Environmental Pollution

Pictures

Air pollution is chocking the South Asian region
Picture from the Ganges
Industrial emission contributes heavily to air pollution
Plastic waste disposal/management is a growing issue all over the globe
A dead albatross in midway island

Outline

- Types of Pollution
- Air Pollution
- Water Pollution
- Noise Pollution
- Legal and regulatory frameworks for abating environmental pollution
- Land Pollution/land degradation
- Desertification
- Countering Desertification

- ‘Unwanted change in the environment caused by the introduction of harmful materials or production of harmful conditions (sound, cold etc.)’[1]
- As per a Cornell university study, 40% of mortality over the globe are caused by water, air and soil pollution

- Two types of sources of Pollution

1. Point source: identifiable sources (Eg: a factory)
2. Non-point source: Difficult to identify since pollutants are dispersed (Eg: Run-off from fields contaminated with pesticides)

Types of Pollution

- Air Pollution
- Water Pollution
- Noise Pollution
- Land/Soil Degradation

Pencil sketch depicting water pollution

Air Pollution

- Air pollution is most harmful since air is the fastest moving fluid medium in the environment.
- Air pollution kills More than 5.5 million people all over the globe each year, as per an American Association for the Advancement of Science (AAAS) report 2016
- 1.2 million deaths per year in India due to air pollution, as per Greenpeace,2017

Major Pollutants and their sources and impacts

Sulphur Dioxide

Important Sources: Automobiles, factories and cooking

Major Impacts: Cause health hazard like nausea and head ache on exposure, Effect plant growth pattern by damaging foliage, kills lichens and bryophytes; responsible for acid rain

Oxides of Nitrogen

Important Sources: Automobiles, Factories

Major Impacts: Create ‘Smog’; aggravate respiratory illness; kills plants and aquatic life; damage monuments and structures, since it is responsible for acid rain.

Sources

Ozone (in the troposphere)

Important Sources: Factories, Automobile

Major Impacts: foliage damage and damage of flora; create smog, various health hazards, destroy rubber fabrics and paints

Carbon Monoxide

Important Sources: Automobiles, cigarettes

Major Impacts: extreme health hazards

Sources

Fluoride compounds

Important sources: Industries (glass, brick etc), refrigerants

Major Impacts: contaminate with fresh water, kill plants, effect cattle

- Chlorofluorocarbon is the major cause agent for ozone depletion

Sources

Suspended Particulate Matter (SPM)

Tiny (0.1-25 ηm) solid/liquid matter

Sources: Factories, Automobile, agriculture burning, burning of plastic, mining

Impacts: health hazards (Byproduct of burning plastic, led cadmium and dioxins may cause cancer); acid rain; smog; killing plants by interfering transpiration and photosynthesis by the accumulation on leaf surface; affect drinking water sources

Water Pollution

- Refers to degradation of water quality
- Water is polluted more easily than air
- Pollutants from land and air normally ends up polluting water bodies
- Pollutants when seep to ground water result in ground water contamination
- Agricultural, industrial, and domestic sectors consume more than one-third of Earth's accessible renewable freshwater

Impacts

- "Today, 1.8 billion people consume contaminated (with faeces) water, putting them at risk of contracting waterborne infections; waterborne infections account for 80% of all infectious diseases

- Eutrophication leads to huge economic loss; in England and Wales $105-160 million and in US $2.2 billion every year*

- The Indian cities Uncontrolled urbanization in Indian cities

Sources of Water Pollution

- Urban runoff (oil, chemicals, organic matter)
- Agriculture runoff (oil, metals, chemicals)
- Industrial runoff (chemicals, radioactive materials, organic matters, sediments (mines))
- Leaks from storage tanks/pipelines (gasoline, oil etc.)
- Accidental spill of chemicals (oil, chemicals etc.)
- Salt water intrusion (low lying areas)
- Seepage from septic system

Biological Oxygen Demand

- The amount of oxygen required for biochemical decomposition of organic materials in the water is Biological/biochemical Oxygen Demand (BOD)
- An indicator of water quality
- when BOD increases Dissolved Oxygen (DO) decreases.

