

# 50 IMPORTANT TOPICS

## REVISION SERIES FOR PRELIMS 2022



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# REVISION SERIES

## PART 2

# CLIMATE CHANGE

# Direct and Indirect Emissions

- **Direct GHG emissions** are emissions from sources that are owned or controlled by the **reporting entity**.
- **Indirect GHG emissions** are emissions that are a consequence of the activities of the reporting entity, but occur at **sources owned or controlled by another entity**.

# Three Scopes

- GHG Protocol further categorizes these **direct and indirect emissions into three broad scopes**:
  - Scope 1: All **direct** GHG emissions.
  - Scope 2: **Indirect** GHG emissions from consumption of purchased electricity, heat or steam.
  - Scope 3: **Other indirect emissions**, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in Scope 2, outsourced activities, waste disposal, etc



# Carbon Neutrality

- Carbon neutrality is a state of **net-zero carbon dioxide emissions**.
- This can be achieved by **balancing emissions** of carbon dioxide with its removal (Carbon Offsetting) or by **eliminating emissions** from society (post carbon economy)
- China - 2060
- India - 2070
- USA - 2050
- UK - 2050
- In order to **limit global warming to 1.5 degrees Celsius**, a threshold the Intergovernmental Panel for Climate Change (IPCC) suggests is safe, **carbon neutrality by mid-21st century is essential**.
- This target is also **laid down in the Paris agreement**.

# Carbon Neutral Fuel/Synthetic Fuel

- **Carbon-neutral fuel** is fuel which produces **no net-greenhouse gas emissions or carbon footprint**.
- They **capture CO<sub>2</sub>** in the **manufacturing process**.
- In this way, this greenhouse gas becomes a raw material, from which gasoline, diesel, and substitute natural gas can be produced with the help of **electricity from renewable sources**.
- Synthetic fuels are made solely with the help of **renewable energy**.
- In a first stage, **hydrogen** is produced from water.
- **Carbon is added** to this to produce a liquid fuel.
- This carbon can be recycled from industrial processes or even captured from the air using filters.
- Combining CO<sub>2</sub> and H<sub>2</sub> then results in the **synthetic fuel, which can be gasoline, diesel, gas, or even kerosene**.

# Carbon Footprint

- A carbon footprint is the **total greenhouse gas (GHG) emissions** caused by an **individual, event, organization, service, place or product**, expressed as carbon dioxide equivalent (CO<sub>2</sub>e).
- India's current CO<sub>2</sub> emissions (2021) are **2.88 Gt**.
- According to the Centre for Science and Environment (CSE)'s projections based on the median annual rate of change in the past decade 2010-2019, India's generation in a **business-as-usual scenario will be 4.48 Gt in 2030**.
- Emissions from **India rank third** in the global list, accounting for **2.46 Gt of carbon or 6.8% of the total global emissions**.
- India's **per capita carbon emissions** are, however, **still low** at 1.84 tonnes compared to the United States' 16.21 tonnes.

# Carbon Offset

- A carbon offset is a **reduction or removal of emissions of carbon dioxide** or other greenhouse gases made in order to compensate for emissions made elsewhere.
- Offsets are measured in tonnes of carbon dioxide-equivalent (CO<sub>2</sub>e).
- One ton of carbon offset represents the **reduction or removal of one ton of carbon dioxide** or its equivalent in other greenhouse gases.

# Net Zero Emissions

- The concept of **net zero emissions** is very similar to **carbon neutral**, but the scale is different.
- Net zero emissions strategies include **every type of greenhouse gases (GHGs)**.
- Carbon dioxide is one of the most significant ones because it **remains longer** in the atmosphere than others and represents a **major part** in emissions from human activities (especially fossil fuel burning).
- But net zero emissions are reached **when human activity is no longer contributing to global warming**: anthropogenic emissions of GHGs in the atmosphere are balanced by anthropogenic removals over a specific period.

