns and cities combined with blocked drains can cause severe flooding.This often in urban areas; where a large percentage of the surface is impermeable.

Lake and canal floods: High levels of precipitation or long-lasting inflows from streams can cause a substantial rise in water levels of lakes and canals that lack sufficient drainage capacity.Also long periods of drought can cause man-made embankments to become unstable & fail-resulting in flooding

CAUSES OF FLOODING

Here are eight of most common causes of flooding both natural and human induced:

Heavy rains: The simplest explanation for flooding is heavy rains. No matter where you live, you are surrounded by infrastructure and systems designed to move rainwater into appropriate basins and reservoirs.

In most cases, the infrastructure does its job and you never have to think about where the rain goes when it runs off.

When it rains heavily, those systems are over helmed, and that water doesn't drain nearly as quickly as it need to. In short, the drainage systems backup and the water rise -- sometimes into homes.

This typically happens only in causes of sustainedheavily rains over a long period.

Overflowing Rivers: You don't necessarily need to have heavy rains to experience flooding in your area.For example, if you live along a river and areas upstream from you experience heavy rains; it could lead to a serious overflow where you live.

Most Larger Rivers include a serious of dams to help manage large amounts of rainfall, and most river systems are managed by government authorities.

Sometimes, however, those authorities have to make tough decisions about how to operate dams.

They often can manage the water and prevent flooding altogether but not always.

Broken dams:

Much of America's infrastructure was built the 20th century, so it is getting old. When heavy rains come and water levels, aging dams can fail unleash torrents of water on unsuspecting households.

This is part of what happened after hurricane Katrina hit new or leans in 2005.

Levees failed and made the flooding for worse than it would have been otherwise.

While we have come to depend on 20th century architecture and much of does its job well, there is always a possibility that a structure will fail.

Urban Drainage Basins:

Many of our cities are made of mostly concrete and impermeable material.

When you have urban drainage basin that is made of concrete, there is no ground for water to sink into.

So, when those chainage basins fill up, it is going to mean flooding for low-lying areas. This is mostly the case in large urban areas- think Houston & los angles. When heavy rain strike, the basin used to drain them cannot always handle the road.

Storm surges and Tsunamis:

Rain is not always the culprit when it comes to flooding storm related to hurricanes and other storms can lead to significant flooding, as can tsunamis that are sometimes caused by underwater earthquakes.

Given modern technology, we often know about storm surges and tsunamis before they arrive, but this is not always the case. For example in 2004, an earthquake off the coast of Indonesia created a tsunami that gave little warning before coming ashore.

Channels with steep sides:

Flooding often occurs when there is fast runoff into lakes, rivers and other reservoirs. This is often the case with rives & other channels that feature steep sides.

It is a similar issue to having a lack of vegetation.

A Lack of vegetation:

Vegetation can help slow runoff and prevent flooding. When there is lack of vegetation, however, there is little to stop water from running off. This can be a bit of a conundrum after a drought.

While area residents likely welcome the rain, the lack of vegetation after the drought can cause flash flooding.

This does not always happen given that basins and reservoirs are close to empty, but it can occur in cases of extreme rains following long periods of drought.

Melting snow and ice:

A winter of heavy snow and other precipitation can lead to a spring of flooding.

After all, that snow and ice have to go somewhere when they melt most mountainous areas experience relatively consistent snowfall totals from year to year, but an unusually heavy winter of precipitation can spell bad news for low-lying areas around the mountains when spring hits.

EFFECTS OF FLOODING

Flooding can be very dangerous-only 15cms of fault-flowing water are needed to knock you off your feet.

Flood water can seriously disrupt public and personal transport by cutting off roads and railways lines, as well as communication links when telephone lines are damaged.

Floods disrupt normal damage systems in cities, and sewage spills are common, which represents a serious health hazard, along with standing water and wet materials in the home.

Floods can distribute large amounts of water and suspended sediment over vast areas, restocking valuable soil nutrients to agricultural lands.

In contrast, soil can be eroded by large amounts of fast flowing water, running crops, destroying agricultural land/buildings and drowning from animals.

Severe floods not only ruin homes/businesses and destroy personal property, but the water left behind cause further damage to property and contents.

The environment and wildlife is also at risk. when damage, when damage to business causes the accidental release of toxic materials like paints, pesticides, gasoline etc.

Unfortunately flooding not only disrupts many people lives each year, but it frequently creates personal tragedies when people are swept away and *drowned.*

HUMAN ADJUSTMENTS – MITIGATION MEASURES TO REDUCE THE RISK OF FLOODING

BEFORE THE FLOODS

Know about your local relief centers and evacuation routes.

Keep emergency numbers and important information handy

Fold and roll up anything onto higher ground including chemicals and medicines.

Make sure everything that is of importance is secured

Plant trees and shrubs and keep a lot of vegetation in your compound .

DURING THE FLOODS

Flash floods occur in a short duration of time. As soon as they start, be quick, keep safe and ensure that children and elderly are safe by leaving the house to a higher ground.

Turn off all electrical appliance, gas, heating and the like if there is a bit of time.

Try to keep away from flood water as it may contain chemicals or other hazardous materials.

AFTER THE FLOODS

Make sure you have permission from emergency officers to get back inside your house.

Keep all power and electrical appliance off until the house is cleaned up properly and an electrical personnel has confirmed that it is OK to put them on.

Make sure you have photographs, or a record of all the damage, as it may be needed for insurance claims.

Wear appropriate gear (mask and gloves) before cleaning begins.

DROUGHT

Drought is a natural disaster of below-average precipitation in a given region, resulting in prolonged shortages in the water supply, whether atmosphere surface water or ground water. A drought can last for months or years or may be declared after as few as 15 days.

TYPES OF DROUGHT

The droughts may be categorized into four types, they are

Meteorological drought
Agricultural drought
Hydrological drought
Socioeconomic drought

METEOROLOGICAL DROUGHT

This kind of drought takes place when dry weather patterns outweigh other climatic conditions.
It is greatly determined by the overall absence of moisture in the atmosphere, for instance, lack of precipitation coupled with other weather conditions like high temperatures and dry winds.
Meteorological drought is a warning sign of potential water shortage if conditions remain constant for extended period.
This kind of drought can also be short lived, which means it can start and end in a short period.