Noise Pollution

- Can be a component of Air pollution
- Noise is sound that causes discomfort

- Safe limit → 45 Db
- Noise→ above 75Db
- Above 150 Db→ cause instantaneous deafness

- However, safe intensity of sound in human even detrimental to many animals and birds

*Sound is measured using decibel (Db)

Sources

- Automobiles
- Factories
- Workshops
- Loud speakers
- Crackers

Legal and regulatory frameworks for controlling Environmental Pollution

Publication of **Silent Spring** by Rachel Carson in 1962 brought substantial transformation in environmental consciousness over the globe, thereafter a handful of **agencies** worldwide formed legal frameworks for protecting environment from pollutions, Eg:

- United States Environmental Protection Agency (EPA-1970)
- United Nations Environment Programme (UNEP-1972)
- Ministry of Environment, Forest and Climate Change (MoEFCC-1985 India)

Legal and regulatory frameworks for controlling Environmental Pollution

- Central Pollution Control Board (CPCB) of India
- Established in 1974 under MoEFCC; there are 7 zonal office and state PCBs
- Acts entrusted under the CPCB power:
  - The Water (Prevention and Control of Pollution) Act, 1974
  - The Air (Prevention and Control of Pollution) Act, 1981
  - The Noise Pollution (Regulation And Control) Rules, 2000

Land Pollution/land degradation

- The process by which the value of the biophysical environment is affected by one or more combination of human-induced processes acting upon the land.

- It is estimated that up to 40% of the world's agricultural land is seriously degraded.

Causes of Land Degradation

- Land clearance, such as clear-cutting and deforestation
- Agricultural depletion of soil nutrients through poor farming practices
- Livestock including overgrazing
- Irrigation and overdrafting
- Urban sprawl and commercial development
- Land pollution including industrial waste
- Vehicle off-roading
- Quarrying of stone, sand, ore and minerals

Effects of Land Degradation

The overall outcome of land degradation is a substantial reduction in the productivity of the land. The processes involved in degradation are:

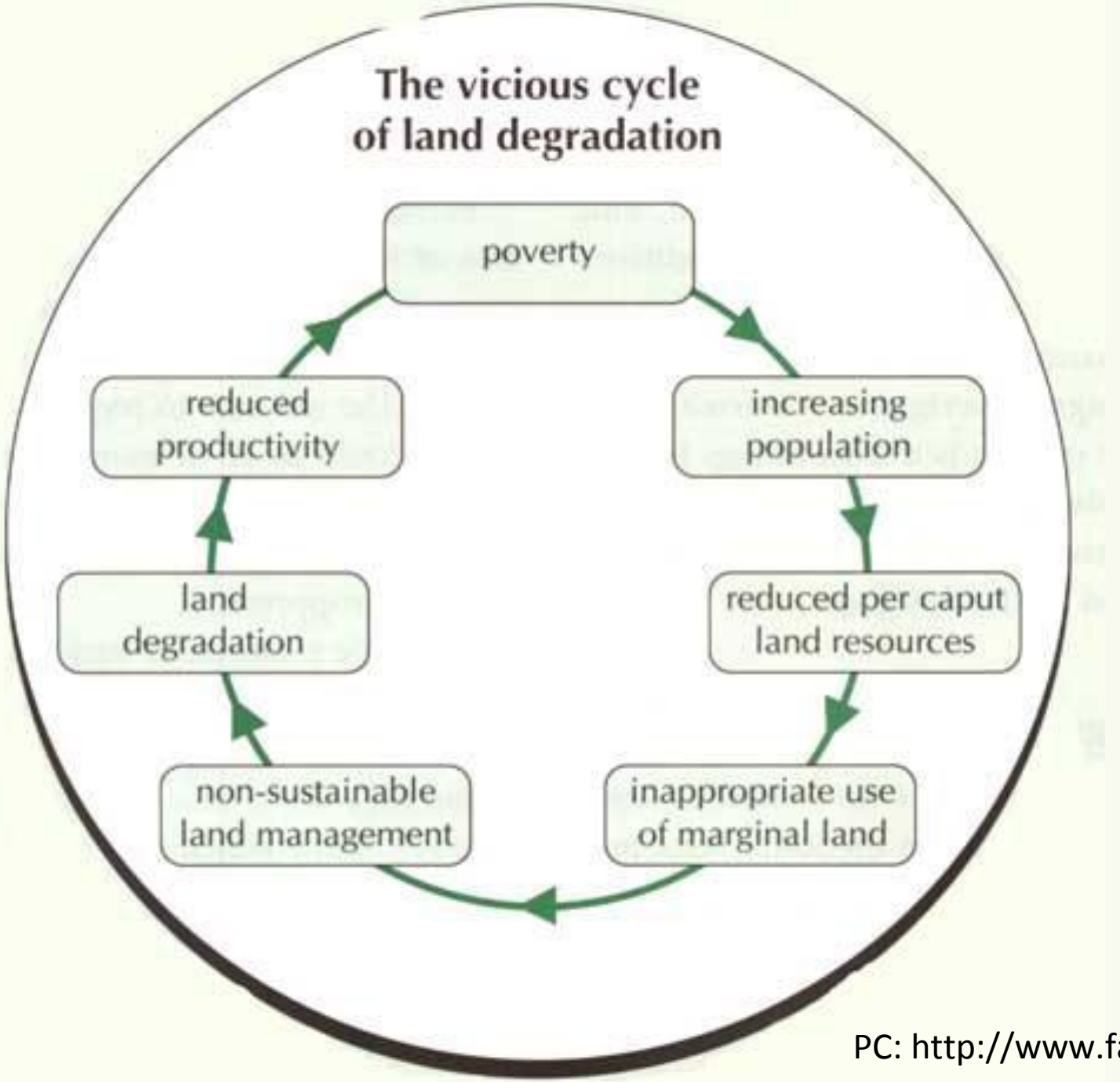
- Accelerated soil erosion by wind and water
- Soil acidification or alkalinisation & Salination
- Destruction of soil structure including loss of organic matter

