

SIXTH SEMESTER DIPLOMA EXAMINATION IN
ENGINEERING/TECHNOLOGY- MARCH, 2014

ENVIRONMENTAL SCIENCE AND DISASTER MANAGEMENT

(Maximum Mark:100)

(Time:3hr)

PART - A

I. Answer the following questions in one or two sentences .Each question carries two mark

1. List any two renewable sources of energy?

- Water for hydroelectric energy
- Sunlight for solar energy

2. What is mean by incineration?

Incineration means burning of solid waste in controlled conditions. This can avoid the formation of hazardous gases.

3 What do you understand by the term Tsunami?

The term Tsunami has been derived from a Japanese term Tsu meaning 'harbor' and nami meaning 'waves'.

A Tsunami is a large wave that is generated in a water body when the seafloor is deformed by seismic activity.

4. Name any two carnivores ?

- Lion
- Shark

5. Differentiate between primary and secondary consumers ?

i) Primary Consumers

These are Herbivores which feed directly on producers. Eg ; Ants, Beetles, Bugs, spiders etc. feeding on tree leaves.

(ii) Secondary Consumers

These are carnivores and feed on primary consumers. Eg: Birds, Lizards, Frogs, Snakes and Foxes.

PART B

II. Answer any five of the following. Each question carries 6 marks.

1. Discuss the effect of water pollution on environment?

Effect on Water Bodies

i. Dissolved Oxygen (DO)

- Most aquatic organisms respire with oxygen dissolved in water. The quantity of dissolved oxygen in a unit volume of aerated water is only .0084g which is about one thirtieth of that present in the same volume of air at 25⁰C. The quantity decreases further with the increase of temperature.

ii. Biological Oxygen Demand (BOD)

- Addition of biodegradable matter exerts demand on oxygen of the water body.
- The demand of oxygen is directly related to increasing loads of organic matter and is expressed as biological oxygen demand (BOD).

Effects on Aquatic Organisms

- Toxic water pollutants such as metals, pesticides, insecticides and chemicals affect aquatic species directly whereas the non-toxic organic load may eliminate some aquatic species indirectly by reducing the DO of water.
- The aquatic flora of lakes and ponds is also affected by slight variations in sustaining elements, thus affecting the whole ecological system.

Effects on Health

- Drinking water polluted with sewage is a source of viruses, bacteria, protozoa and worms.
- Water-borne infectious diseases like cholera, dysentery, typhoid, jaundice and worm infection are still the major public health problems in developing countries.

2. How the radio active pollution effect the environment?

Radioactivity is toxic because it forms ions when it reacts with biological molecules. These ions can form free radicals, which damage proteins, membranes, and nucleic acids. Radioactivity can damage DNA (deoxyribonucleic acid) by destroying individual bases (particularly thymine), by breaking single strands, by breaking double strands, by cross-linking different DNA strands, and by cross-linking DNA and proteins. Damage to DNA can lead to cancers, birth defects, and even death.

3. List the adverse effect of Cyclone?

Ans)

Adverse effect of cyclone

i) Physical damage –

Structures will be damaged or destroyed by the wind force, flooding and storm surge.

ii) Casualties and public health –

Caused by flooding and flying elements, contamination of water supplies may lead to viral outbreaks, diarrhea, and malaria.

iii) Water supplies –

Ground and pipe water supply may get contaminated by flood waters.

iv) Crops and food supplies –

High winds and rains ruin the standing crop and food stock lying in low lying areas. Plantation type crops such as banana and coconut are extremely vulnerable. Salt from the sea water may get deposited on the agricultural land and increase the salinity. The loss of the crop may lead to acute food shortage.

v) Communication –

Severe disruption in the communication links

4. Differentiate between hazard and disaster?

Hazard :

Hazard is defined as a perceived natural event which threatens both life and property.

There are two types of hazards:

1. Natural hazard.
2. Manmade hazard.

1. Natural hazard

Natural hazards are hazards which are caused because of natural phenomena (hazards with meteorological, geological or even biological origin).

Examples :- cyclones, tsunamis, earth- quake

2. Manmade hazards

Manmade hazards are associated with industries or energy generation facilities and include explosions, leakage of toxic waste, pollution, dam failure, wars or civil strife etc.

Disaster

The occurrence of a sudden or major misfortune which gives rise to casualties and / or damage or loss of property, infrastructure, essential services etc.