# Carbon Negative/Climate Positive

- Carbon negative means, in effect, that you **emit less than zero carbon dioxide and carbon dioxide equivalent (CO<sub>2</sub>e) greenhouse gasses.**
- However, since it is impossible to emit a negative amount of carbon (or any other physical substance), being carbon negative refers to the net emissions you create.
- To be carbon negative means **to offset more carbon, through carbon capture, sequestration, or avoidance,** than you contribute to the environment.

# Carbon Positive

- A 'carbon positive' building takes this a step further, **producing more energy** than it needs and **feeding that energy back into the grid**.
- Carbon positive moves **beyond carbon zero** by making **additional 'positive' or 'net export' contributions** by producing more energy on site than the building requires and feeding it back to the grid.
- Carbon positive projects can make **significant contributions** by helping to address the carbon intensity and damaging impacts of past building practices and lifestyles, and by offsetting situations where carbon zero buildings are not possible.

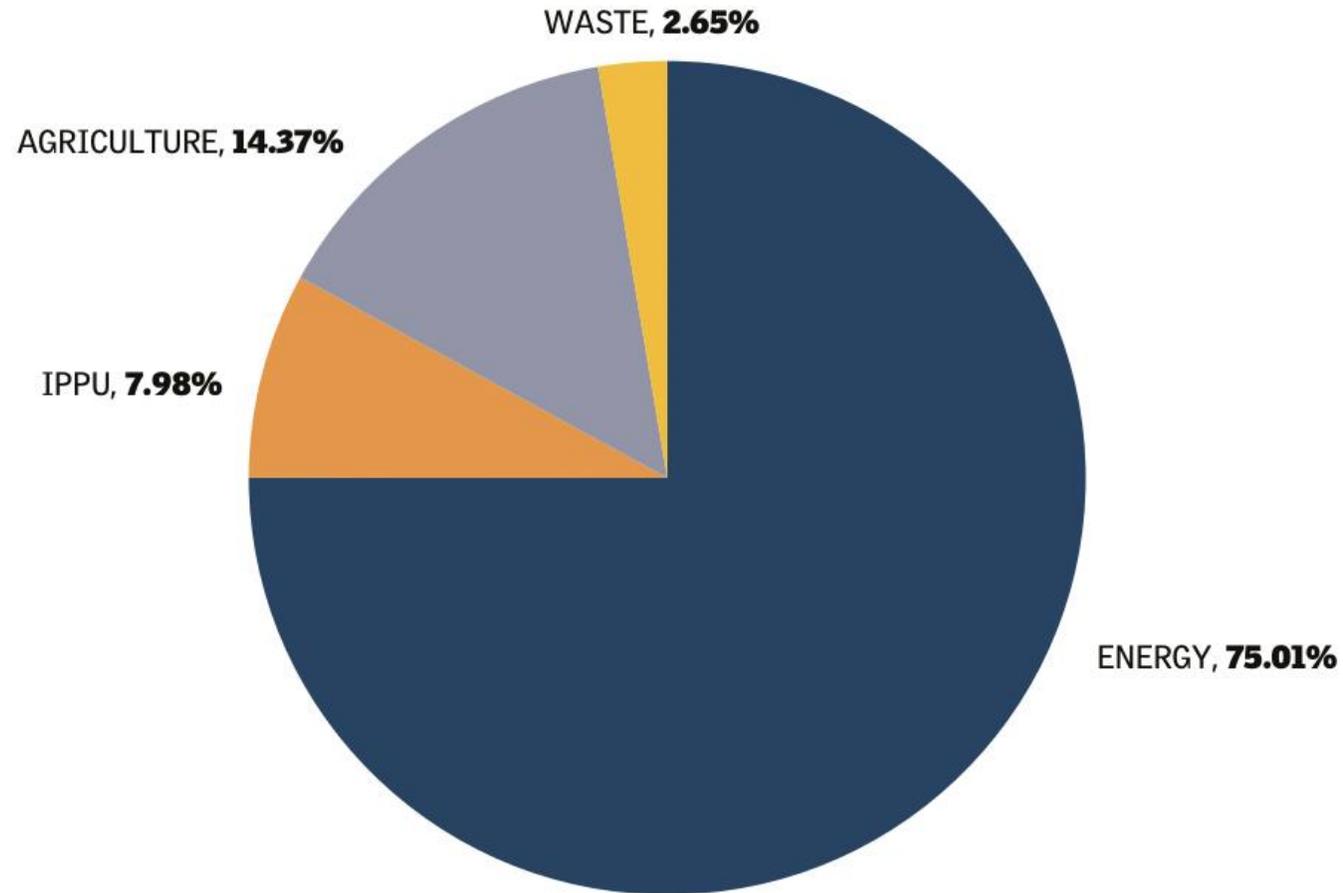
# Carbon Credit

- A **carbon credit** is a generic term for any **tradable certificate or permit representing the right to emit** a set amount of carbon dioxide or the equivalent amount of a different greenhouse gas (tCO<sub>2</sub>e).
- **One carbon credit** is equal to **one tonne of carbon dioxide**, or in some markets, carbon dioxide equivalent gases.
- Carbon trading is an application of an **emissions trading approach**.
- Greenhouse gas emissions are **capped and then markets are used to allocate** the emissions among the group of regulated sources.

# Carbon Intensity

- The carbon intensity of the economy is measured as carbon dioxide (CO<sub>2</sub>) emissions per unit of GDP.
- It is dependent on the **fuel mix** (carbon intensity of the energy sector) and **energy intensity** (amount of energy consumed for every unit of GDP)
- As per India Energy Outlook 2021 of the IEA **India is the third largest global emitter of CO<sub>2</sub>**, despite low per capita CO<sub>2</sub> emissions.
- **CO<sub>2</sub>** contributes more than **78 per cent** of India's total GHG emissions (2016), and the **energy sector** contributes **more than 92 per cent** of all CO<sub>2</sub> emissions from the country.

**Graph 2: Sectoral contribution in India's GHG inventory (2016)**



Source: Indian BUR-3