Land Degradation—Prime Examples

- Overcutting of vegetation for timber and fuelwood. E.g. Iran.
- Overgrazing—decrease in the vegetation—wind and water erosion. E.g. Afghanistan.
- Agricultural activities (shifting cultivation, absence of soil conservation measures, fertilizer use, faulty planning or management of irrigation) E.g. Bangladesh.
- High population density (land shortage)—excessive pressure on land for above uses. E.g Pakistan.

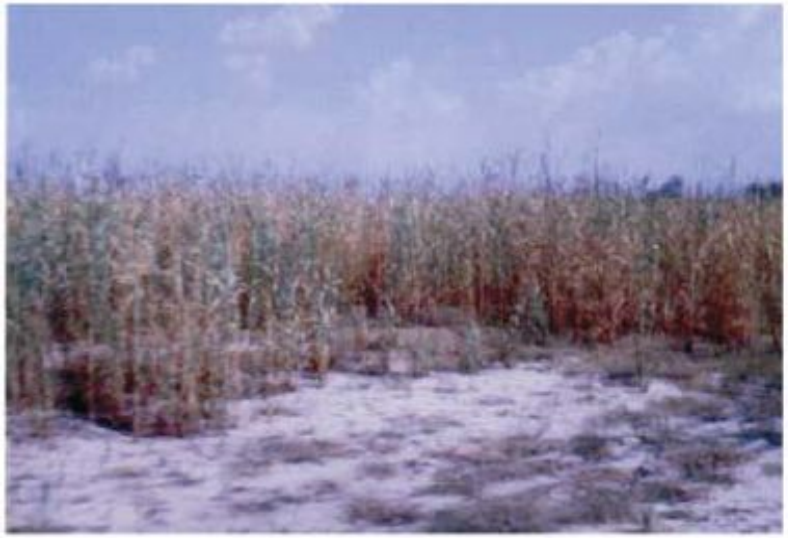
Food Resources

- Starvation and malnutrition are rampant in Africa, Asia, Latin America
- Regions of dense population and poor economies most affected
- Surplus food in developed world; used for livestock. In the US Midwest, farmers are paid to leave land fallow!
- Land use for cash crop production
- Presently, proper land management and equitable distribution may be required
- Unless we take drastic steps to reduce possible, more starvation is inevitable in the future.