AGRICULTURAL DROUGHT

This kind of drought occurs when atmospheric moisture is minimized to degree that soil moisture is imparted.
The reduction of moisture in the soil takes toll on crops and animals.
Agricultural drought is the first signal people witness when meteorological is happening.

HYDROLOGICAL DROUGHT

This kind of drought manifests when there is evidently low water supply, more so in natural rivers and lakes, reservoirs, streams, and ground water levels.
Hydrological drought occurs after months of meteorological droughts.
Hydrological droughts stem from less precipitation, overreliance on these water sources for agriculture, energy requirements and other needs. Unlike meteorological drought, hydrological droughts do not take place at the same time.
This reduction in quickly and quality of surface water is a direct effect of meteorological drought.

SOCIO ECONOMIC DROUGHT

This kind of drought is related demand and supply of specific goods &services.

Ex: drinking water, food &energy are imparted by shifts in hydrological &meteorological changes. This situation is sometimes compounded by rising population and explosion of demand for those goods and services to the degree that it leads to scramble for the little available water.

This kind of drought takes a long time to become severe & equally long time to recover from it.

CAUSES OF DROUGHTS

Lack (or) insufficient rainfall: (or precipitation)

This is the major cause of drought in most regions.

A long drawn out period without rainfall can cause an area to dry out.

The quantity of water vapour in the atmosphere pretty much impacts the precipitation of an area.

When region has moist and low pressure systems, there is huge probability that rain, hail and snow will occur.

The exact opposite would happen when the region has high-pressure and less water vapour.

Formers plant crops in anticipation of rains, and so, when the rains fail and irrigation systems are not in place, agriculture droughts happens.

Changes in climate:

Changes in climate, for instances global warming can contribute to droughts.

Global warming is likely to impact, the whole world, especially third world economies most government have pride to pay down the fact that the earth temperature has significantly increased.

But scientists have proven without doubt, the human activities are main contributions to the increase in the green house gases to the atmosphere.

This increase in green house gases has resulted in warmer temperature.

Warmer temperature receipts per damage &bust fires.

These set of conditions might contribute to prolonged droughts.

Human Activities:

Forests are critical components of the motor cycle.

They help store water, minimize evaporate and contribute a great deal of atmospheric moisture in the form of transpiration.

This is essence, implies that deforestation, aimed at uplift in the stat economic status of a region, will expose vast quantities of water of evaporation.

Cutting down trees will also take away the capability of the ground to retain water and allow de-certification to occur easily.

Deforestation also greatly minimizes watershed potential.

Over farming is another human activity contributing to droughts.

Over farming loosens the soil allowing erosion to takes place.

Soil erosion compromises the capacity of soil to hold water.

Over Exploitation of surface water resources:

Specific areas are endowed with surface water resources like rivers and streams whose sources are water shed and mountains.

These surface water resources could dry out of their main sources are interfered with.

Irrigation systems and hydro electric are just some of the aspects that contribute to over exploration of surface water resources.

They also cut off supply of water to downstream communities.

EFFECTS OF DROUGHTS

Economic effects: Economic effect of droughts usually involves loss of money by government, enterprises- families or individuals.

Below is an outline of main economic impact of droughts

Farmers will have to content with spending huge sums of money for irrigation and watering animals this involves drilling wells (or) buying water from far distances.

Low yields equal loss of substantial income. Low yields also lead to pay cuts and layoffs to farm workers.

Business and industries that produce to farm equipments make close down since farmers have no money to produce equipments.

Prolonged shortage of rains means drier conditions.

This makes an area susceptible to wild fires. Wild fire can destroy property.

Governments spend millions to control (or) put out wild fires annually all this affects the economy of the region.

Of water supply plummets, hydro power plants operate below capacity, and this means business have to pay more for electricity (or) insure the cost of using their own generators.

Energy firms also loss out since they are unable to satisfy energy demands of the region.

The government also losses a big chunk of tax revenue.

Environmental effects:

Droughts lead to decimation of habitats. Water bodies such as rivers, lakes, ponds, lagoons and creeps dry out and this leads to death of water animals.

Soil moisture is critical to the beak down of organic matter.

Droughts compromise soil quality since there is less to ‘o’ organic activity because organisms have died.

Droughts magnify the impacts of decertification by wiping out any chance of land recovering.

Wild life walk long distances in search of water they end up in new dangerous habitats that can lead to their demise.

Social effects:

These are the most potent since they directly impact humans.

Many in the 3rd world countries that have experienced, drought can attest to their severity

HUMAN ADJUSTMENTS – MITIGATION TO REDUCE THE RISK OF DROUGHT

Strategies for drought protection, mitigation or relief include:

Dams – many dams and their associated reservoirs supply additional water in times of drought.
Cloud seeding – a form of intentional weather modification to induce rainfall.
Desalination – of sea water for irrigation or consumption. By building canals in drought prone areas with more number of channels. Regulating the use of sprinklers, filling pools, and other water-intensive home maintenance tasks.
Rainwater harvesting – Collection and storage of rainwater from roofs or other suitable catchments.
Recycle the water – Former wastewater (sewage) that has been treated and purified for reuse.
Risk management efforts by the government – These include

DPAP – Drought Prone Area Programme

NWDPRA – National Watershed Development Project for Rain –Fed Areas
WDPSC – Watershed Development Programme for Shifting Cultivation

IWDP – Integrated Water Development project.

PHYSICAL HAZARDS/DISASTERS

SOIL EROSION

Soil erosion is one form of soil degradation.
Soil erosion is a naturally occurring process an all land.
The agents of soil erosion are water and wind, each contributing, a significant amount of soil loss each year.
Soil erosion may be a slow process that continues relatively unnoticed, or it may occur at an alarming rate causing serious loss of topsoil.
The loss of soil from farmland may be reflected in reduced crop production potential, lower surface water quality and damaged drainage networks.
The process of soil erosion is made up of 3 parts:
Detachment: This is when topsoil is actually detached from the rest of ground.
Movement: This is when the top soil is relocated to another area.
Deposition: where the top soil ends up after this process.

CAUSES OF SOIL EROSION

Some of the principal causes of soil erosion include

Rain and Rainwater runoff:

In a particular heavy rain, soil erosion is common.
First of all, the water starts to break down the soil, dispersing the materials it is made of.
Typically, rain water runoff will impact lighter materials like silt, organic matter, and focus and sand particles, but in heavy rainfall, this can also include the larger material components as well.

