

22CEO01- DISASTER MANAGEMENT

MODULE - I

YEAR,CLASS: IV YEAR OPEN ELECTIVE

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MODULE 1- DIMENSIONS OF DISASTERS

- 1.1. Dimensions of natural & anthropogenic disasters**
- 1.2. Components of Disaster management**
- 1.3. Organisational structure of Disaster Management
- 1.4. Disaster management schemes– Natural disasters and mitigation efforts
- 1.5. Flood control
- 1.6. Drought management
- 1.7. Cyclones
- 1.8. Land use planning
- 1.9. NBC threat and safety measures
- 1.10. Crisis in power Sector
- 1.11. Accidents in coal mines.
- 1.12. Forest fires
- 1.13. Oil fires

DISASTER

- The word ‘Disaster’ derives from **Middle French** and that from Old Italian **disastro**, which in turn comes from the Greek pejorative prefix (dus-) “bad”+ (aster), “star”.
- The root of the word disaster (“bad star” in Greek and Latin) comes from an **astrological** theme in which the ancients used to refer to the destruction or deconstruction of a star as a disaster.
- Disaster is an **event** or **series of events**, which gives rise to **casualties** and **damage** or loss of properties, infrastructures, environment, essential services or means of livelihood on such a scale which is beyond the normal capacity of the affected **community** to cope with.

INTRODUCTION TO DISASTER MANAGEMENT

1. INTRODUCTION

- Disaster is a sudden, calamitous event bringing great damage, loss, and destruction and devastation to life and property.
- We cannot stop disasters but we can arm our ourselves with knowledge



Effects of disasters like earthquake, flood, Forest fire, Drought

VIDEO LINK :

- Introduction to disaster management :

https://drive.google.com/open?id=1Cxa9THI9KMu-Fv_0F4OGehGYIO7feGBP

1.1.DIMENSIONS OF NATURAL AND ANTHROPOGENIC DISASTER

- Disasters are caused either by natural forces or processes known as “Natural disasters” or by human actions, negligence, or errors known as “Anthropogenic disasters”

Major natural disasters: <ul style="list-style-type: none">▪ Flood▪ Cyclone▪ Drought▪ Earthquake	Minor natural disasters: <ul style="list-style-type: none">▪ Cold wave▪ Thunderstorms▪ Heat waves▪ Mud slides▪ Storm
Major man-made disaster: <ul style="list-style-type: none">▪ Setting of fires▪ Epidemic▪ Chemical pollution.▪ Wars	Minor man-made disaster: <ul style="list-style-type: none">▪ Road / train accidents, riots▪ Food poisoning▪ Industrial disaster/ crisis▪ Environmental pollution



Severe **floods** affected the south Indian state **Kerala**, on August 2018 due to high rainfall during the monsoon season,



A strong 6.1-magnitude earthquake struck India's northeastern state of **Arunachal Pradesh** on April 24, 2019



Longest duration (41 months) droughts in India. The 2015-2018 drought had a remarkable impact on reservoir and groundwater storage in India

Wayanad Landslide 2024



VIDEO LINKS :

- Dimensions of natural & anthropogenic disasters

<https://drive.google.com/open?id=1LGC2UInsYAv4mycUZ7wcx6NUuW1ymNbh>

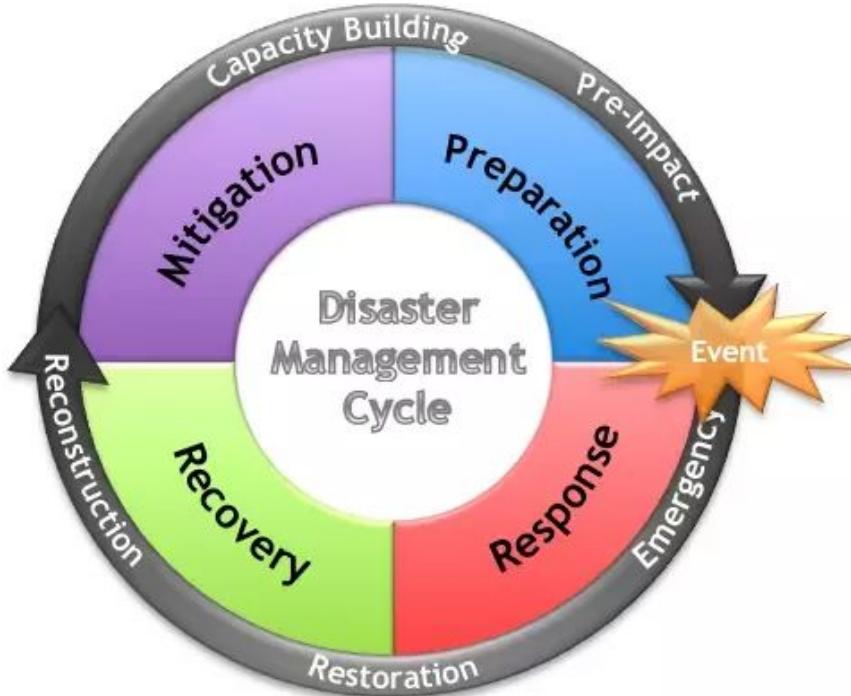
- Natural disaster and its types

<https://drive.google.com/open?id=14QIk3ti6GxkgKQIGwiDbF4vCkT8LptAF>

- Manmade disaster and its types

<https://drive.google.com/open?id=1eFJjgjmPGex5leemzgrMDthmVSQWaC3K>

1.2. COMPONENTS OF DISASTER MANAGEMENT



The disaster management cycle has four stages, mitigation (or risk reduction), preparedness, response and recovery

VIDEO LINK :

- Components of disaster management:

<https://drive.google.com/open?id=13SZaUFx0qM8JXcvssDWcQqXKV9Fda8fP>

1.2.1.MITIGATION

Mitigation is the effort to **reduce** loss of life and property by lessening the **impact of disasters**

- Prevention of hazards developing into disasters
- Reduce effects of disasters
- Focuses on long term measures
- Actions:
 - Structural – use technology
 - Non structural –legislation
- Necessitates identification of risk



1.2.2.PREPARDNESS

Disaster preparedness refers to measures taken to **prepare for** and **reduce the effects of disasters**. That is, to predict and, where possible, prevent disasters, mitigate their impact on vulnerable populations, and respond to and effectively cope with their consequences.