Disasters are often classified according to their:

a) Causes – Natural disaster and Manmade disaster

b) Speed of onset – Sudden and Slow

- **Natural Disasters**

These types of disaster naturally occur in proximity to, and pose a threat to, people, structures or economic assets.

Examples are Storm, Flood, Earthquake, Tsunamis

- **Manmade Disasters**

Accidents: Road, Rail, Air, Sea, Building collapse.

Industrial Mishaps: Gas leak, Explosion, Safety.

Fire: Building, Coal, Oil.

Forest Fire (In tropical counters, forest fires are often manmade)

- **Speed of onset**

1 Sudden onset: little or no warning, minimal time to prepare. For example, an earthquake, tsunami, cyclone, volcano, etc.

2 Slow onset: adverse event slow to develop; first the situation develops; the second level is an emergency; the third level is a disaster.

For example, drought, civil strife, etc.

5. What are the different causes for land degradation?

CAUSES FOR LAND DEGRADATION

- Geological Weak material: Weakness in the composition and structure of rock or soil may also cause landslides.
- Erosion: Erosion of slope toe due to cutting down of vegetation, construction of roads might increase the vulnerability of the terrain to slide down.
- Intense rainfall: Storms that produce intense rainfall for periods as short as several hours or have a more moderate intensity lasting several days have triggered abundant landslides. Heavy melting of snow in the hilly terrains also results in landslide.
- Human Excavation of slope and its toe, loading of slope/toe, mining, deforestation, irrigation, vibration/blast, Water leakage from services.
- Earthquake shaking has triggered landslides in many different topographic and geologic settings. Rock falls, soil slides and rockslides from steep slopes involving relatively thin or shallow dis-aggregated soils or rock, or both have been the most abundant types of landslides triggered by historical earthquakes.
- Volcanic eruption Deposition of loose volcanic ash on hillsides commonly is followed by accelerated erosion and frequent mud or debris flows triggered by intense rainfall.

6. Write short notes on food chain?

FOOD CHAIN

- A trophic level of an ecosystem can be defined as the number of links by which it is separated from the producer, or as the position of the organism in the food chain.
- The patterns of eating and being eaten forms a linear chain called food chain which can always be traced back to the producers.

Example

Grass ► Grasshopper ► Frog ► Snake ► Eagle

Kinds of food chain

1. Grazing food chain

- The grazing food chain begins with green plants at its base as producers.
- Therefore, plants act as the source of energy for the primary consumers. .

Eg:- Grass → Rabbit→ Fox

2. Detritus food chain

- The detritus food chains start from dead and decaying organic matter of animal and plant bodies known as detritus.
- Here, the detritus act as the source of energy for the primary consumers termed as **detritus consumers**.

7. What leads to ecological succession?

ECOLOGICAL SUCCESSION

- Over the course of years it is observed that in nature one biotic community gradually gives way to a second, the second perhaps to a third, and even the third to a fourth.
- This phenomenon of transition from one biotic community to another is called ecological or natural succession.
- It include primary and secondary succession.

Primary succession

- If the area has not been occupied previously, the process of initial invasion and then the progression from one biotic community, to the next is termed "Primary Succession".
- An example is the gradual invasion of a bare rock surface by what eventually becomes a climax forest ecosystem.

Secondary Succession

- When an area has been cleared by fire or by humans and then left alone, the surrounding ecosystem may gradually invade the area- not at once, but through a series of distinct stages termed secondary succession.
- The major difference between primary and secondary succession is that secondary succession starts with the preexisting soil substance.

PART-C

(Answer on full question from each one. One question carries 15 mark)