Farming:

When land is worked through crops or other agricultural processes, it reduces the overall structure of the soil, in the addition to reducing the levels of organic matter, making it more susceptible to the effects of rain and water.
Tilling in particular, because it often breaks up and softens the structure of soil, can be a major contributor to erosion.
Farming particles that reduces this activity tend to have far less issues with soil erosion.

Slope of the Land:

The physical characteristics of the land can also contribute to soil erosion.
For example, land with a high hill slope will perpetuate the process of rain water or runoff saturation in the area, particularly due to the faster movement of the water down a slope.

Lack of Vegetation:

Plants and crops help maintain the structure of soils, reducing the amount of soil erosion.
Areas with less naturally-occurring flora may be a hint that the soil is pure to erosion.

Wind:

Wind can be a major factor in reducing soil quality and promotion erosion, particularly if the soil's structure has already been loosened up.
However, lighter winds will typically not cause too much damage, if any.
The most susceptible soil to this type of erosion is sandy or lighter soil that can easily be transported through the air.

EFFECTS OF SOIL EROSION

A major problem with soil erosion is that there is no telling how quickly or slowly it will occur.
Some of the greatest effects of soil erosion include:

Loss of Topsoil:

Obviously, this is the biggest effect of the soil erosion.
Because topsoil is so fertile, if it is removed, this can cause serious harm to farmer's crops or the ability to effectively work their land.

Soil compaction:

When soil under the topsoil becomes compacted and stiff it reduces the ability for water to infiltrate these deeper levels, keeping runoff at greater levels, which increase the risk of more serious erosion.

Reduced organic and fertile matter:

As mentioned, removing topsoil that is heavy with organic matter will reduce the ability for the land to regenerate new flora or crops.
When new crops or plants can't be placed successfully in the area, this perpetuates a cycle of reduced levels of organic nutrients.

Poor drainage:

Sometimes too much compaction with sand can lead to an effective crust that seals in the surface layer, making it even harder for water to pass through to deeper layers.
In some ways, this can help erosion because of the densely packed soil, but if it perpetuates greater levels or flooding, it can negatively impact the crucial topsoil.

Soil acidity levels:

When the structure of soil becomes compromised, and organic is greatly reduced, there is a higher chance of increased soil acidity, which will significantly impact the ability for plants & cops to grow.

Long term Erosion:

Unfortunately, if an area is prone to erosion or has a history of it, it becomes even harder to protect it in the future.
The process has already reduced the soil structure and organic matter of the area, meaning that it will be harder to recover in the long run.

Water pollution:

A major problem with runoff from soils- particularly those used for agricultural is that there is a greater likelihood that sediment & contamination like the use of fertilizer or pesticide.
This can have significant damage on fish and water quality.

Solutions for Soil Erosion:

When it comes to finding solutions for soil erosion, the most useful techniques found tend to be those that emphasize reinforcing the structure of the soil and reducing processes that affect it.

Careful tilling:

Because tilling activity breaks up the structure of soil, doing less tilling with fewer passes will preserve more of the crucial topsoil.

Crop rotation: It is the practice of growing series of different crops in the same area in sequenced seasons.

Plenty of crop rotation is crucial for keeping land happy and healthy.
This allows organic matter to build up, making future planning more fertile.

Increased Structure for plants:

Introducing terraces or other means of stabilizing plant life or even the soil around them can help reduce the chance that soil loosens and erodes.

MEASURING OF SOIL EROSION

The most commonly used model for predicting soil loss from water erosion is the Universal Soil Loss Equation (USLE). This was developed in the 1960s and 1970s. It estimates the average annual soil loss A on a plot-sized area as:

$$A = RKLSCP$$

Where R is the rainfall erosivity factor,

K is the soil erodibility factor,

L and S are topographic factors representing length and slope
C is the cover and management factor

P is the support practices factor.

SEDIMENTATION

Sedimentation is a natural physical process occurring in the aquatic areas and land based areas (i.e. lakes, rivers, estuaries, wastal zones, deep oceans)

Sediments that clog the aquatic areas and land-based areas originate from many sources such as stream banks, building lots, construction sites, lawns & streets, agricultural fields etc.

The sedimentation process comprises the following aspects:

Erosion:
The term erosion refers to the process of weathering, corrosion or abrasion of a material to form smaller particles.
The smaller units thus formed are relocated by water, wind, ice, animals or humans.

The top soil organic material and other valuable natural resources are removed by the process of erosion.

Entrainment:

The term entrainment refers to the picking up and movement of sediment particles on a slope or from the bed and banks of stream.

In order to accomplish the process of entrainment, the movement of water must exert a force on the sediment particles & this force must be larger than the force of resistance exerted by the sediment particle.

Transportation:

The sediment particles move under the action of the force of gravity and/ or the movement of fluid in which the sediment is entrained by a variety of sediment transport processes, such as rolling, sliding, jumping and suspension.

The sediment transport due to gravity occurs on sloping surfaces such as hill slopes, scarps, cliffs &continental shelf. The sediment transport due to the movement in the field occurs in water bodies such as rivers, lakes, oceans and sea, due to currents and tides and in glaciers under the influence of wind.

Deposition:

The sediment particles (pebbles, sand, mud & salts) carried by wind, water or ice are laid down near the banks or the shores.

The sediments carried by flowing water for instance, a stream are deposited when the velocity of the flowing water decreases.

The large sediment particles are deposited near the shore, whereas the smaller sediment particles settle away from the shore.

The melting glaciers & ice-sheets transport huge amounts of gravel, sand, mud and deposited at the sides and end of glacier.Similarly, in deserts, fine dust may be carried by wind to hundreds of miles & deposited.

Compaction &cementation:

The deeply buried sediments are under pressure because of the weight of overlying layers, which causes the grains to pack tightly. This is compaction.

Cementation involves the sticking of the sediment particles together with the help of cementing materials such as calcite (caco3), silica (sio2), iron oxides & clay minerals. This is similar to the cement binding the sand grains in a brick layer's mortar.

SEDIMENTATION PROBLEMS

Global sedimentation problems.

Regional sedimentation problems.