Prepare action plans

- Communication plans
- Emergency response teams
- Emergency warning methods
- Shelters, evacuation plans
- Resources inventory building
- Develop trained volunteers
- Casualty prediction- helps in evacuation



1.2.3.RESPONSE

Disaster response consists of a number of elements, for example; warning/evacuation, search and rescue, providing immediate assistance, assessing damage, continuing assistance and the immediate restoration or construction of infrastructure

- Mobilization of
 - Emergency teams
 - Core emergency services
 - Specialist teams
 - First responders in area
 - Search and rescue efforts
- Runs on
 - principle of unified command
 - Mutual aid
- Immediate needs are addressed

1.2.4.RECOVERY

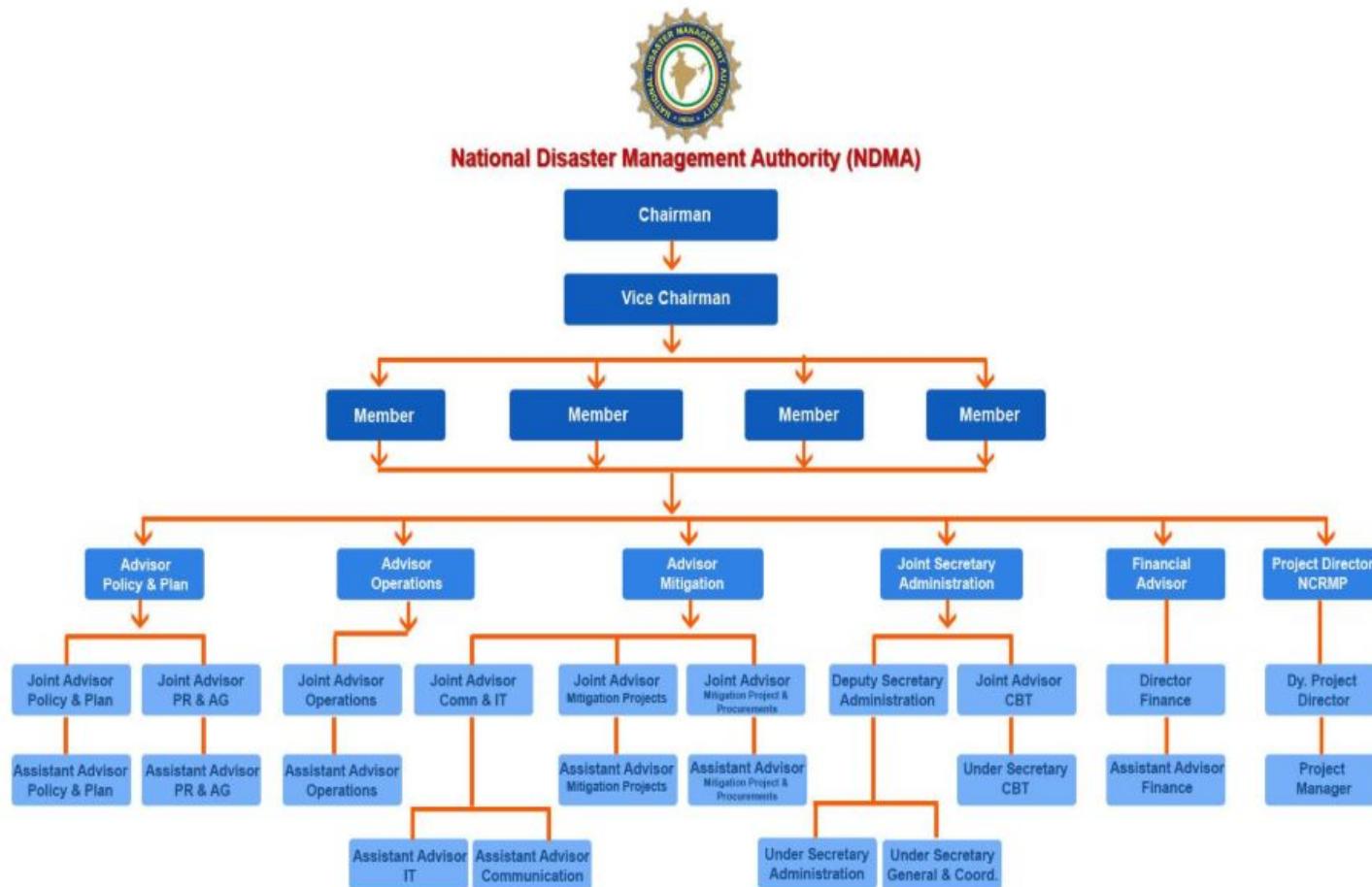
- Restore affected area to previous state
- Rebuild , employ and repair
- “window of opportunity” for implementing harsh measures of mitigation



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1.3. ORGANISATIONAL STRUCTURE OF DISASTER MANAGEMENT



NDMA, as the apex body, is mandated to lay down the policies, plans and guidelines for Disaster Management to ensure timely and effective response to disasters.