Unit –I

III. a) List the causes of formation of desert?

8

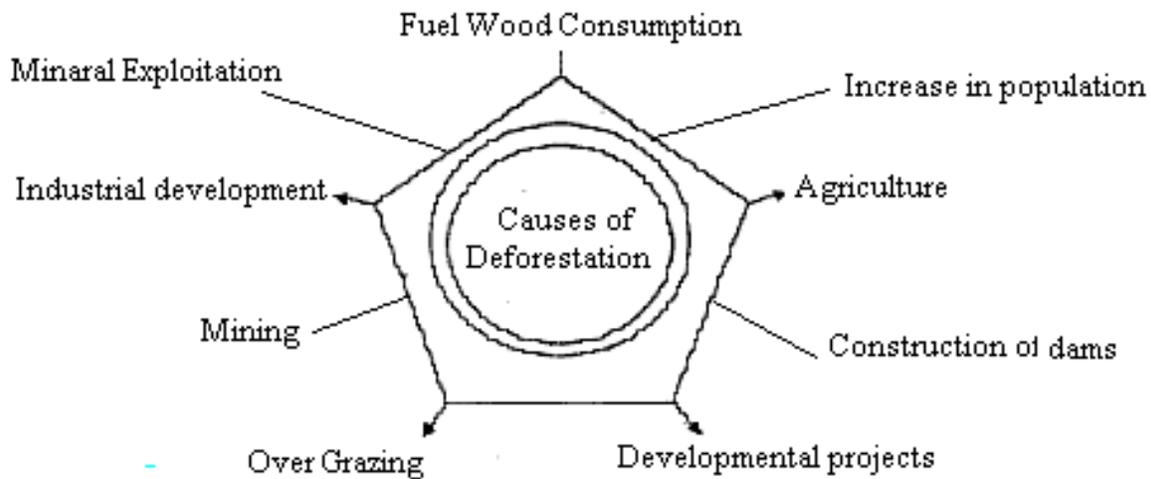
CAUSES OF FORMATION OF DESERT

- **Deforestation:-**The process of denuding and degrading a forest land initiates a desert. If there is no vegetation to hold back the rain water, soil cannot soak and groundwater level do not increases. This also increases, soil erosion, loss of fertility.
- **Overgrazing :-** The increase in cattle population heavily grazes the grass land or forests and as a result denudes the land area.
- The denuded land becomes dry, loose and more prone to soil erosion and leads to desert.
- **Water management:-** Over utilization of ground water, particularly in the coastal regions, is resulting in saline water intrusion into aquifers which is unfit for irrigation.
- **Mining and quarrying:-** These activities are also responsible for loss of vegetal cover and denudation of extensive land area leading to desertification.
- **Climate change:-** Formation of deserts may also take place due to climate change, ie., failure of monsoon, frequent droughts.
- **Pollution:-** Excessive use of fertilizers and pesticides and disposal of toxic water into the land also leads to desertification

b) What are the causes for deforestation?

7

CAUSES FOR DEFORESTATION



Wood consumption

The wood consumption for fuel and furniture will effect the forest economy. That may cause the ecosystem.

Construction of Dams

The construction of dams will need more forest area. Then more trees and living things are effected and which will create harmful effect on environment.

Mining

Mining is the process of removing deposits of ores from substantially very well below the ground level.

These mineral deposits invariably found in the forest region, and any operation of mining will naturally affect the forests.

Timber extraction

Timber extraction results in deforestation and in the fragmentation of the last remaining forests. It harms the valuable species of trees, birds and wild animals.

OR

IV. a) Briefly explain the negative effect due to use of pesticides on environment? 8

b) Explain an advantages and disadvantages of use of wind as an energy source?

7

Ans:-

a) **NEGATIVE EFFECTS OF CHEMICAL PESTICIDES**

- Chemical pesticides are linked to a number of illnesses including cancer, lymphoma, reproductive abnormalities, endocrine disorders and neurological problems. According to Science Daily, scientists in a study have discovered links between Parkinson's disease and the use of two common pesticides, maneb and paraquat. Health experts are particularly concerned about pesticide exposure in children because they proportionally consume more food during their growing years and are often in contact with floor surfaces where pesticide residues are found.
- Pesticides also kill insects indiscriminately, destroying insects that are beneficial to plants and an important food source for other creatures.
- **Biological Magnification:-** Pesticides are non-biodegradable and they keep on accumulating in the food chain. This is called as Biological magnification. The biomagnified form of pesticides in the human being is very harmful. Since human being occupy the higher trophic level in the food chain, use of pesticides causes destruction of wild life. Accumulation of these pesticides in fatty tissue of the organism causes mutation in the reproductive cells.
- **Threats to wild life:** Wild life gets destroyed due to the use of pesticides.
- **Development of genetic resistance :** Some individuals of the pest species usually survive even after the pesticide spray and give rise to development of genetic resistant pest species.
- **Production of new pest:-** About twenty new species of pest are known which became resistant to all types of pesticides and are called as "Superpest".
- **Death to nontarget species:-** Many insecticides have broad spectrum poisons which not only kill the target species but also the nontarget useful species.
- **Threats to human health:-** Due to excessive use of pesticides in contaminated food, human health is threatened.

b)

ADVANTAGES OF WIND POWER:

1. The wind is free and with modern technology it can be captured efficiently.
2. Once the wind turbine is built the energy it produces does not cause green house gases or other pollutants.
3. Although wind turbines can be very tall each takes up only a small plot of land. This means that the land below can still be used. This is especially the case in agricultural areas as farming can still continue.
4. Many people find wind farms an interesting feature of the landscape.
5. Remote areas that are not connected to the electricity power grid can use wind turbines to produce their own supply.
6. Wind turbines have a role to play in both the developed and third world.
7. Wind turbines are available in a range of sizes which means a vast range of people and businesses can use them. Single households to small towns and villages can make good use of range of wind turbines available today.