# Emission Intensity

- Emission intensity is defined as the **total amount of greenhouse gas emissions** emitted for every unit of GDP.
- Importantly, it counts emissions beyond those related to energy (such as emissions from agriculture), and greenhouse gases beyond carbon dioxide (such as methane).
- **India is on track** to meet its NDC (33–35 per cent reduction by 2030), which it has defined **not in terms of absolute reduction** in GHG emission but in terms of how much it will reduce emissions intensity as it grows economically.
- Between 2005–2016, **India has reduced emission intensity between 24–25 per cent.**

# Emissions Trading/Carbon Trading

- Emissions trading, sometimes referred to as “cap and trade” or “allowance trading,” is a **cost-effective way of reducing greenhouse gas emissions.**
- In an emissions trading scheme, a **central authority or governmental body** allocates or sells a limited number (a “cap”) of permits that allow a discharge of a specific quantity of a specific pollutant over a set time period.
- Polluters are required to **hold permits** in amount equal to their emissions.
- Polluters that want to increase their emissions **must buy permits from others willing to sell them.**

# Clean Development Mechanism

- It is a **carbon offset scheme** allowing countries to **fund greenhouse gas emissions-reducing projects** in **non Annex I countries** and claim the saved emissions as part of their own efforts to meet international emissions targets.
- For each cubic tonne of greenhouse gas avoided, a **carbon credit** is issued.
- Participants then get credits – CER – which they can apply towards meeting their own emission reductions.
- **CER stands for Certified Emission Reduction**, a carbon credit vetted by the UN.
- Each CER represents one tonne of greenhouse gas emission.



# Joint Implementation

- Through the Joint Implementation, any **Annex I country** can invest in emission reduction projects (referred to as "Joint Implementation Projects") in any **other Annex I country** as an alternative to reducing emissions domestically.

# Social Cost of Carbon

- The **social cost of carbon (SCC)** is the **marginal cost** of the impacts caused by **emitting one extra tonne of greenhouse gas** (carbon dioxide equivalent) at any point in time, inclusive of 'non-market' impacts on the environment and human health.
- The purpose of **putting a price** on a ton of emitted CO<sub>2</sub> is to **aid policymakers** or other legislators in evaluating whether a policy designed to curb climate change is justified.