- On 23 December 2005, the Government of India enacted the **Disaster Management Act**, which envisaged the creation of the National Disaster Management Authority (NDMA), headed by the Prime Minister, and State Disaster Management Authorities (SDMAs) headed by respective Chief Ministers, to spearhead and implement a holistic and integrated approach to Disaster Management in India.
- The vision states "To build a safer and disaster resilient India by a holistic, pro-active, technology driven and sustainable development strategy that involves all stakeholders and fosters a culture of prevention, preparedness and mitigation.“

VIDEO LINK :

- Organizational structure of disaster management

<https://drive.google.com/open?id=1Dxb9VYHI-4OeFtiA0YFqBhJo5YCvY8EC>

1.4. DISASTER MANAGEMENT SCHEMES – NATURAL DISASTERS AND MITIGATION EFFORTS

- The National Policy framework has been prepared after due deliberation and keeping in view the National Vision to build a safe and disaster-resilient India by developing a holistic, proactive, multi-disaster and technology-driven strategy for DM.
- Goal is achieved through a culture of prevention, mitigation and preparedness to generate a prompt and efficient response during disasters. The entire process will centre-stage the community and will be provided momentum and sustenance through the collective efforts of all government agencies and Non-Governmental Organizations

DISASTER MANAGEMENT SCHEMES

National Cyclone Risk Mitigation Project (NCRMP) – Phase I

NCRMP Phase – I

Aim: The project aims at minimizing the vulnerability to the cyclone and making people and infrastructure disaster resilient Components: The project has four principal components namely:

Component A – Last Mile Connectivity

Component B – Structural and Non-Structural Measures

Component C - Technical Assistance for Cyclone Hazard Risk Mitigation, Capacity Building and Knowledge Creation

Component D – Project Management and Implementation Support.

- The Government of India approved NCRMP Phase-I for Andhra Pradesh & Odisha at a cost of Rs. 1496.71 crore in January 2011 to address the vulnerability of the coastal community to cyclones, who are generally poor and are from the weaker section of the society.

- After the cyclone Phailin, the Cabinet revised the cost of NCRMP Phase-I project on 16.07.2015 from 1496.71 crores to Rs. 2331.71 crore with the inclusion of additional scope of works and completion date was extended from 31st January 2016 to 31st March 2018.
- After considering additional requests from the State Governments, the project cost has further been revised to Rs. 2541.60 crore (Rs.1985.68 Cr – Central Share and Rs.555.92 Cr- State Share) in May 2017 with no change in completion schedule.
- In Jan 2018, the completion time of the project has been extended up to December 2018

National Cyclone Risk Mitigation Project (NCRMP) – Phase II

NCRMP Phase – II

- Rs. 2361.35 crore (Rs 1881.20 crore- Central Share and Rs. 480.15 crore- State Share)
- States of Goa, Gujarat, Karnataka, Kerala, Maharashtra and West Bengal
- Started in July 2015 with the date of completion as 31.03.2020. It has same components and cost sharing mechanism like Phase - I.

Sustainable Reduction in Disaster Risk in 10 Multi-Hazard Districts

- To strengthen community and local self-government's preparedness and response in the ten most multi-hazard vulnerable districts, two each in five identified states (Uttarakhand , Assam, Bihar, Himachal Pradesh and Jammu and Kashmir)
- Rs. 6.07 crores have been budgeted for the project.
- 24 months, i.e, for the financial year of 2015-2016 to financial year of 2018-2019.

National Cyclone Risk Mitigation Project (NCRMP) – Phase II

NCRMP Phase – II

- Government of India has approved Phase-II of NCRMP in July,2015 for five years up to March, 2020 covering States of Goa,Gujarat,Karnataka,Kerala,Maharashtra and West Bengal at an Outlay of Rs2361.25Cr with the World Bank funding amounting to Rs1881.10Cr.
- The remaining amount of Rs480.15Cr. is being contributed by State Governments as their share. The sub-component of underground cabling has been included under NCRMP Phase-II
- States of Goa, Karnataka, Kerala and Maharashtra are in the process of finalization of Sites, Environment clearances, DPR etc. An amount of Rs.173Cr. (GOI & State Share) has been released with an expenditure of Rs.103 Cr .

Infrastructure Development for 10 Battalions and 10 teams of National Disaster Response Force (NDRF)

Aim:

To increase the functional efficiency in the administrative matter, capacity building and storage of specialized equipment of NDRF as well as relief stores and resources.

Outcome:

- More effective and prompt responses by the NDRF to the disaster affected area thereby helping in mitigating the effects of the disaster and disaster like situation all over the country.
- The project will help in increasing functional efficiency of the force, capacity building and storage of specialized equipment of NDRF as well as relief stores/resources and boost the morale of the force.

Duration: The scheme is completed by March 2020.

- To make the NDRF battalions fully functional and to house its men and material, construction of infrastructure and ancillary work is considered essential.
- The Ministry of Home Affairs has sanctioned a scheme in March, 2015, to raise the infrastructure of 10 Battalions and 10 team locations.
- The project includes construction of Office Buildings, Training Block (Basic rubble field and props, High rise rescue, Advance search & rescue and Swimming pool deep diving etc.) and Residential quarters.
- The implementation of the projects is closely monitored by NDRF and a periodic review is taken by the Disaster Management Division.

Upgradation of National Fire Service College, Nagpur

Aim: To enhance the capacity of the National Fire Service College to meet the requirements of specialized professional training in all aspects namely fire prevention, fire protection, firefighting, rescue, a specialized emergency response in the event of a disaster and for research documentation and consultancy requirements in the field.

Components:

The main components of the scheme are as follows:

- Construction of technical and non-technical buildings at a cost of Rs. 146.80 crore to be carried out by CPWD,
- Procurement of equipment including training aids and laboratory items at an estimated cost of Rs. 58.20 crore.