DISADVANTAGES OF WIND POWER:

1. The strength of the wind is not constant and it varies from zero to storm force. This means that wind turbines do not produce the same amount of electricity all the time. There will be times when they produce no electricity at all.
2. Many people feel that the countryside should be left untouched, without these large structures being built. The landscape

should left in its natural form for everyone to enjoy.

3. Wind turbines are noisy. Each one can generate the same level of noise as a family car travelling at 70 mph.
4. Many people see large wind turbines as unsightly structures and not pleasant or interesting to look at. They disfigure the countryside and are generally ugly.
5. When wind turbines are being manufactured some pollution is produced. Therefore wind power does produce some pollution.
6. Large wind farms are needed to provide entire communities with enough electricity. For example, the largest single turbine available today can only provide enough electricity for 475 homes, when running at full capacity. How many would be needed for a town of 100 000 people?

- it does not cause any air pollution
- It is very cheap

Unit - II

V. a) Briefly explain the biotic components of a forest ecosystem? (8)

b) Write a short not on ecological pyramid? (7)

Ans:-

a) Biotic components of a forest ecosystem

The biotic component consists of all living things of the environment which constitute producers, consumers and decomposers.

Example of Biotic Component

Plants – trees, shrubs, climbers and ground cover.

Animals – mammals, birds, reptiles amphibians, fish insects and microscopic animals.

i. Producers of Forest ecosystem

- All living organisms intake energy in order to survive.
- In a forest ecosystem, trees and other plants get their energy from sunlight.
- Plants produce their own food, in the form of carbohydrates.
- Plants are, therefore, called the primary producers, since they produce the basic food stuffs for other organisms within food chains and foodwebs.
- Photosynthesis is the chemical reaction that allows plants to produce their own food.

ii. Consumers of Forest ecosystem

- Animals cannot produce their own food.
- They must consume food sources for the energy they need to survive.
- All animas, including mammals, insects, and birds are called consumers.

In a forest there are three types of consumers as follows:

(a) Primary Consumers

These are Herbivores which feed directly on producers. Eg ; Ants, Beetles, Bugs, spiders etc. feeding on tree leaves.

Larger animals such as Elephants, Deer, giraffe etc. grazing on shoots and/or fruits of trees.

(b) Secondary Consumers

These are carnivores and feed on primary consumers. Eg: Birds, Lizards, Frogs, Snakes and Foxes.

(c) Tertiary Consumers

These are secondary carnivores and feed on secondary consumers.

These include top carnivores like Lion, Tiger.

iii) Decomposers

- Leaves, needles, and old branches fall to the forest floor as trees grow. Eventually all plants and animals die. These materials are decomposed by worms, microbes, fungi, ants, and other bugs. Decomposers break these items down into their smallest primary elements to be used again. Decomposers are important in they sustain the nutrient cycle of ecosystems.

These include wide variety of saprotrophic micro- organism like;

i) Bacteria ii) Fungi iii) Actinomycetes (Streptomyces).

b) ECOLOGICAL PYRAMIDS

- The trophic levels of an ecosystem can be expressed in a diagrammatic way in the form of ecological pyramids. The ecological pyramid basically consists of three parts; the base, body and the apex.
- The producers form the base; the body consists of successive trophic levels and the top carnivores form the apex. Ecological pyramids could be worked out and represented in three different ways, based on the number of organisms or the total living matter or the energy content of trophic levels. They can be named as,

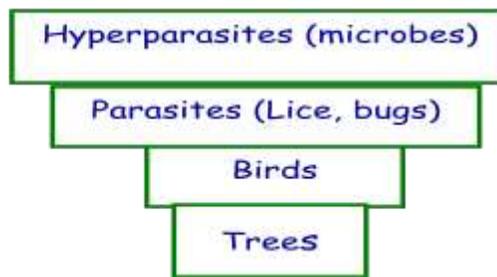
i. Pyramid of numbers

ii. Pyramid of biomass, and

iii. Pyramid of energy or productivity

Pyramid of number

The pyramid of numbers shows the relationship between producers, herbivores and carnivores at successive trophic levels in terms of their numbers.