Sedimentation & environmental problems.

The deposition of sediment may create a variety of serious problems.

Damage to agricultural land because the harmful materials in sediments reduce the fertility and productivity of soils.

Sediments deposited in fertile plains hamper surface drainage.

It's deposition in stream channels lowers the flood carrying capacity therefore, causing more frequent overflows.

Sediment deposition affects the quality of water & its suitability for human consumption.

Loss of important or sensitive aquatic habitat. The sediment deposits in water bodies cover the gravel beds needed for habitat by the aquatic fauna.

The sediments clog the small spaces between the gravel particles.

Therefore, oxygenated water can't flow freely onto the spaces.

The waste products from the developing eggs deposited in the gravels is not removed.

So the developing eggs die due to suffocation, thus affecting the reproductive success.

Further, the sediments make the water turbid; reduce sunlight penetration, reduced photosynthesis by aquatic plants.

Decrease in fishery resources. Increase in sedimentation harm/kill the valuable aquatic life.The sediments cause abrasion of grill membrane, impairment of feeding affects small aquatic animals such as crayfish & insects that are food for fish.

Loss of recreation attributes such as boating, fishing, swimming, wading, aesthetics &hunting.

The contaminants found in sediments affect human health in many ways. Pollutants in the sediments accumulate in fishes and shell fishes via the food chain, and ultimately end up in our dinner plates causing varied health effects such as increased cancer risks, decreased sperm count, low birth weight in children, weak reflexes & slow movements.

Sediments threaten a nation's economy.

Sedimentation of reservoirs had the following impacts:

Loss of hydroelectric power generation.

Loss of irrigation production.

Loss of flood control benefits.

Increase in maintenance costs of drainage ditenes and irrigation canals.

Increase in degrading costs of hydroelectric reservoirs.

Loss of revenues from tourism & recreational activities.

The other impacts of sediment deposition are increase in erosion, loss of wetlands, loss of submerged vegetation & coastline erosion.

CORRECTIVE MEASURES OF EROSION & SEDIMENTATION

Effective erosion & sedimentation control measures can be accomplished only when the soil surface is protected from the erosive forces of wind, rain & runoff.

Some of the techniques for best management practices of erosion control are:

1.Mulching: In this method, organic material is applied to soil surface to conserve soil moisture, prevent surface compaction and erosion of top soil, control of weeds, etc., In this method, organic material is applied to soil surface to conserve soil moisture, prevent surface compaction and erosion of top soil, control of weeds, etc.,

2. Silt fences: Silt fences are constructed usually at the construction site. They act like dams to trap the sediment and allow water to leave the site

3. Berms: Berms are narrow, earthen ridges built across roads to allow water to leave the site

4.Geotextile roll: They are known as filter fabrics. These are highly permeable, synthetic textile material used to prevent erosion of soil. It acts like a filter, allows water to move from the soil while the soil is retained.

5.Brush mattress: It is also referred as brush mat. It is a re vegetation technique that provide protection to stream banks or slopes from soil erosion.

6.Gabions: These are structures filled with bricks, boulders and stones, used for stabilization and retention of soil. They are of three types namely gabion basket, gabion mattress and sack gabion.

7. Tree revetment: In this method, trees are anchored along the banks of a stream. The erosion of soil, sand and silt decrease, which get deposited along the bank.

8. Sodding: Layers of soil containing grass and plant roots are placed as a thick mat over an area of exposed soil as an effective erosion control measure.

CHEMICAL HAZARDS/DISASTERS

PESTICIDES

The crop plants are infected by many disease causing organisms called as pests.
They cause damage to crops, humans and other animals.
The insects, mice and other animals, unwanted plants, fungi, micro organisms such as bacteria and viruses.
The term pesticide refers to a substance or mixture of substances that is meant to prevent, destroy, repel or mitigate any pest.
It includes the insecticides, fungicides and other substances that re used to control the pests.
Some examples include cockroach sprays, insect repellents, tick sprays and powders.

CLASSIFICATION OF PESTICIDES

In general, the pesticides are categorized as fallows

Based on the type of pest
Broad spectrum pesticides-they are capable of killing a few kind of pests.
Narrow spectrum pesticides-they are capable of killing narrowly defined group of pests
Based on the target pests

Pesticide	target pest
Algaecide	algae
Avicide	birds

Bactericide bacteria
Fungicide fungi

Based on the chemical structures

Organic-they have carbon in their chemical structure

Ex-captain, pyre thin

Inorganic-they are derived from mineral ores extracted from the earth

Ex-copper sulphate, ferrous sulphate

Based on mode of action

Contact-the pests are killed as a result of direct contact with pesticides

Systemic/translocated- they are absorbed by plants or animals and move to untreated tissues

Foliar pesticides-there are applied to the foliage part(leaves,stems,branches)of the plant

Soil applied pesticides-these are applied to the soil which are then taken up by roots and translocated inside the plants

Protectant fungicides-they protect the plants from fungal infections

Selective pesticides- they can control certain species of pests

Non selective pesticides- they can control a wide range of pest species

ADVANTAGES

The greatest benefit of using pesticides is controlling the population of pest species.

Pesticides help in eliminating the disease vectors to plantation.

Application of pesticides to crops leads to agricultural augmentation i.e., the plants are able to grow more healthily, as the pests can neither feed nor lay eggs on them and cause damage.

DISADVANTAGES

Pest resistance

Toxic effects

Effects of pesticides on humans

EFFECTS OF PESTICIDE POLLUTION

The soil becomes deficient in micronutrients.

Deficiency of carbon content in soil results in decrease in water and nutrient holding capacity.

Increased usage of pesticides have caused disorders of endocrine system, particularly the thyroid, parathyroid, pituitary glands, kidneys, etc..

PRECAUTIONS

Always read the label on the pesticides container and follow the instructions while using it.

The pesticide should be kept out of reach of children.

Smoking should be avoided while spraying.

The body should be properly clothed from head to toe to avoid exposure of the body to the harmful chemicals.

Hands should be thoroughly washed after using the pesticides.

BHOPAL GAS TRAGEDY

On the night of December 2, 1984, chemical, methyl isocyanate (MIC) spilt out from Union Carbide India Ltd's (UCIL's) pesticide factory turned the city of Bhopal into a colossal gas chamber. It was India's first major industrial disaster. At least 30 tonnes of methyl isocyanate gas killed more than 15,000 people and affected over 600,000 workers. Bhopal gas tragedy is known as world's worst industrial disaster.