Project Cost: The total outlay of the scheme is Rs.205 crores, which has been recently revised upto Rs. 235 Cr.

Project Duration: 2010- 2018

Creation of National Disaster Response Reserve (NDRR)

Aim: To maintain an inventory of necessary relief equipment for at least a population of 2,50,000 people from Central resources in the plain areas and store availability for minimum 1,50,000 population in hilly areas.

Outcome: To mitigate the sufferings of the victims of the disasters and readily make available items commonly required for rendering relief in disasters which are beyond the coping capacity of the States.

Project Cost: Rs. 250 cores.

The purpose of creating National Disaster Response Reserve (NDRR) is to mitigate the sufferings of the victims of the disaster which are beyond the coping capacity of the States.

Aapda Mitra Scheme

Aim: To train community volunteers with the skills that they would need to respond to their community's immediate needs in the aftermath of a disaster, thereby, enabling them to undertake basic relief and rescue tasks from emergency situations such as floods, flash floods, and urban flooding, when emergency services are not readily available.

Outcome:

- a) Training of 6000 community volunteers (200 per state)
- b) Development of standardized training modules at the National Level and training institutes will be identified at the state level to impart training to volunteers

Project Cost: The total cost of the project is Rs.15.47 crore

Duration: The project has been approved for the duration of 2 years, i.e., for financial year 2016-2017 and the financial year of 2017-2018.

National Disaster Management Services

The scheme has an integrated approach to provide reliable telecommunication infrastructure to disaster managers during times of non-disasters and in the event of disasters. It is a NDMA pilot project being implemented by BSNL.

Aim: The aim of the project is to provide the failsafe communication infrastructure and technical support for Emergency Operation Centers (EOCs) at MHA, NDMA, NDRF, 36 States/Union Territories and 81 most vulnerable districts.

Outcomes:

- Electronic Private Automatic Branch Exchange (EPABX) feature will be made available through Universal Gateway which will have the facility to transfer telephone calls on any media including high frequency, satellite, terrestrial network, or any other mode including intercoms.
- A single view of the disaster from the disaster affected site as far as possible will be provided to all stakeholders through the integration of various information feeds from handicaps, tablets and other devices.

Project Cost: The total cost of the project is 19.54 crores

Project Completion: The project is expected to end in 2018

Mobile Radiation Detection System (MRDS)

NDMA, as part of a pilot project on national level preparedness to cope with Radiological Emergencies, has taken an initiative to equip police and NDRF personnel for management of radiological emergencies in public domain.

Outcomes:

- To prevent and detect any accident or malicious act involving radioactive material as a pilot scheme
- To equip the surveillance vehicles of nearly 930 police stations in all the capital cities/Union Territories, and other major cities of the country, with simple monitoring instruments and personal protective gear to detect the type of cases mentioned above
- Train NDRF and states/UTs police personnel to handle MRDS equipment and disaster situations

Project Cost: The total cost of the project is Rs.6.97 crores.

Duration: 5 years

Sustainable Reduction in Disaster Risk in 10 Multi-Hazard Districts

Aim: To strengthen community and local self-government's preparedness and response in the ten most multi-hazard vulnerable districts, two each in five identified states (Uttarakhand, Assam, Bihar, Himachal Pradesh and Jammu and Kashmir)

Outcomes:

- Development of a Comprehensive Disaster Risk Reduction/Recovery plan for each district
- Awareness and publicity campaigns throughout the selected district
- Preparation of training modules in community based disaster management
- Formation of disaster management teams at district levels
- Training of trainers/stakeholders on CBDM and conduct mock drills in these selected districts

Project Cost: An amount of Rs. 6.07 crores have been budgeted for the project.

Project Duration: The project has been approved for a duration of 24 months, i.e, for the financial year of 2015-2016 to financial year of 2018-2019.

VIDEO LINK :

- Disaster management schemes:

<https://drive.google.com/open?id=1J9ttzR1s8KQ6AkEWikD4FFliNhi84hs7>

- National Disaster Management Plan 2016:

<https://drive.google.com/open?id=1eLirGVpc4-O0W50XdRhxSVcsjiKkiu5D>

- National policy on Disaster management - 2009:

<https://drive.google.com/open?id=1eLirGVpc4-O0W50XdRhxSVcsjiKkiu5D>

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1.5. FLOOD CONTROL

- Flooding is the unusual presence of water on land to a depth which affects normal activities.
- Flooding can arise from: overflowing rivers, heavy rainfall over a short duration, or an unusual inflow of sea water onto land. Ocean flooding can be caused by storms such as hurricanes, high tides, seismic events or large landslides



*Chennai Flood, 2015.
500 people killed.
Over 1.8 million
people affected.
Nov. 8 – Dec. 14,
2015.*

VIDEO LINK :

- Flood Control

https://drive.google.com/open?id=1Knnaa27tr8N_YI3NrYoucwsQ6A8Iz9IQ

Flood mitigation strategies:

- Watercourses which pass through significant settlement areas should be properly configured and lined with concrete.
- Existing bridges should be inspected to determine which ones are too low or which have support pillars within the watercourse channel. Where possible these should be replaced as these features restrict water flow and cause the channels to be easily blocked with debris.
- Future bridges should not be built with these undesirable features.
- Buildings constructed adjacent to watercourses should be elevated by at least one meter to prevent potential flood inundation.
- Critical facilities should not be located adjacent to watercourses.

Causes of Flooding :

1. Heavy Rains
2. Overflowing Rivers
3. Broken Dams
4. Urban Drainage Basins
5. Storm Surges and Tsunamis
6. Channels with Steep Sides
7. A Lack of Vegetation
8. Melting Snow and Ice



1.6. DROUGHT MANAGEMENT

- Drought is a normal, recurring feature of climate; it occurs in virtually all climatic regimes.
- It is the consequence of a natural reduction in the amount of precipitation received over an extended period, usually a season or more in length.
- Factors influencing drought – timing, intensity & duration of droughts.