# Carbon Market

- The **carbon market** refers to the market in which carbon credits, are **obtained and sold** within defined **standards for the prevention or reduction of GHGs**.
- This market **punishes businesses that emit more than the limit, while rewarding those who emit less**.

# Carbon Tax

- Under a carbon tax, the government **sets a price that emitters must pay** for each ton of greenhouse gas emissions they emit.
- Businesses and consumers will take steps, such as switching fuels or adopting new technologies, **to reduce their emissions** to avoid paying the tax.

# Carbon Border Tax

- A carbon border tax is a **tax on carbon emissions attributed to imported goods** that have not been carbon-taxed at source.
- In pushing through policies that result in **EU manufacturers** relying on environmentally friendlier but more expensive renewable energy, the manufacturers would be at a **cost disadvantage** compared with overseas competitors that are still using carbon dioxide-producing but cheaper power sources.
- The border tax **would not take effect until 2026**.
- European officials are proposing a **phase-in period** where they would try to figure out how the border tax would work in practice, giving time for other countries to prepare.

# NDCs India

- To reduce the **emissions intensity** of its GDP by 33 to 35 per cent by 2030 from 2005 level.
- To achieve about **40 per cent cumulative electric power installed capacity** from non-fossil fuel based energy resources by 2030, with the help of transfer of technology and low cost international finance, including from Green Climate Fund.
- To create an **additional carbon sink** of 2.5 to 3 billion tonnes of CO<sub>2</sub> equivalent through additional forest and tree cover by 2030.
- According to Climate Transparency, **India is the only G20 nation on-track** to achieve the targets under the Paris Agreement.



# COP 26

- The **2021 United Nations Climate Change Conference**, more commonly referred to as **COP26**, was the 26th United Nations Climate Change conference, held at the SEC Centre in Glasgow, **Scotland, United Kingdom**, from 31 October to 13 November 2021.
- The president of the conference was UK cabinet minister Alok Sharma.
- The conference was the **first since the Paris Agreement of COP21** that expected parties to make **enhanced commitments towards mitigating climate change**; the Paris Agreement requires parties to carry out a process colloquially known as the '**ratchet mechanism**' every five years to provide improved national pledges.

# Ratchet Mechanism

- Under the Paris Agreement, countries submitted pledges called nationally determined contributions, to limit their greenhouse gas emissions.
- Under the framework of the Paris Agreement, each country is expected to submit **enhanced nationally determined contributions every five years**, to ratchet up the ambition to mitigate climate change.
- When the Paris Agreement was signed at COP21, the **conference of 2020 was set to be the first ratcheting up**.

# COP 26

- The **Glasgow Summit** has urged countries to consider strengthening their 2030 targets by COP27 to be held in Egypt in 2022.
- The summit **targeted global warming not to exceed +1.5°C** and **got about 140 countries to announce target dates** for bringing emissions down to net zero.
- **An early assessment by Climate Action Tracker (CAT)**, an independent organisation, suggests that the targets declared, if fully achieved, **could limit global warming to around +1.8°C**.
- However, it also warns that the targets for 2030 are **insufficiently ambitious**.
- Unless significantly tightened, the world is more likely to end up seeing **global temperatures rise by 2.1°C to 2.4°C**

# Coal

- For the first time at a COP conference, there was an **explicit plan to reduce use of coal** - which is responsible for **40% of annual CO2 emissions**.
- However, countries only agreed a weaker commitment to "**phase down**" rather than "**phase out**" coal after a late intervention by China and India.

# Glasgow Breakthrough Agenda

- A potentially important development which emerged out of COP26 but outside the COP process is the **Glasgow Breakthrough Agenda**
- **Breakthrough Agenda** called **The Glasgow Breakthrough** is an **unprecedented global clean technology plan** to help keep 1.5°C within reach of all parties.
- The main key is the successful implementation of **technology transfer** from developed countries to developing countries.
- Endorsed by **42 countries** including India.