Warning bell before the tragedy

In 1969, the UCIL factory was made to produce Sevin (a pesticide) using methyl isocyanate as an intermediate. In 1976, trade unions in Bhopal complained of pollution within the plant. A few years later, a worker accidentally inhaled a large amount of toxic phosgene gas, leading to his death a couple of hours later. Observing the events, a journalist began investigating the plant and also published his findings in Bhopal's local paper, saying - 'Wake up people of Bhopal, you are on the edge of a volcano'. Two years before tragedy struck Bhopal, around 45 workers who were exposed to phosgene were admitted to a hospital. Between 1983 and 1984, thee were leaks of phosgene, carbon tetrachloride, methyl isocyanate and mono methylamine.

How methyl isocyanate leaked happened

Union Carbide India's Bhopal facility housed three 68,000-litre liquid MIC storage tanks: E610, E611, and E619. Months before the tragedy, MIC production was in progress and was being filled in the tanks. No tank was allowed to be filled more than 50% of its capacity and the tank was pressurized with inert nitrogen gas. The pressurization allowed liquid MIC to be pumped out of each tank. However, one of the tanks (E610) lost the ability to contain nitrogen gas pressure, hence liquid MIC could not be pumped out of it. As per the rules, each of the tanks could not be filled with more than 30 tonnes of liquid MIC. But this tank had 42 tonnes. This failure forced UCIL to halt methyl isocyanate production in Bhopal and the plant was partly shut for maintenance. An attempt was made to make the defective tank functional again on December 1, however the attempt failed. By then, most of the plant's methyl isocyanate related safety systems were malfunctioning. According to reports, by December 2 eve, water had entered the malfunctioning tank, which resulted in runaway chemical reaction. The pressure in the tank increased five times by night. By midnight, the workers in the MIC area started feeling the effects of MIC gas. The decision to address the leak was to be made a couple of minutes later. However, by then the chemical reaction in the tank had reached a critical state. About 30 tonnes of MIC escaped from the tank into the atmosphere within an hour. Most Bhopal residents were made aware of the gas leak by exposure to the gas itself.

Impact of methyl isocyanides leak

Doctors were not aware of proper treatment methods the incident. Methyl isocyanate gas leak killed more than 15,000 people and affected over 600,000 workers. The stillbirth rate and the neonatal mortality rate increased by up to 300% and 200% respectively.
The gas leak impact trees and animals too. Within a couple of days, trees in the nearby area became barren. Bloated animal carcasses had to be disposed of. People ran on the streets, vomiting and dying. The city ran out of cremation grounds.

What is Methyl Isocyanate (MIC)?

Methyl Isocyanate is a colourless liquid used for making pesticides. MIC is safe when maintained properly. The chemical is highly reactive to heat. When exposed to water, the compounds in MIC react with each other causing a heat reaction.
Methyl Isocyanate is no longer in production, although it is still used in pesticides. The Bayer CropScience plant in Institute, West Virgina is currently the only storage location of MIC left across the globe.

Methyl Isocyanate chemical reaction's impact on health

Immediate health effects include ulcers, photophobia, respiratory issues, anorexia, persistent abdominal pain, genetic issue, neuroses, impaired audio and visual memory, impaired reasoning ability, and a lot more.
Long-term health effects include chronic conjunctivitis, decreased lung function, increased pregnancy loss, increased infant mortality, increased chromosomal abnormalities, and impaired associate learning and more.

NUCLEAR EXPLOSION

A nuclear explosion is an explosion that occurs as a result of the rapid release of energy from a high-speed nuclear reaction.

The driving reaction may be nuclear fission or nuclear fusion or a multi-stage cascading combination of the two, though to date all fusion-based weapons have used a fission device to initiate fusion, and a pure fusion weapon remains a hypothetical device.

Atmospheric nuclear explosions are associated with mushroom clouds, although mushroom clouds can occur with large chemical explosions. It is possible to have an air-burst nuclear explosion without those clouds. Nuclear explosions produce radiation and radioactive debris.

EFFECTS NUCLEAR EXPLOSION

The dominant effects of a nuclear weapon (the blast and thermal radiation) are the same physical damage mechanisms as conventional explosives, but the energy produced by a nuclear explosive is millions of times more per gram and the temperatures reached are in the tens of megakelvin.

Nuclear weapons are quite different from conventional weapons because of the huge amount of explosive energy that they can put out and the different kinds of effects they make, like high temperatures and nuclear radiation.

The devastating impact of the explosion does not stop after the initial blast, as with conventional explosives. A cloud of nuclear radiation travels from the hypocenter of the explosion, causing an impact to life forms even after the heat waves have ceased.

Any nuclear explosion (or nuclear war) would have wide-ranging, long-term, catastrophic effects. Radioactive contamination would cause genetic mutations and cancer across many generations.

BIOLOGICAL HAZARDS/DISASTER

POPULATION EXPLOSION

Population explosion refers the measure and sudden rapid rise of population among the human being.
It causes the poor result in census while population increased.
It is the main purpose, that increasing birth rate day by day in India.
It is good in the country, where the infant mortality rate decreases in India.
There is life expectancy has improved in India.
In India, there is limited employment and literacy among the people. Due to the population explosion, it is prominent in under developed.

CAUSES OF POPULATION EXPLOSION

Increase in birth date:

In India, there is population explosion increasing day by day. Most of the people don't have the knowledge about control the delivery.
The birth rate is increasing due to the lack of awareness in people.
There is the full range of gaping has increased in population.
The birth rate increases, when an average number of women burn to the child came down from about six in the fifties to 4.4.
In 1951-61, the average birth rate was 42 per thousand populations.
In 1996, the average birth rate came down 28.1 per thousand populations.

Decreases of infant mortality rate:

Due to the age of science and technology, some people are getting facility for improvement of good health and best medical care.
Because of the sciences, there is an extensive use of preventive drugs, which can reduce the infant mortality rate.
During the past time, there was not any facility reduce the infant mortality, but time science makes all possible for everything.

In 1995, the average mortality rate was 74 per thousand in India.
In an urban area, it was 49 per thousand, and in the rural area, it was 80 per thousand.