The 2018 northeast monsoon season was one of the driest ever recorded in Chennai, as only 343.7 mm of rain had fallen compared to an average of 757.6 mm, which was a 55% rainfall deficit.

VIDEO LINK :

- Drought Management

https://drive.google.com/open?id=1668pYo3iUFOnggf0qCX2drg_PEpumCPU

Types of Drought :

- **Meteorological Drought** describes a situation where there is a reduction in rainfall for a specific period (days, months, season or years) below a specific amount (long term average for a specific time).
- **Hydrological Drought** involves a reduction in water resources (stream flow, lake level, ground water, underground aquifers) below a specified level for a given period of time
- **Agricultural Drought** is the impact of meteorological/hydrological drought on crop yield.
- **Socio-economic Drought** describes a situation where food/water supply does not meet demands due to lack of water
- **Ecological Drought** leads to adverse effect in plant and animal species

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CYCLONES

- Cyclones (or Tropical Cyclones) are a type of severe **spinning storm** that occurs over the ocean near the tropics.



*Myanmar Cyclone of 2008, claimed 200,000 lives. Winds of 200 km per hour and the low pressure created a **storm surge**, measuring 6.3 meters high*

VIDEO LINK :

- Cyclones :

<https://drive.google.com/open?id=1mH6UVyqmR4FJ-oSospSSgbCeRj0MBHKk>



FORMATION OF CYCLONE

Cyclone Mitigation Strategies :

- Future critical facilities should not be located in areas of accelerated winds.
- The most significant aspect of structural damage to buildings by high velocity wind results from roof damage. The roofs of existing buildings should be inspected and if necessary retrofitted to adequate standards.
- The roofs of existing critical facilities should be retrofitted to a higher standard to ensure wind resistance.
- Building openings such as windows and doors also suffer damage from high velocity winds. These openings if not constructed of wood or metal should be protected with shutters or temporary covers of adequate design.

1.8.LAND USE PLANNING

Land use planning creates the preconditions required to achieve a type of land use that is **environmentally sustainable, socially just** and desirable and **economically sound**. It thereby activates social processes of decision making and consensus building concerning the utilization and protection of private, communal or public areas

OUTCOMES :

- Prevent new hazards
- Reduce vulnerability
- Reduce economic losses
- Contributes to sustainable development
- Poverty reduction

VIDEO LINK :

- Land use planning

<https://drive.google.com/open?id=1s8NMnmmY5WbulfjDDSgjcjdZabextlDi>

Land use in disaster risk management (DRM)

- Utilization of land and natural resources which is adapted to local conditions and needs, and takes into account disaster risks.
- Disaster risk management should be integrated in all phases of land use planning, from its preparation and base-line assessment through decision making, implementation and monitoring.
- Disaster risk management and land use planning can be combined at any moment during planning or implementation.

Tools for land use planning and DRM integration

- Risk assessment (on the basis of hazard and vulnerability analysis) should be integrated in the base-line assessment for land use planning
- Risk mapping should be part of zoning and other methods of scenario building
- Disaster risk management measures should be integrated in the land use plan, e.g. introduction of sustainable agriculture to avoid soil degradation
- Local regulations to enforce land use criteria and decisions should explicitly mention relevant disaster risk management strategies and criteria
- Disaster risk management indicators should be integrated in the established monitoring and evaluation mechanisms
- Disaster risk management should be considered in the involvement of relevant actors and organizational mechanisms

1.9. NBC THREATS

Nuclear Threat



Tsar Bomba :The Soviet Union had trumped over America in detonating the biggest nuclear warhead on October 30, 1961. The AN602 hydrogen bomb recorded the most powerful man-made explosion ever to have taken place on Earth.

Chemical Threat

The Arkema chemical plant in Crosby, about 25 miles northeast of Houston, experienced two explosions, releasing organic peroxides into the air claiming lives of 15 people



Biological Threat



*A biologic **threat** is an infectious disease with the potential to spread and cause an outbreak. Infectious diseases are illnesses caused by germs such as bacteria and viruses.*

1.9.1.NUCLEAR THREAT

Global Nuclear Policy

- Reducing reliance on nuclear weapons, preventing their use and their spread, and ultimately ending them as a threat to the world
- The world has entered a new nuclear age. While the risk of large-scale, world-ending nuclear war has declined, regional instability, the proliferation of weapons and the materials to make them along with emerging threats like cyber and terrorism mean the risk of a single nuclear weapon or device being detonated – by accident, by miscalculation or on purpose – is on the rise.
- NTI works with governments, partner organizations and leaders around the world to develop policies, leadership and the global capacity—human and institutional—to reduce reliance on nuclear weapons, prevent their spread and ultimately end them as a threat to the world.

1.9.2.BIOLOGICAL THREAT

Preventive Measures:

- **Prepare an emergency kit :** In the event of widespread illness, it is possible that services and facilities in the community – like restaurants, public transportation, and banks – will close temporarily. Similar to preparedness for other types of emergencies, it is important that you have essential supplies at home, including at least a 3-day supply of water and food that will not spoil, as well as any medicines that your family members need daily.
- **Stay informed :** In an emergency, seek out information early and often. Public health authorities will communicate the things you can do to protect yourself and your family. The Centers for Disease Control and Prevention (CDC) will provide information through television, radio, the Internet, or social media pages, such as Twitter and Facebook.
- **Know your family's medical history:** It may be necessary to take antibiotics, receive vaccines, or take other medicines to treat an infection. Healthcare professionals want to know about your family's health and any medical problems you and your relatives have had in the past.

