Environment Class 16

28th March, 2024 at 9:00 AM

1. **BIOREMEDIATION (09:12 AM)**

- It is an environmentally friendly cost-effective method to treat and clean up environmental pollutants such as pollutants in ground and surface waters, and landfills, by utilizing, **micro-organisms to degrade, remove or neutralize pollutants.**
- **In-Situ Remediation:**
- It involves the treatment of contaminated material at the site.
- E.g., bio-venting, which involves pumping air into the soil to stimulate microbial activity.
- **Ex-Situ Remediation:**
- It involves the removal of contaminated material to be treated elsewhere.
- E.g. Biopiles, where excavated soil is mixed with nutrients, moisture, and controlled aeration, for the degradation of pollutants.

2. **Phyto-Remediation:**

- This includes plants to absorb, accumulate and detoxify pollutants.
- E.g. **Poplar trees:** Treat contaminated groundwater
- **Sunflower:** Extract toxic metals from the soil in the aftermath of Chernobyl.
- There are certain **challenges in Bio-Remediation:**
- The effectiveness depends upon environmental conditions such as temperature, pH, presence of oxygen. etc.
- Bio-remediation techniques are slower and may not be suitable for all types of situations.
- The complete breakdown of pollutants, particularly heavy metal pollutants often does not occur.

PLASTIC POLLUTION (09:30 AM)

- Plastic pollution is one of the biggest environmental issues we are facing.
- Most plastic does not bio-degrade, it harms marine life and accumulates in gyres.
- The breakdown of plastic waste leads to microplastics, and microbeads, which are ingested by marine organisms entering the food chain and potentially impacting human health.
- Many plastics also leech toxic chemicals such as Bisphenol-A into food and beverages.
- **To tackle plastic pollution, we need to:**
- reduce its uses which should include minimizing or eliminating Single-use plastic.
- recycling and upcycling
- biodegradable, compostable plastic (some companies are working on it by making plastic from corn starch and from byproduct of petroleum waste.)

and

Converting into new products such as textile, construction material etc.

India is the biggest polluter of plastic and we have contribution of 20% in world's all plastic waste.
9.3 million tonnes of plastic waste we generate every year.

EXTENDED PRODUCER RESPONSIBILITY (09:56 AM)

- It is based on the **'Polluters Pay' principle.**
- All the stakeholders have a responsibility to tackle particular waste-related issues. However, producers have the highest responsibility.
- This concept was introduced in **Electronic Waste Management Rules, 2011** as of now it is integrated into Electronic Waste Management Rules 2016, Plastic Waste Management Rules 2016 and Battery Waste Management 2022.
- Under Plastic waste management rules, ~~they also~~ introduced the concept of the **Plastic Credit Model,** a market-based mechanism to implement EPRs.
  - For Ex: Producers have to manage equivalent amount of plastic in an environment friendly way, this includes recovery, reuse, recycle and upcycle. In amendment rules 2022 govt.
- As per the amendment in 2022, single-use plastic has been banned and the minimum thickness of plastic bags has been increased from 75 microns to ~~12~~ 120 microns.

GLOBAL CONVENTIONS (10:17 AM) (All five conventions are legally binding and India is member of them.)

1. **Basel Convention, 1992**
   - This aims to tackle the **Transboundary Movement of Hazardous Waste.**
   - Such movement can't occur without the Prior Informed Consent of the country where the waste is being moved. (since many companies in developing nations are accepting waste from companies in developed nations)
   - It does not include waste from the shipping industry and radioactive waste.
2. **Stockholm Convention on Persistent Organic Pollutants (POPs) 2004**
   - It aims to eliminate or reduce persistent organic pollutants which are **dangerous chemicals with high lifetime, biomagnification and carcinogen.**
   - Originally: Started with the 12 most dangerous POPs called **Dirty Dozens.**
   - As of now, many more chemicals can be added
   - Many of these PoPs are pesticides or industrial chemicals.
3. **Rotterdam Convention** 2004
   - it is a multilateral treaty to promote shared responsibility for the regulation of international trade of **hazardous chemicals.**
   - it promotes the open exchange of information which includes direction on safe handling, possible dangerous impacts and any known restrictions or bans thus it works on PIC.
4. **Minamata Convention 2013**
   - It is a global treaty to protect human health and the environment from the adverse **impact of mercury.**
   - It aims to phase down and ~~phase out~~ the use of mercury in several products.
   - mercury can cause, Minamata disease, there is no safe ~~pollutant~~ exposure limit for mercury
5. ***MARPOL Convention, 1973*** (It is the part of International Maritime Organization)
   - *The MARPOL Convention, 1973, aims to **prevent marine pollution** by regulating the discharge of harmful substances from ships into the ocean.*
   - *It sets standards for oil, chemicals, sewage, garbage, and emissions, promoting environmental protection in maritime activities.*

-> Basel Convention does not include waste from Shipping Industry and Radioactive Waste.

DISCUSSION ON PYQs (10:52 AM)

ALTERNATIVE ENERGY SOURCES (11:25 AM)

- It includes all non-fossil fuel sources.
- **Non-Conventional Energy Sources:**
- Renewable: Ocean Thermal, Solar, Wind, etc.
- Non Renewable: Nuclear Energy

SOLAR ENERGY (11:43 AM)

- There are two ways to utilize solar energy :
- **i. Solar Thermal Technology**
- This includes
- **a. Solar Water Heating:** Capturing solar energy to heat water directly for residential, commercial or industrial use. (i.e. for cooking food for example in pressure cooker using only solar energy)
- **b. Concentrated Solar Power:** This uses a **Concave Mirror/Parabolic Mirror** or convex lens to concentrate sunlight onto a small area typically a heat-absorbing fluid.
- Thus fluid is used to produce steam which drives a turbine connected to a generator to produce electricity.
- This is used for large-scale power generation.
- **ii. Solar photovoltaic** (Solar panels)
- Photovoltaic cells are dependent on sunlight and convert sunlight directly to electricity using semiconducting material such as silicon.
- They generate direct current which can be converted into AC.
- **Challenges Associated with Solar:**
- a. Intermittency: Solar Energy is dependent on sunlight, making it an intermittent energy source, it cannot be relied upon during bad weather conditions or the night.
- Such intermittent supply also makes the power grid unstable. (because power grid can default in case of high energy)
- c. Land and water use. (for Concentrated Solar Power plants.)
- d. High capital cost.
- e. For photo voltaic cells increasing efficiency remains a challenge.
- for PV recycling of panels is important otherwise it will cause another set of waste problems.

Topic for the next class: Non Conventional Energy Sources (Continued)

b. Energy Storage:
-> To make it reliable we need to invest in energy storage solutions which make solar energy expensive.