Growth of life expectancy:

In India, there is the life expectancy will become weak, when the proper nutrition and good health do not improve by the human population.
Due to improved living condition, the better sanitation, better nutrition, and education in human population improves the life expectancy. It is significant for the person.
The good quality of food creates the expectancy for the human being and it well nourished to the people while using of nutrition food.
Population grows when they adequately nourished.

High level of illiteracy:

Due to lack illiteracy among women is the biggest problem of family planning.
The female education directly related to age at marriage, the general states of women, their fertility and infant mortality rate, and so forth.
In 1991, the male literacy rate was 64.13% are female literacy rate was 39.29%.
In 1999, the male literacy rate was 73% are female literacy rate was 49%.
In India, everyone should become literate either male or female.
Education must develop the skill, personal liberal, broad minded, open to new ideas, and rotational.

Effects of population explosion:

Population explosion creates by many facts which are following us:

Unemployment:

Due to the growing countries, the unemployment is also increasing day by day. It is reason back economy of countries.
Millions of people are jobless in the India.
They are not getting the job after finding everywhere.
After all that, they lose their confidence about searching the job.
The unemployed people are living with average dangerous condition of the economy.
Without the job,they have ensured the living, left frustrated, and demoralize.
They loss their faith in their life.
It happens in India as compared to their countries such as South Africa & Asia.

Large population:

In India, there is the number of population and also impressing day by day.
It is more useful for the population explosion.
There are over population in India.
Because of this condition of India, people are not getting comfortable and accommodate life.
It also poses a threat to the environment.

Poverty:

Poverty is primary reason of population explosion.
Most of the people, who belong from the poverty line, they have not any knowledge about the overpopulation of country.
They generate the high birth rate in India, which can cause and effect of population explosion.
Due to the poverty, there is massive growth of population. On the other hand, the large number of population almost increases by the poor people of the country.
Due to result of 2011 census, the poverty level was 1021 billion in the forties the poverty line was two million.

Illiteracy:

In India, the illiteracy is the key reason of population explosion.
The resource available fixed. In theory and practice, the total available resources are shared by the people using them.
Some of the people have not any sources to provide the education to their children.

Small health condition:

People get the low health status, when they have not adequate food & nutrition.

Pollution and global warming:

Pollution and global warming are most effective for the population explosion.
Much population creates the pressure on the earth.
There arise excessive demands for finished products leading to over-industrialization and over-utilization of resources.

PREVENTION OF POPULATION EXPLOSION

Awareness made by government:

The government creates more aware among our country.
They cannot ignore or solve the problem of population explosion.
Our nation is mostly active dependent on the government of India, how they treat & solve the problem of India.
The government made this awareness, at the central & state to think about adopting an official program to educate opinion and reduces the birth rate so that the population can fit in well with the evolving pattern of developing country.
The government also starts the program of family planning in 1952. The government is still trying to aware to people for family planning campaign.
The small family is right for every citizen of people, and they have to be aware of it.
Small families always become happy & healthy, and they can complete all needs of children.
It is the best advantage of small family.

It controls the population.
It is much beneficial for the country.
So everyone should have to follow it.
Population explosions have caused more pressure on earth.
We should save energy so that entire population can enjoy its benefit.
We can control the global warming issues by curbing the use of fossil fuels.
Food security is another area that needs attention.
The agricultural output should increase with growing population to make a sure steady supply of food to all.
We should use potable water carefully with larger population; there is a need for harmony & peace among nations.

UNIT-V

EMERGING APPROACHES IN DISASTER MANAGEMENT

1.0 DISASTER MANAGEMENT

- Disaster management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness response and recovery in order to lessen the impact of disasters.
- Disaster management is a well planned technique for reducing hazards caused by disasters, however it does not avoid or eliminate hazards and it focuses on planning to minimize the impact of disasters.
- Disaster management refers to the conservation of lives and property during natural (or) manmade disasters
- Disaster management includes co-ordination, command and Control, fast assessment of damage, restoration of power telecommunication, surface transport, deployment of research& rescue teams, medical and Para-medical teams, arrangement of food & drinking water, setting up of temporary shelters, sanitation and hygiene identification etc, last but not the least maintenance of law and order is equally importance.
- India is especially vulnerable to natural disasters because of its unique geo-climatic condition, having recurrent floods, droughts, cyclones, earthquake and landslides.

2.0 DISASTER MANAGEMENT ACT, 2005

- The disaster management act was passed by the loksabha on 28 November 2005, and by the rajyasabha on 12 December 2005.
- It received the assent of the president of India on 9 January 2006.
- The act calls for the establishment of a national disaster management authority (NDMA) with the prime minister of india as chairman.
- The NDMA has not more than nine members at a time, including a vice chairman. The tenure of the members of the NDMA is 5 years.
- The NDMA which was initially established on 30 May 2005, by an executive order was constituted under section-3(1) of the disaster management act on 27 September 2005.
- The NDMA is responsible for laying down the policies, plans and guidelines for disaster management and to ensure a very timely and effective response to the disaster.
- Under section 6 of the act it is responsible for laying down guidelines to be followed by the state authorities in drawing up the country plans.

3.0 DIFFERENT STAGES OF DISASTER MANAGEMENT

The different stages for the management of disaster can be broadly categorized into the following

1. Pre- Disaster Stage (Preparedness)

2. Emergency Stage (Disaster Phase Or Phase Of Catastrophe)

3. Post Disaster Stage (Rehabilitation/ Recovery Stage)

4.0 PRE-DISASTER PHASE

The pre-disaster stage includes

- Preparedness phase(phase of readiness)
- Mitigation phase(Risk diminution phase)

A. PREPAREDNESS PHASE(PHASE OF READINESS)

- The "preparedness" phase also occurs before a disaster takes place. Here, an organization attempts to understand how a disaster might affect overall productivity and the bottom line. The organization will also provide appropriate education while putting preparedness measures into place.
- This phase involves planning to respond immediately in anticipating of a disaster
- This includes awareness about emergency exercises or training in various methods of safely vacating the disaster – stricken areas and first – aid measures.
- Such awareness programs must also strengthen the technical and managerial capacity of governments, organization and communities to minimize the mortality and property loss and enhance disaster response operations.
- Installation of disaster warning systems, emergency communication system, emergency personnel/contact lists, plenty of food reserves, equipment, water, medicines and other necessities must be maintained

Phase of readiness includes the following aspects:

- **Hazard zone mapping:** Regions vulnerable to natural disasters must be mapped accurately using the latest techniques viz Remote sensing (RS), Geographic information system (GIS). The various parameters assessed in such studies include geology,lithology,soil type,minerals formingthe rocks and soils,water resources (ground and surface)
- **Hazard forecasting, warning and prediction :** Hazard forecasting, warning and prediction are inter-linked with each other.landslides and floods can be predicted as they occur mostly during the rainy season. if the general public is warned of the impending disaster in advance,then they can make last-minute

preparation or vacate the area and move to safer places or take other protective actions the essential supplies may be transported to the affected site before the hazard conditions strike and make movement to the affected area difficult.