1.9.3.CHEMICAL THREAT

- A **chemical threat** is fear of a release of **poisonous vapors**, aerosols, liquids, and solids being dispensed into the air or water ways which would have a toxic effect on people, animals, and/or plants.
- Chemical agent or chemical poisons are primarily used in war, terrorism and riot control. These kinds of chemical threats are very real and are often dispensed through bombs or via some type of projectile. They can also be sprayed from aircraft, boats, and vehicles or shot out of some type of weapon.
- Be prepared to shelter in place or evacuate the area.

Several things you should keep in mind about chemical threats:

- While potentially lethal, they are difficult to deliver in lethal concentrations
- Chemical agents are difficult to produce in large quantities
- A chemical attack could come without warning
- They dissipate rapidly outdoors
- Chemical poisons may be odorless and tasteless and hard to detect

VIDEO LINK

- Nuclear threats

<https://www.youtube.com/watch?v=xLRSmzGRLUk>

- Biological threats

https://youtu.be/_XkGChXp2qc

- Chemical threats

<https://www.youtube.com/watch?v=WmYNgerlQgA>

ARTICLE : NBC DISASTERS PREVENTION & MITIGATION

[http://www.indiandefencereview.com/spotlights/nbc-disasters-prevention-m
anagement/#:~:text=The%20chemical%20agents%20present%20an,a%20
terrorist%20group%20to%20obtain.](http://www.indiandefencereview.com/spotlights/nbc-disasters-prevention-management/#:~:text=The%20chemical%20agents%20present%20an,a%20terrorist%20group%20to%20obtain.)

1.10. FOREST FIRES

- Poses a threat not only to the forest wealth but also to the entire regime to fauna and flora seriously disturbing the bio-diversity and the ecology and environment of a region.



Forest fire in Portugal in Pedrogao Grande in June 2017. Relative humidity ranged below 53% and dryness and high temperatures persist for more than 4 days

VIDEO LINK :

- Forest fires

https://drive.google.com/open?id=14kL0b-24zTLd9_F-YE50FxvXLQI16AXT

Causes of Forest fire

- Natural – Lightening; High atmospheric temperatures and dryness (low humidity) offer favourable circumstance for a fire to start.
- Man made - flame, cigarette or bidi, electric spark or any source of ignition comes into contact with inflammable material.

Types of Forest fires

- Based on Cause
 - Natural or controlled forest fire
 - Forest fires caused by heat generated in the litter and other biomes in summer through carelessness of people (human neglect)
 - Forest fires purposely caused by local inhabitants.
- Based on Spreading nature of Fire
 - Surface Fire
 - Crown Fire

Preparedness and Mitigation Measures :

- Forest fires are usually seasonal. They usually start in the dry season and can be prevented by adequate precautions.
- Successive Five Year Plans have provided funds for forests fighting.
- During the British period, fire was prevented in the summer through removal of forest litter all along the forest boundary. This was called "Forest Fire Line" This line used to prevent fire breaking into the forest from one compartment to another.
- The collected litter was burnt in isolation. Generally, the fire spreads only if there is continuous supply of fuel (Dry vegetation) along its path. The best way to control a forest fire is therefore, to prevent it from spreading, which can be done by creating firebreaks in the shape of small clearings of ditches in the forests.

Precautions :

- keep the source of fire or source of ignition separated from combustible and inflammable material.
- keep the source of fire under watch and control.
- Not allow combustible or inflammable material to pile up unnecessarily and to stock the same as per procedure recommended for safe storage of such combustible or inflammable material.

VIDEO LINK :

- How to prepare for forest fire :

https://www.youtube.com/watch?v=_bNLtjHG9dM



*Fire had ravaged thousands of hectares of forest land in
Algeria in December 2020*



Residents look on as flames burn through bush in Lake Tabourie, Australia, on January 4, 2020



1.11. OIL FIRES

- Oil fires can be the result of human actions, such as accidents or arson, or natural events, such as lightning
- It can cause the loss of millions of barrels of crude oil per day. Combined with the ecological problems caused by the large amounts of smoke, can cause enormous economic losses.
- Smoke from burnt crude oil contains many chemicals, including sulfur dioxide, carbon monoxide, benzopyrene, Poly aromatic hydrocarbons doxin



Kuwaiti firefighters fight to secure a burning oil well in the Iraqi Rumaila oilfields in 2003

VIDEO LINK :

- Oil Fires

<https://drive.google.com/open?id=166yG0IfDf98oPnWAGqFHxYeJxgENsuQI>

1.12. ACCIDENTS IN COAL MINES

Accidents in Coal mines caused due to :

- Leaks of poisonous gases such as hydrogen sulphide or explosive natural gases especially firedamp or methane,
- coal dust explosions,
- collapsing of mine slopes,
- mining-induced seismicity, flooding, or general mechanical errors from improperly used or malfunctioning mining equipment



An accident caused due to Rajmahal mine tragedy at Goda district, Jarkhand , killed 17 mine workers.