Pyramid of biomass

- If the numbers of consumers at each trophic level are multiplied by their weight, then, what we obtain is the pyramid of biomass.
- It indicates by weight or other measurement

Pyramid of energy

- Of the ecological pyramids, the energy pyramid gives the best picture of the overall nature of an ecosystem. The pyramid of energy is based on the total energy content of each trophic level. The total energy content of each trophic level depends on the following factors.
- They are the amount of energy that
 - a) Individuals take in (or quantity of energy fixed)
 - b) Burn up during metabolism (or quantity of energy used)
 - c) Remains in their waste product (or quantity of energy passed) and
 - d) Individuals store in bodies (or quantity of energy stored)

OR

VI. a) Briefly explain the characteristics of a forest ecosystem?

8

a) Characteristics of a forest ecosystem

1. Forest has warm climate with adequate rain fall.
2. Forest has well defined seasons of about equal length.
3. Forest protects biodiversity.
4. Forest has tall and dense trees with many wild animals within ecosystem.
5. The soil of forest is rich in organic matter and nutrients.

6. Forest grows very slowly.
7. Forests provide various resources for human life.

b) List the different types of ecosystems and sub ecosystems with examples?

7

b) Types of ecosystem

1. Natural
 - i Terrestrial ecosystem
 - ii Aquatic ecosystem
 - a) bLentic, the ecosystem of a lake, pond or swamp.
 - b) Lotic, the ecosystem of a river, stream or spring.
2. Artificial

Unit - III

VII. a) Briefly explain the different measures to control the air pollution?

(8)

CONTROL MEASURES FOR AIR POLLUTION

- (i) Controlling the spread of coal dust by sprinkling water on it before handling in a thermal power plant.
- (ii) Preventive maintenance by repairing leaky valves in advance so as to prevent the leakages of the harmful gases in air.
- (iii) Applying zoning to distribute the impact of air pollution in a community.
- (iv) Selection of proper material. For example using low sulfur coal reduces the SO₂ problem.

b) Discuss the different method of disposal of solid waste?

(7)

DIFFERENT METHODS OF SOLID WASTE DISPOSAL

some of methods of solid waste disposal is explained below

Incineration

- Incineration means burning of solid waste in controlled conditions. .
- Generally the waste is collected in the streets or roads and the heap of this waste is left there itself for drying or collection of more waste on it.
- Then this waste is either transported to some distant site or burnt there itself.

Landfill

- The most common and easy way of disposal of solid waste is dumping it on land.

- The inorganic waste like construction and demolition waste can be easily used for filling of low lying areas or plinth filling of buildings or the earthwork of roads.

Composting

- The organic matter (consisting of carbon, hydrogen, nitrogen, oxygen, and sulfur) has a tendency of being converted into inorganic matter as the later is a stable form.
- The food, excreta and other organic waste gets decomposed (changed into inorganic form) and produce gases like biogas (mainly methane) and solids of decomposition like sulfates, nitrates, phosphates etc.

Vermi-composting

- In the case of households or colonies vermi-composting which involves the stabilization of organic solid waste through special earthworm by conversion of the organic matter to worm casting is also done.
- Vermi-composting involves the culture of earthworms (vermiculture)for the stabilization of different variety of organic solid waste

OR

VIII. (a) List the different pollutant that may cause the water pollution? (8)

Water Pollutants

Water pollution can occur on account of any one or more of the following agents:

i) Biological

Pathogens such as Virus, Bacteria, Protozoa and Worms.

ii) Chemical

a) Inorganic:-

Nitrates, Phosphates, Chloride and Fluoride,

b) Organic :-

Pesticides, dyes, Chloro-Compounds, Phenols, Points and Plastics.

c) Heavy metals:-

Soluble heavy metal ions such as Mercury, Lead, Cadmium, Copper, Zinc and their Organometallic compounds.

iii) Physical:-

Waste heat from industrial plants

(b) Briefly explain the adverse effects of noise pollution? (7)

Effects of noise pollution:

- Emotional or psychological effects - irritability, anxiety and stress. Lack of concentration and mental fatigue are significant health effects of noise.
- It has been observed that the performance of school children is poor in comprehension tasks when schools are situated in busy areas of a city and suffer from noise pollution - disturbance.
- Interferes with normal auditory communication, it may mask auditory warning signals and hence increases the rate of accidents especially in industries.
- The effects can range in severity from being extremely annoying to being extremely painful and hazardous. Lowers workers efficiency and productivity and higher accident rates on the job.
- There are about 25000 hair cells in our ear which create wave in our ear, responding to different levels of frequencies.
- With increasing levels of sound the cells get destroyed decreasing our ability to hear the high frequency sound.