- **Disaster preparedness plan:** The regions vulnerable to disaster must have a well co ordinated comprehensive preparedness plan for mitigating disasters.for instance, certain preventive measures may be taken up,like placing sand bags near the level to rise it's height or to create barriers around buildings to prevent rain water from flooding the homes. Stockpiling of essential commodities like food batteries,candles,and water can limit the hazards consequences.

Emerging operations plan(EOP)

An important component of disaster planning is the basic emergency operations plan.an EOP is a document,it contains a detailed description of the duties,roles, responsibilities and actions of agencies and people who will be involved in response to emergencies or disaster events.

EOP are referred by several names

a. Contingency plans

b. continuity of operations plans

c. Emergency response plans

d. counter-disaster plans

- **Land-use zoning:** Hazard prone areas must be identified and marked, their usage must be prevented through national or local logistations or prohibitions. such areas should not be used for residential or industrial purpose, however hazard prone areas can be used for agricultural activities
- **Preparedness through information, Education & Communication :** The general public must have the awareness and knowledge about the hazards through information, education,and communication to prepare them for disaster mitigation. information regarding disaster preparedness can be disseminated by traditional methods of communication and entrainment which includes sketches,songs,play,story boards,poster etc

B. MITIGATION PHASE(RISK DIMINUTION PHASE)

- The "mitigation" phase occurs before a disaster takes place. Here, an organization will take steps to protect people and property, while also decreasing risks and consequences from a given disaster situation. The organization's main goal is to reduce vulnerability to disaster impacts (such as property damage, injuries and loss of life).
- Mitigation phase is the second aspect of pre-disaster stage.it involves the disaster victims who have returned to normal or at least near normal life and are pursuing their occupation.
- These people may begin to think about the measures needed to minimize the effects of similar kind of probable Disaster in future. for instance,an earthquake that would have damaged improperly

constructed houses or a tsunami that would have washed away the houses in the coast line.in such situations, people begin to build stronger houses and buildings that can sustain the impact of earthquakes and encourage the development of green belt by planting more trees along the coastline to reduce the impact of tsunami waves on the land.

Some other measures essential for effective disaster mitigation

- Construction of disaster resistant houses
- Decreasing population pressure in hazard sensitive zones
- Awareness to the public about the do'sand don'ts at the time of disaster
- Land use control
- High standards of engineering design of buit structures
- Reduce urban densities in disaster prone areas
- Promotion of fire resistant structures
- Equitable economic development
- Relocation of existing settlement or infrastructure

MITIGATION PLANNING

Mitigation planning refers to the actions taken to identify the disaster risk areas and bring down the long term risk to life and property

- **Organize resources:** This step includes motivation of the community members as well as technical experts for a successful mitigation planning process.
- **Risk assessment:** This step includes identification of risk involved and potential consequences of hazards and it's impact on life and property
- **Develop mitigation plan:** Based on the understanding of risk assessment. The communities should put fourth maximum efforts to avoid or minimize the undesired effects of a catastrophe
- **Implement plan and monitor progress:** Specific measures for mitigation of disaster are to be implemented at the same time , periodic evaluations must be conducted to monitor the progress.

5.0 GUIDELINES FOR MITIGATION OF DISASTER

The guidelines for mitigation of disasters are intended to increase public awareness in the face of the exigencies

- **Early warning Symptoms:** Early warning Symptoms of an impending disaster have a major role in mitigating the effects of disasters.it enables the effected people to enhance the disaster response operations the early warning Symptoms include detection of signs of impending catastrophe, analysis of symptoms and disseminating information to the concerned people.

- **Land use zoning:** Hazard prone areas must be identified and marked, their usage must be prevented through national or local logistations or prohibitions.such areas should not be used for residential or industrial purpose, however hazard prone areas can be used for agricultural activities
- **Building codes:** The building codes are meant to improve the quality of new construction in order to resist catastrophes and thus protect life and property. Buildings codes are established in consultation with builders,architects and the public
- **Incentives:** Hazard mitigation can be accomplished by a wide range of incentive techniques. For example funds may be given to firms or households in hazard prone areas to strengthen the existing buildings or to include certain modifications during the construction phase.
- **Provision of assets at subsidized rates:** Community cyclone shelter May be provided to people residing in cyclone prone areas at subsidized rates or for free. Deep bore holes may be drilled in drought prone areas or sufficient land should be provided for water harvesting in such regions.
- **Increase public awareness:** Awareness raising compaigns about the hazards must be conducted to educate the population about how to respond and cope when hazards occur.efficient mitigation plans must be considered and implented systematically prevent the impact of natural hazards.

