

Technologies to combat climate change

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Source: *The Hindu*

Manifest pedagogy: Climate change is real and if not tackled, it's doomsday for human kind. Climate change can be effectively tackled through new technologies and sustainable living. Technology to climate change could be asked at both prelims and mains stage.

In news: Climate changes are having an adverse effect on the planet

Placing it in syllabus: Environment conservation and sustainable development

Dimensions:

- General description
- UN instruments to combat climate change
- Suitable technologies

Content:

General description:

Climate change, impacts on biodiversity and depletion of natural resources are mankind's major challenges today. The **last five years have been the warmest five-year period on record.** The Arctic warmed much faster than predicted and Greenland's ice sheet is melting seven times faster than in the 1990s. UN estimates that in the last 10 years, **climate-related disasters have caused \$1.4 trillion worth of damage worldwide.**

In just over 40 years, the world has witnessed 60% decline in

wildlife across land, sea and freshwater and is heading towards a shocking **decline of two-thirds by 2020** if current trends continue. Forests are under pressure with unabated **deforestation** and at sea 90% of the world's fish stocks are overfished.

As populations, economies and standards of living grow, so does the cumulative level of **greenhouse gas (GHGs) emissions**. The concentration of GHGs in the earth's atmosphere is **directly linked to the average global temperature on Earth**. The most abundant GHG, carbon dioxide (CO₂), is largely the product of burning fossil fuels.

On **1st August, 2019**, the world hit **Earth Overshoot Day**, the point in our calendars when we tip into consuming more natural resources than the planet can regenerate in a year.

As global biodiversity continues to decline steeply, the **health and functioning of crucial ecosystems will be affected**. Coupled with climate change impacts the increasing frequency and **intensity of extreme weather events** worldwide is going to be disastrous for the ecological balance of the planet and for our survival.

Solutions such as **reforestation, ecosystem protection and rewilding** represent 30% of the opportunity to address climate change yet receive just 3% of the available funding.

Hence sustainable development needs **cleaner and resource efficient environmental technologies** which can decrease material inputs, reduce energy consumption and emissions, recover valuable by-products, minimize waste disposal problems or some combination of these.

These technological solutions may help us meet the goals of the **2015 Paris climate agreement or achieve the Sustainable Development Goals (SDGs) by 2030**.

Recently a new report called **'The Future of Sustainability'**,

highlighted how **innovations such as** carbon capture, energy storage, 3D printing, artificial intelligence (AI) and data analytics could fast track the global transition to a low carbon, sustainable world.

United Nations legal instruments to combat climate change:



United Nations Framework Convention on Climate Change (UNFCCC): In **1992, UN “Earth Summit”** produced the UNFCCC as a first step in addressing the climate change problem. Today 197 countries are parties to the Convention. The ultimate aim of the Convention is to prevent “dangerous” human interference with the climate system.

Note: The 2019 United Nations Climate Change Conference, also known as **COP25**, was **held in Madrid, Spain, from 2 to 13 December 2019** under the **presidency of the Chilean government**. The conference incorporated the 25th COP to the UNFCCC, the 15th meeting of the parties to the Kyoto Protocol (CMP15) and the second meeting of the parties for the Paris Agreement (CMA2).

Kyoto Protocol: The Kyoto Protocol, adopted in 1997, **legally binds developed country Parties to emission reduction targets**. The Protocol’s first commitment period started in 2008 and ended in 2012. The second commitment period began on 1 January 2013 and will end in 2020. There are 192 Parties to the Kyoto Protocol.

Paris Agreement: At the **21st Conference of the Parties (CoP) in Paris in 2015**, Parties to the UNFCCC reached a landmark agreement to combat climate change and to **accelerate and intensify the actions and investments needed for a sustainable low carbon future**.

Its **central aim is to strengthen the global response to the threat of climate change** by keeping the **global temperature**

rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to **limit the temperature increase even further to 1.5 degrees Celsius.**

On **Earth Day, 22 April 2016**, 175 world leaders signed the Paris Agreement at UN Headquarters in New York. This was by far the largest number of countries ever to sign an international agreement on a single day. There are now **186 countries that have ratified the Paris Agreement.**

Suitable technologies to combat climate change:

Blockchain technology: Blockchain systems enable electricity sharing such as Germany's OLI has developed. Renewable energy-powered blockchain computing facilities have been developed from Soluna.

World wide fund for nature (WWF) in Australia, Fiji and New Zealand have joined forces to stamp out illegal fishing and slave labour in the tuna fishing industry using blockchain technology. It helps consumers track the entire journey of their tuna and potentially other agricultural commodities and fish – revolutionizing systems of certification and traceability.

Developing renewable energy technology: Due to the non-renewability of fossil fuels researchers are coming up with new ways to generate energy with technology which involves **three main aspects:** storing, energy grids, and electricity generation. Energy storage includes developing low-cost storage solutions for energy in the form of modern batteries, thermal energy collectors and improved fuel cells.

Smart grids assist in moving the generated electricity around to ensure that everyone on the network can access it. E.g. Peer-to-peer solar energy sharing platforms that extend clean energy to remote areas like that of Bangladesh-based SOL-Share.

Carbon sequestration: Carbon sequestration is a way to reduce GHG emissions which are the major contributors of climate change. There are **two primary types** of carbon sequestration.



One is **carbon dioxide capture and storage (CCS)**, where carbon dioxide is **captured at its source** (e.g., power plants, industrial processes), then **transported by pipeline** or by ship for safe **storage subsequently in non-atmospheric reservoirs** (e.g., depleted oil and gas reservoirs, unmineable coal seams, deep saline formations, deep ocean).

Next is **terrestrial carbon sequestration** which means **using plants to capture CO2 from the atmosphere** and then storing it as carbon in the stems and roots of the plants as well as in the soil. Terrestrial sequestration **is a set of land management practices that maximizes the amount of carbon that remains stored in the soil and plant** material for the long term.

Benefits of terrestrial storage includes improved soil and water quality, reduced erosion, reduced evaporative water loss, reduced pest problems and overall ecosystem improvement.

No-till farming, wetland management, conservation tillage, reforestation, using buffer strips along waterways, eliminating summer fallow are **examples of terrestrial sequestration practices** that are already in use.

3D printing: In industries that run the gamut from medical to manufacturing, 3D printing will continue to play an increasingly important role. E.g. 3D printable solid-state battery powered by vegetable oil that has potential applications in energy storage has been introduced from Berekotry Ltd, Nigeria.

Drones acting as eyes on the forest: WRI (World Research Institute) has developed Global Forest Watch (GFW), an online

forest monitoring and alert system that uses crowdsourcing, to allow anyone to create custom maps, analyse forest trends, subscribe to alerts, or download data for their local area or the entire world. It is helping in monitoring forest health and detect illegal logging.

Adopting a smarter lifestyle: Smart homes that work on advanced sensors and which advocate green living and less waste are gaining popularity nowadays. Usually powered by a renewable energy source, they also employ natural waste management systems with in-built recycling methods, thus, generating less waste.

Smart cars are developed on the same lines that contribute to reducing the conventional automobile pollution and saves energy. E.g. Electric cars.