Disaster Management Module 2 Important Topics

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Hazard mapping

- Hazard mapping involves graphical representation of the location, magnitude and temporal characteristics of the hazard on 2 or 3 dimensional surfaces.
- Objectives of hazard mapping:
  - To represent spatial and temporal characteristics of the hazard.
  - To represent the magnitude of hazard using graphical symbols

Data Requirement

- Spatial characteristics such as location, distribution and dimension
- temporal characteristics and magnitude are the major data requirements for hazard mapping.
- Such information can be obtained through the following sources:

- 1. Base maps
  - Base maps represent topographic layers of the data such as elevation, roads, water bodies, cultural features and utilities.
- 2. Remotely sensed images
  - Satellite images are becoming preferred sources of readily available information of locations on the earth's surface as compared to conventional ground survey methods of mapping, that are labour intensive and time consuming
- 3. Field Data
  - Through the advances in technology, ground surveying using electronic systems like total station, global positioning system (GPS), and laser scanners have increased opportunities for data capture in the field.

Approaches to Hazard Mapping

- 1. Hazard Mapping using geographical information system:
  - GIS is increasingly used for hazard mapping and analysis , as well as for the application of disaster risk management measures.
- 2. Participatory mapping
  - It is an interactive process that draws on local people's knowledge and allows them to create visual and non-visual data to explore social problems, opportunities and questions.

Application of Hazard Maps

- Risk reduction measures: Hazard maps assist in the localisation and dimensioning of hazard protection measures
- Emergency planning: Hazard maps indicate where the biggest risks arise and the events most likely to occur. This information can be used as a source of orientation in emergency planning.
- Raising awareness among the population: Hazard maps help to demonstrate potential risks to the population and to increase awareness of eventual protective measures

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Disaster risk assessment

- A qualitative or quantitative approach to determine the nature and extent of disaster risk

- This is done by analysing potential hazards and evaluating existing conditions of exposure and vulnerability that together could harm people, property, services, livelihoods and the environment on which they depend.

Components

There are 2 main components:

- 1. Risk Analysis.
  - The use of available information to estimate the risk caused by the hazard to individuals, population
- 2. Risk Evaluation:
  - This is the stage at which values and judgements are entered for the decision making process.
  - It includes all the results of risk associated with social, economic and environmental.

Approaches

- 1. MULTI-HAZARD:
  - Same area may be threatened by different types of hazards.
- 2. MULTI-SECTORAL:
  - Hazards will impact different sectors of elements at risk.
- 3. MULTI-LEVEL
  - Risk assessment can be carried out at different levels.
  - Different levels include national, regional, district and local policies.
  - It also defines what resources are available at the different levels to reduce risks.
- 4. MULTI-STAKEHOLDER
  - Risk assessment should involve the relevant stakeholders, which can be individuals, businesses, organisations and authorities.
- 5. MULTI PHASE
  - It consist of various phases of risk assessment such as response, recovery,mitigation and preparedness.

Methods

- 1. Qualitative methods
  - This involves qualitative descriptions of risk in terms of high, moderate and low.
- 2. Semi –quantitative methods
  - These techniques express risk in terms of numerical values.

- Ranging between 0 and 1
- They do not have a direct meaning of expected losses; they are merely relative indications of risk.

3. Quantitative methods.
   - In this method, the combined effects, in terms of losses for all possible scenarios that might occur, are calculated.

Vulnerability types and assessment

- Vulnerability is the inability to resist a hazard or to respond when a disaster has occurred. For eg:, people who live on plains are more vulnerable to floods than people who live higher up
- It the degree to which a system is exposed and susceptible to adverse effect of a given hazard

Types of Vulnerability:

1. Physical Vulnerability
   - This refers to the potential losses to the physical infrastructure such as roads, bridges,railways, radio and telecommunication mast and other features in the built environment.
   - It also includes impacts on human population, in terms of injuries or death.
2. Social Vulnerability
   - Social vulnerability refers to the losses experienced by the people and their social, economic and political systems.
3. Economic Vulnerability
   - Refers to the potential impacts of hazards on economic assets and processes and also includes vulnerability of different economic sections.
4. Ecological or environmental vulnerability
   - Refers to the degree of loss that an ecosystem will sustain to its structure, function and composition as a result of exposure to a hazardous condition

Vulnerability Assessment

- Vulnerability assessment is the process of assessing degree of loss.
- Types of vulnerability assessment

- 1. Physical vulnerability assessment
  - Two main methods are empirical method and analytical method.
    - Empirical method can be applied to groups of related structures.
    - Analytical method are based on the use of geotechnical engineering software and are limited to individual structures.
- 2. Socio economic vulnerability assessment
  - Socio-economic vulnerability is indicator based.
  - It can be assessed by analysing the level of exposure and coping mechanisms of individuals, households and communities.
- 3. Environmental or ecological vulnerability assessment
  - The environmental vulnerability assessment is used for the comprehensive evaluation of the resource system affected by natural conditions and intervened by human activities

Methods of representing Vulnerability

- 1. Vulnerability indices
  - based on indicators of vulnerability.
- 2. Vulnerability Table
  - tabular representation of vulnerability, which indicates relation between hazard intensity and degree of damage.
- 3. Vulnerability Curves
  - Graphical representation of vulnerability, which indicates relation between hazard intensity and degree of damage.
  - Relative curves
    - shows percentage of property value as the damaged share of total value to hazard intensity.
  - Absolute curves
    - shows the absolute amount of damage depending on the hazard intensity
  - Fragile curves
    - provides probability of a particular group of elements at risk.

Problems

Question 1

In Kerala for the past 5 years, the average no of road accident is 44076 per year and one death occur in every 10 accidents, Considering the population as 3.33 crores assess the risk of being killed in driving an automobile in terms of societal and individual risk.

Solution

- Given Datas
  - Average no of road accident = 44076
  - One Death occur is every 10 accidents
  - Population = 3.33 Crores
- To Find out
  - Societal Risk = ?
  - Individual Risk = ?
- Finding the values
  - Societal Risk = Average no of death per year
    - = 44076/10 = 4407.6
    - = 4407 death/year
  - Individual Risk = Yearly death per person
    - = Societal Risk/population
    - 4407/3.33 Crores = 4407/3,33,00000
    - = 1.32x10^-4 Death/person year

Question 2

What are the risk from driving an automobile? (Societal, Individual and Lifetime risk), There are 15,000,000 accidents per year, 1 in 300 if which results in death, there are 25,00,00,000 people

Solution

- Given Data
  - No of accidents per year = 15,000,000
  - 1 Death occur in every 300 accidents
  - population = 25 crores
- To find out
  - Societal Risk = Average no of death per year
    - = 1,50,00000 x 1/300 = 50,000 death/year
  - Individual Risk = Yearly death per person
    - = Societal risk/population

    - 50,000/25,00,00,000 = 2x10^-4 death/person . year
- Lifetime risk for 70 years
    - = Individual risk x 70
    - = (2x10^-4) x 70 = 0.014 death/person