PC: http://www.fao.org/

Land Degradation—India



Salinity

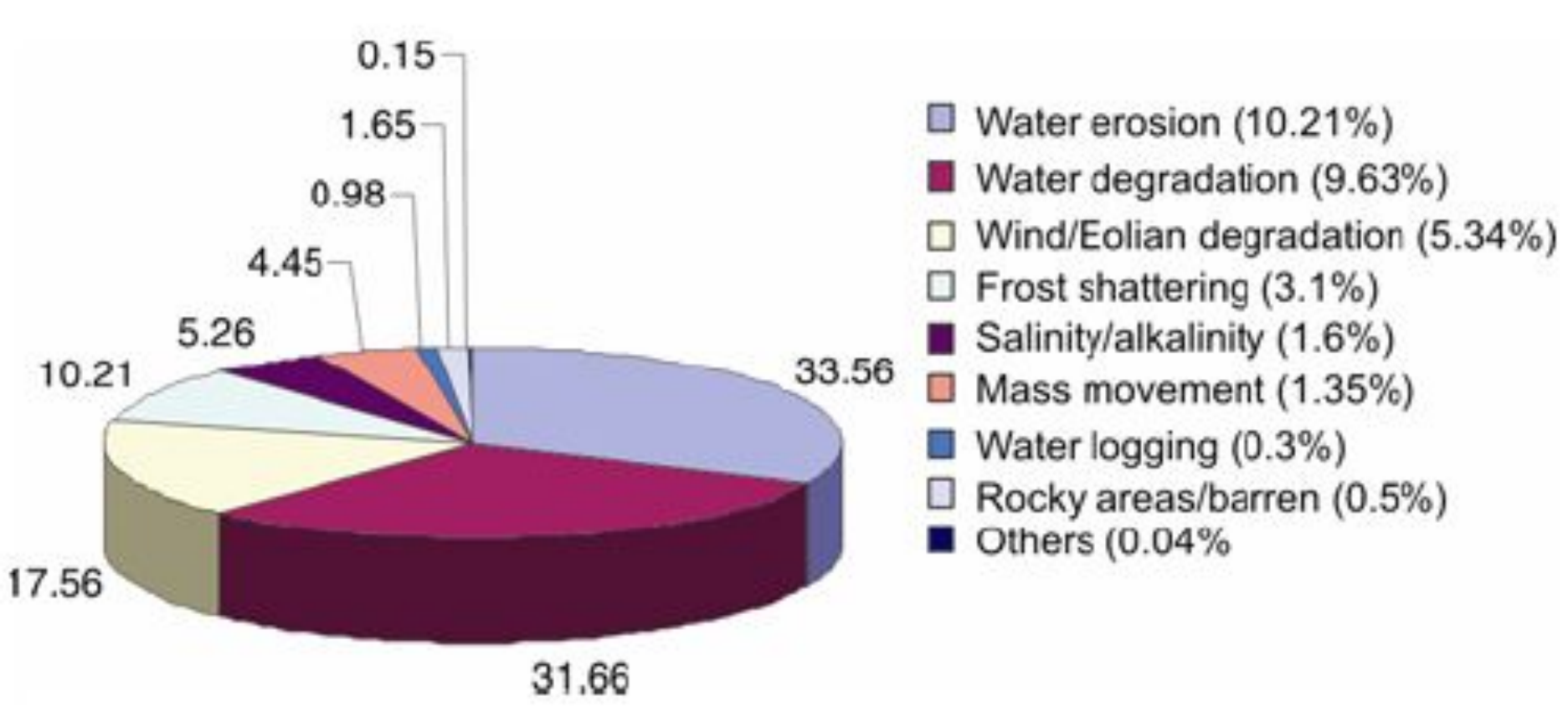
Wind erosion

Water erosion

Vegetal degradation

Land Degradation—India

By Process



Remedial Measures

- Reduce population and urban sprawl
- Reduce industrialization or mining of environmentally sensitive areas.
- Develop and strictly enforce pollution control standards
- Active steps to combat global warming
- Implement watershed development strategies as alternatives to mega dams
- Waste: Reduce, Reuse, Recycle

Desertification

Desertification is the degradation of land in arid, semi-arid, and dry sub-humid areas resulting from various climatic variations, but primarily resulting from human activities.

Effect of desertification

- Loss of Biodiversity
- Loss of productive capacity
- Loss of water availability
- **Famines, droughts, more degradation, reduced rainfall**

Causes of Desertification

- **Deforestation**
- **Burning**
- **Overgrazing:** animal hooves destroying new growth, uprooting grass while eating, eating of other plant species
- **Over agriculture:** loss of fertility erosion, nutrient leaching.
- **Salinization:** due to excess watering with salt containing water
- **Global climate change**

Global Effects

- US Embassy Reports—satellite images
  - 2 deserts in N. Central Asia merging
  - 24,000 villages overrun by sand
  - In 2000, 2,240 sq. km/yr. lost to deserts
- **Afganistan**, 100 villages buried under sand. 15 m high sand dunes block roads.
- **Iran** 124 villages buried
- **Nigeria** 2000 sq. km/yr lost to deserts
- **Mexico** 700,000 men forced off the land due to land degradation
- **India** 328 million hectares of land affected.

Countering Desertification

- Windbreaks
  - Sand fences, stone fences, tall trees/shrubs
  - Prevent evapotranspiration, sand deposition and soil erosion
- Improve Soil fertility: hardy leguminous plants
- Water harvesting and storage; Watershed management
  - Percolation tanks, contour bunding and planting,
  - stone stacks at plant base to collect dew
  - Storage tanks; Check dams and canals
- Cooking Fuel: firewood plantation, solar cooking
- Sustainable farming and livestock rearing:
  - crop rotation, crop choice, fallow periods, limit livestock, prevent overgrazing

United Nations Convention to Combat Desertification (UNCCD)

Established in 1994; a legally binding international agreement linking environment and development

"…to forge a global partnership to reverse and prevent desertification/land degradation and to mitigate the effects of drought in affected areas in order to support poverty reduction and environmental sustainability"

Focus specifically the drylands in arid, semi-arid and dry sub-humid areas over the globe