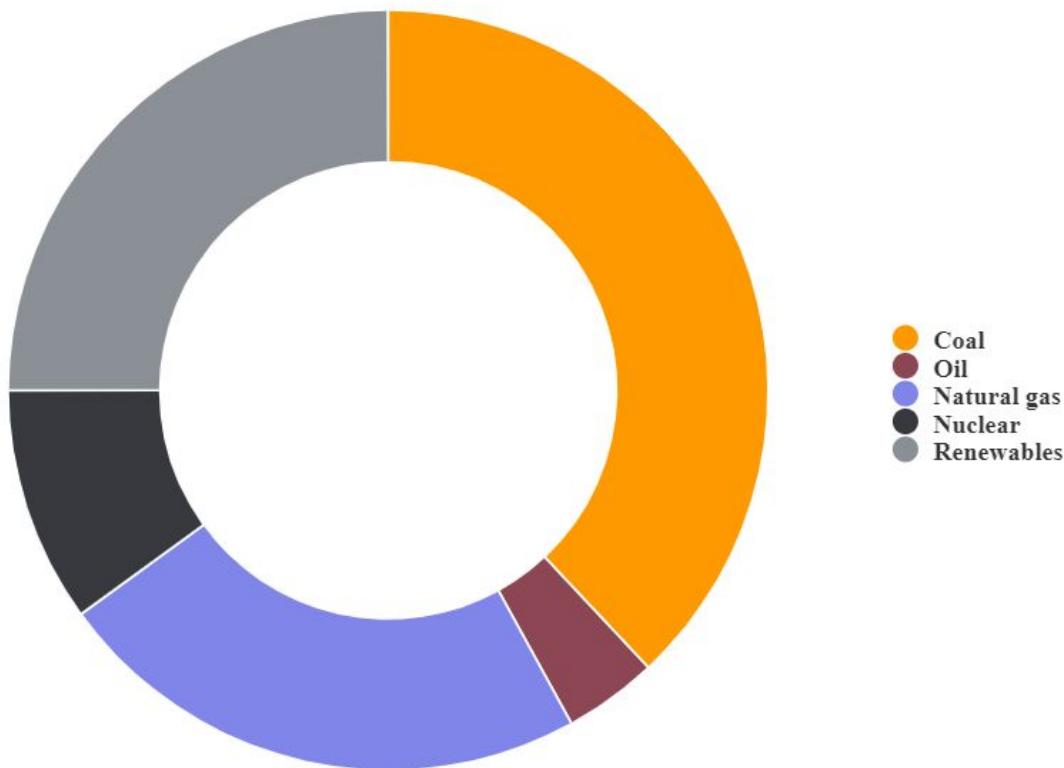
VIDEO LINK :

Accidents in Coal mines

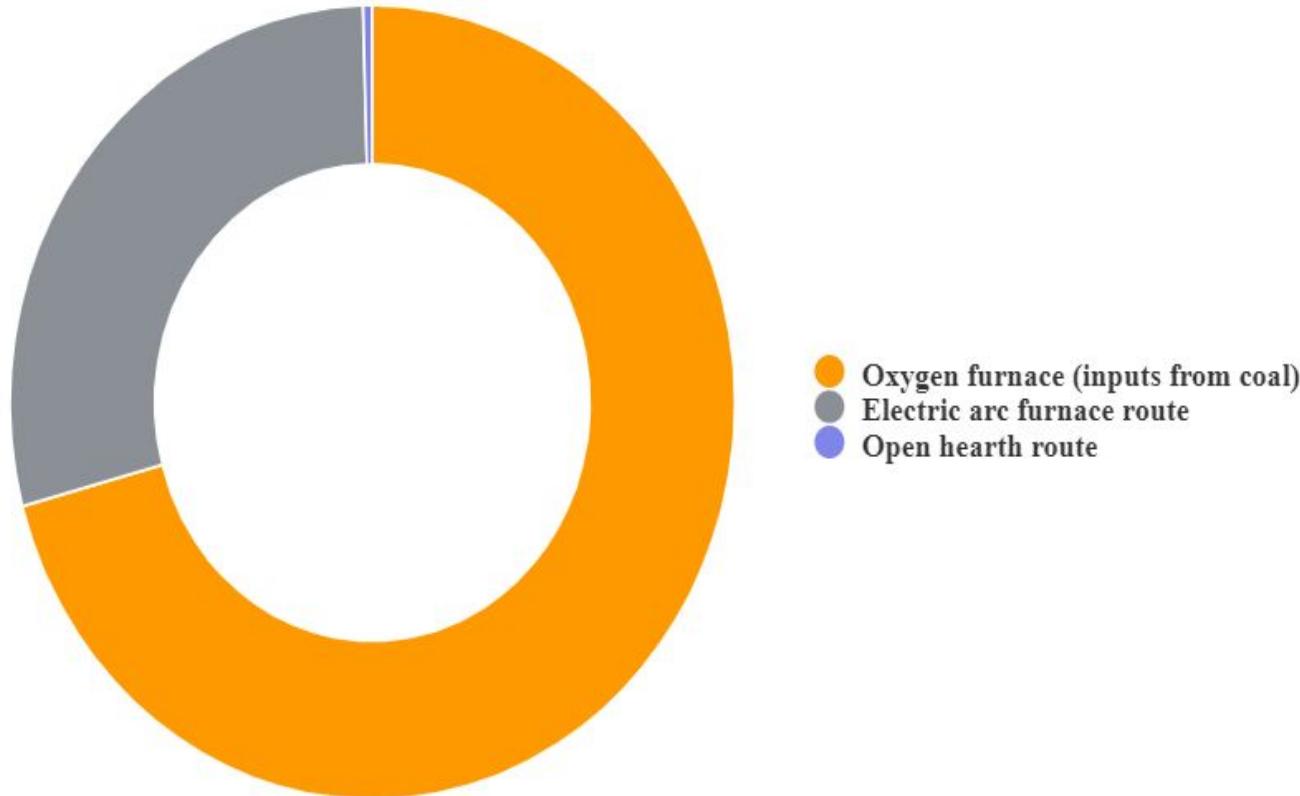
<https://drive.google.com/open?id=1vFnrrxW4GavdTgqS1q3JxBoYhCD53csA>