6.0 ROLE OF TECHNOLOGY IN DISASTER MANAGEMENT

New technologies that are considered as a well developed and successful tool form an integral part of disaster management as they can be used to manage natural disaster issues.these include

- **Mapping:** The different types of maps used by disaster managers for control of disaster and managing the disaster response include topographic maps,land use maps,hazards map,geologic maps, vegetation maps, population distribution maps, seismic maps and hurricane tracking maps.the interpretation of these maps can be used to monitor disaster of any type and respond accordingly. Microcomputer are being used now a days to generate computerized maps,which provide updated information about the disaster situation.
- **Aerial photography and remote sensing:** Satellite and aerial photography is being used to highlight the type of disaster and the devastation caused. Ballon photogrammetry system is used for low altitude aerial mapping. It combines ballon aerial photography and digital photogrammetry. The ballon carries the digital camera to a height of 400m above the ground level to take aerial photographs at appropriate viewing angle.the digital photogrammetry prorduces a 3-D model of the photographs taken.
  Remote sensing also called earth observation, refers to the collection of data about the biosphere, lithosphere, hydrosphere,and atmosphere of the earth with the help of mechanical devices known as remote sensors fitted on air planes, satellites,space craft,buoy or ship to survey large and inaccessible areas.the device records data/information about an object by measuring it's transmission of electromagnetic energy from reflecting and radiating surfaces.
- **Communications:** Electronic communications has an important role in disaster management for coordinaton, control, assessment, reporting and monitoring the disasters. Satellite and mobile phones

help to keep track of the victims of disaster. The wireless technology is most useful at such times especially during the disaster warning and disaster recovery phases.due to power failures the phones have limited usage. Therefore cell phones with large capacity and standby battery power. Upgraded batteries with extended time limits are required. Other means of communication include SMS, messages, internet, cell, broadcasting,HAM radios,fax,e-mail,high frequency transceiver, transistor radios,very high frequency transceivers, transistor radios and television. All these means of communication provide useful platform for dissemination of disaster mitigation and communication. The print media too serves as a reliable means of communication through which the specific disaster related information can reach the targeted population.

- **Information management:** Microcomputers are used by disaster managers for collecting, structuring and evaluating information in emergency situations by establishing an information management systems.despite the development of latest technologies all over the world,disaster can not be completely prevented or mitigated. All efforts must be focused to make our society ready to deal with any type of disaster.

7.0 EMERGENCY STAGE

- The "response" phase occurs in the immediate aftermath of a disaster. Organizations must focus their attention on addressing immediate threats to people, property and business. Occupant safety and wellbeing largely depends on its preparedness levels before disaster strikes.
- The most notable example of the "response" phase is to ensure that people are out of harm's way. The organization will then move on to assess damage, implement disaster response plans, triage cleanup efforts and start resource distribution as necessary. Businesses will also need to navigate building closures, preliminary damage assessments and hampered communication with stakeholders (like staff, vendors and suppliers) due to shutdowns.
- As the response period progresses, focus will typically shift from immediate emergency issues to conducting repairs, restoring utilities, re-establishing operations and cleaning up. The organization will also need to begin planning the reconstruction of damaged infrastructure.
- Emergency plan rehearsal is essential to achieve optimal output with limited resources. In the response phase, medical assets will be used in accordance with the appropriate triage of the affected victims.
- In addition volunteers and other non-governmental organizations (NGOs) such as the local Red Cross branch or St. John Ambulance may provide immediate practical assistance, from first aid provision to providing tea and coffee.
- A well rehearsed emergency plan developed as part of the preparedness phase enables efficient coordination of rescue efforts.
- The response phase of an emergency may commence with a search and rescue phase. However in all cases the focus will be on fulfilling the basic needs of the affected population on a humanitarian basis. This assistance may be provided by national and/or international agencies and organisations.

- Effective coordination of disaster assistance is often crucial particularly when many organisations respond and Local Emergency Management Agency (LEMA) capacity may be over-stretched and diminished by the disaster itself.
- Mostly this occurs during disaster
- It addresses threats presented by the disaster, including saving lives,meeting humanitarian needs i.e., food,shelter,clothing,public health and safety, cleanup, damage assessment and the start of the resource distribution .
- Recognition or identification of risks
- Ranking or evaluation of risks
- Responding to significant risks
- Tolerating
- Treating
- Transferring
- Resourcing controls and planning
- Reaction planning
- Reporting and Monitoring risk performance

8.0 POST-DISASTER STAGE

- The "recovery" phase takes place after a disaster. This phase is the restoration of an organization following any impacts from a disaster. By this time, the organization has achieved at least some degree of physical, environmental, economic and social stability.
- The recovery phase of a disaster can last anywhere from six months to a year (or even longer depending on the severity of the incident).
- An example of "recovery" is creating strategic protocols and action plans to address the most serious impacts of a disaster. An organization will work to obtain new resources, rebuild or create partnerships, and implement effective recovery strategies. The organization will also want to take steps to reduce financial burdens, rebuild damaged structures and reduce vulnerability to future disasters.
- It includes Recovery ,Relief and Rescue, Rehabilitation

4 R'S OF RESCUE, RELIEF, REHABILITATION AND RECONSTRUCTION

- The standard time frame of rescue, relief and rehabilitation are usually defined as approximately 7 days, 3 months and 5 years respectively. (This is an approximate rule.)
- The rescue operation starts with the local residents, immediately after the earthquake / disaster. It is usually supported by the trained and skilled staffs from the (Urban) Search and Rescue (SAR) departments of the governments. These activities can be complemented by the non-government organizations (NGO).
- International Relief Teams arrive in the later stage, usually after 24 hours, depending on the accessibility, and political relation with the country.

- **RESCUE PHASE:** Rescue phase usually lasts for the first 48 to 72 hours after a disaster when the rate of survival of trapped victims is high. Rescue operations continue for much longer duration, however, after the first 2 to 3 day, the resources allocated for rescue are comparatively low since other priorities take over. Initially Rescue may be 'self-rescue' or the rescue by bystanders or witnesses.
- **RELIEF PHASE:** Relief phase followed immediately after the Rescue phase. During the relief phase, the focus is to provide basic necessities to victims of the earthquake and to restore social equilibrium. Detailed assessment of human and other losses is also usually carried out during the relief phase, which helps in optimal allocation of resources.
- Relief phase may last between 1 to 3 months depending on the severity of the earthquake and the resources of the government. Community, supported by government is usually the central point. Added resources of the NGOs and the international organization substantiate this effort.
- **REHABILITATION / RECONSTRUCTION PHASE AIMS:** Rehabilitation/reconstruction phase aims to restore the communities to the pre-earthquake status. During this phase, the social and other infrastructure is restored and economy revitalised. The rehabilitation/reconstruction phase typically starts at the end of relief phase and may last for several years.
- The short term plans of the recovery process are clearance of debris, building housing units, restoration of the lifelines and infrastructures, while the long-term objective is to build a safer and sustainable livelihood. Past experiences show that the efforts are sustainable only with community / government partnership, while NGOs and international organizations role is reduced after a certain period.