Unit - IV

IX. (a) List the different causes of occurrence of flood? (8)

CAUSES OF FLOOD

- Heavy rainfall
- Heavy siltation of the river bed reduces the water carrying capacity of the rivers/stream.
- Blockage in the drains lead to flooding of the area.
- Landslides blocking the flow of the stream.
- Construction of dams and reservoirs
- In areas prone to cyclone, strong winds accompanied by heavy down pour along with storm surge leads to flooding.
- Increasing of cutting trees. It will destroy the water storage on earth.
- Increasing the construction of buildings by takeout paddy and canal

(b) Write a short note on hazard zonation map? (7)

HAZARD ZONATION MAP.

- Disaster mapping is a tool for assessing, storing and conveying information on the geographical location of a disaster occurrence and spread of the effects or probable effects of disasters..
- Every year in a country like India, natural disasters like floods and cyclones are fairly frequent.
- Earthquake also occur time and again.
- The occurrence of such disasters, their intensity, the area /region of their occurrences and their impacts has to be assessed, so as to have information /data about the damages caused by them to the area /population specific or probable damages or impact likely to be caused.

- Proper mapping will be helpful not only for pre-disaster preparedness but also in rescue and relief operations with greater accuracy and speed.
- With the data / information collection, storage, retrieval becoming highly technological and scientific, new specialized techniques like Geographical Information System (GIS) are increasingly used for disaster mapping and these are proving to be very useful.

OR

X. (a) Write a short notes on Minamata tragedy? (8)

Minamata tragedy :-

- In 1900, Minamata Bay was a sleepy fishing village, located on the west coast of the Japanese island of Kyushu about 560 miles southwest of Tokyo.
- The bay was nature's bounty.
- The ocean served up a rich variety of seafood, and its tidal shallows were a veritable sea garden filled with clams, oysters, and sea cucumbers.
- The rituals and rhythms of fishing—the building of small boats and weaving of nets,—created a community based on an intensely intimate relationship with the natural world.
- It was a low-tech venture: mostly wood and thread spun, shaped, and hewed into various fishing implements.
- Identity in the fishing community of Minamata emerged from labor in the natural world and from working with natural materials to harvest the waters. Life was hard and poverty endemic, to be sure, but the waters, at least, provided a livelihood and a way of life.
- However, a newer community soon came to Minamata, an industrial community funded and employed by the Chisso Corporation.
- From 1932 to 1968, Chisso Corporation, dumped an estimated 27 tons of mercury compounds into Minamata Bay.
- When Chisso Corporation dumped this massive amount of mercury into the bay, thousands of people whose normal diet included fish from the bay, unexpectedly developed symptoms of methyl mercury poisoning.
- The illness became known as the "Minamata Disease".
- The mercury poisoning resulted from years of environmental destruction and neglect from Chisso Corporation.

(b) Enumerates the causes for occurrence of land slid? (7)

Causes of Landslide

1. Geological Weak material: Weakness in the composition and structure of rock or soil may also cause landslides.
2. Erosion: Erosion of slope toe due to cutting down of vegetation, construction of roads might increase the vulnerability of the terrain to slide down.
3. Intense rainfall: Storms that produce intense rainfall for periods as short as several hours or have a more moderate intensity lasting several days have triggered abundant landslides. Heavy melting of snow in the hilly terrains also results in landslide.

4. Human Excavation of slope and its toe, loading of slope/toe, mining, deforestation, irrigation, vibration/blast, Water leakage from services.
5. Earthquake shaking has triggered landslides in many different topographic and geologic settings. Rock falls, soil slides and rockslides from steep slopes involving relatively thin or shallow dis-aggregated soils or rock, or both have been the most abundant types of landslides triggered by historical earthquakes.
6. Volcanic eruption Deposition of loose volcanic ash on hillsides commonly is followed by accelerated erosion and frequent mud or debris flows triggered by intense rainfall.

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