USES OF COAL

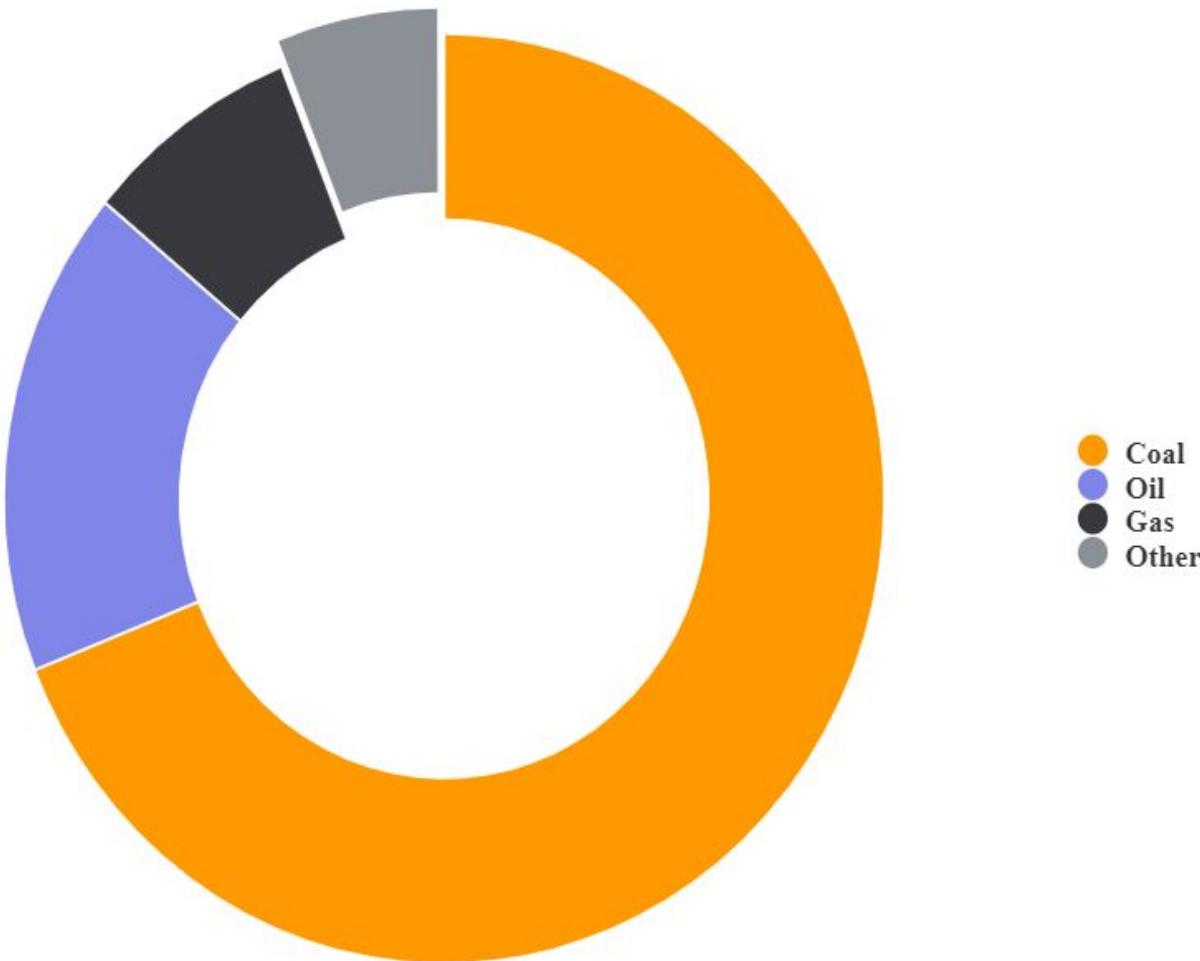
- Coal plays a vital role in **electricity generation** worldwide. Coal-fuelled power plants currently fuel 38% of global electricity and, in some countries, an even higher percentage.



Global **steel production** is dependent on coal. 70% of the steel produced uses coal. Metallurgical coal – or coking coal – is a vital ingredient in the steel making process. World crude steel production was 1.8 billion tonnes in 2018.



The **cement industry** requires energy to produce cement. Coal is an important source of the energy needed. Cement is critical to the construction industry – mixed with water and gravel it forms concrete, a key cons



Innovative technologies to prevent mining accidents

Methane monitoring and control technologies

For detecting methane gas level, the coal mining equipments are recommended to be fitted with methane monitors in order to enable the machines as well as the electricity to be automatically shut off once the methane level reaches 1.5%.

Dust monitoring and control technologies

Dust build-up in the underground mining area is another major cause of coal mine explosions. The coal dust explosibility meter (CDEM), a portable and handheld instrument for instant monitoring of the ratio between coal dust and rock dust levels in the underground mine

Automated underground mining



Automated underground mining is the most promising technology to prevent fatal mining accidents such as drilling, blasting, loading and hauling at deep undergrounds and can be performed using unmanned vehicles and machines operated from a remote location.

Rock -falls prevention technologies



Rock and roof falls is one of the most common cause of underground mining accidents. Automated Temporary Roof Support (ATRS), Mobile Roof Supports (MRS), and automated roof bolting system involving self-drilling injectable rock bolts are some of the new technologies providing protection against such injuries.

1.13. CRISIS IN POWER SECTOR

- Reliability of power systems is weakened by increased weather-related outages and damages ; Weak and ageing power systems are more vulnerable to natural disasters.
- Crisis and Disaster Management Plan (C&DMP) for power sector, 2004 cover activities to plan for, quick respond to and to recover from unexpected events, and situations for ensuring safety of people protection of installation and restoration of power supply by utilities



Organization for security and co-operation in Europe (OSCE), work on “Protecting Electricity Networks from Natural Hazards”

VIDEO LINK :

- Crisis in Power sector

https://drive.google.com/open?id=1G_AloI9GjcxSPs21PswY-nRm_yJO1m_D

THANK YOU