# Methane Pledge

- The pledge was first announced in September 2021 by the **US and EU**, and is essentially an **agreement to reduce global methane emissions**.
- **Launched** at the UN COP26 climate conference in Glasgow.
- One of the central aims of this agreement is to cut down **methane emissions by up to 30 per cent from 2020 levels by the year 2030**.
- **China, Russia and India have not signed up**, while Australia has said it will not back the pledge.
- Methane is the **second-most abundant** greenhouse gas in the atmosphere, after carbon dioxide, and, therefore, pledges related to cutting down its emissions are significant.
- According to the latest Intergovernmental Panel on Climate Change report, methane accounts for about **half of the 1.0 degrees Celsius net rise** in global average temperature since the pre-industrial era.

# Deforestation Pledge

- More than 100 world leaders have **promised to end and reverse deforestation by 2030**, in the COP26 climate summit's first major deal.
- The pledge includes **almost £14bn (\$19.2bn) of public and private funds.**
- Experts welcomed the move, but warned a previous deal in 2014 had failed to slow deforestation at all and commitments needed to be delivered on.

# Climate Finance

- India at the **Ministerial meeting of Like-Minded Developing Countries (LMDC)** at the 26th international climate conference in Glasgow has said that **climate finance** cannot continue at the levels **decided in 2009**, and emphasised that it should be **at least \$1 trillion** to meet the goals of addressing climate change.

# LMDC

- LMDC comprises around **24 developing countries from Asia and other regions.**
- It is a group of developing countries who organise themselves as a block of negotiators in international organizations such as the United Nations, they represent **more than 50% of the world's population.**
- The member countries of the Like Minded Group are *Algeria, Bangladesh, Belarus, Bhutan, China, Cuba, Egypt, India, Indonesia, Iran, Malaysia, Myanmar, Nepal, Pakistan, the Philippines, Sri Lanka, Sudan, Syria, Vietnam, and Zimbabwe.*

# Infrastructure For Resilient Island States (IRIS)

- India has launched the **Initiative for the Resilient Island States (IRIS)** for developing infrastructure of small island nations.
- Small Island Developing States or SIDS face the **biggest threat** from climate change.
- **India's space agency ISRO** will build a **special data window** for them to provide them **timely information** about cyclones, coral-reef monitoring, coast-line monitoring etc. through satellite.
- The initiative is a part of the **Coalition for Disaster Resilient infrastructure** that would focus on building capacity, having pilot projects, especially in small island developing states.

# LIFE: Lifestyle for Environment

- Prime Minister Modi's speech outlining India's COP26 commitments were prefaced with a call for a **"mass movement" of environmentally conscious living, labelled LIFE: Lifestyle for Environment.**
- This includes **mindful and deliberate utilization of resources** across the diverse sectors of fishing, agriculture, wellness, dietary choices, packaging, housing, hospitality, tourism, clothing, fashion, water management, and energy.

# The Green Grids Initiative - One Sun One World One Grid Project

- India and UK have launched a 'green grids' initiative – the **One Sun One World One Grid (OSOWOG)** project – on the sidelines of the COP26 summit.
- The project aims to connect energy grids across borders to facilitate a faster transition to the use of renewable energy.
- The proposal is aimed at addressing the **issue of reliability** of supply from solar power plants, which do not generate electricity after the sun has set.
- A **transnational grid** would allow countries to source solar power from regions where it is daytime to meet their green energy needs even when their own installed solar capacity is not generating energy.

# The Green Grids Initiative - One Sun One World One Grid Project

- Implementation is divided into **three main phases**
  - Phase 1 ensures interconnectivity in the Asian continent.
  - Phase 2 connects the functional first phase to the pool of renewable resources in Africa.
  - Phase 3 aims to achieve a global interconnection

# PANCHAMRITA

- At the 26th Conference of Parties (CoP26), **Indian Prime Minister declared a five-fold strategy**, termed as the *panchamrita*.
- These **five points** include:
  - India will get its non-fossil energy capacity to 500 gigawatt (GW) by 2030
  - India will meet 50 per cent of its energy requirements from renewable energy by 2030
  - India will reduce the total projected carbon emissions by one billion tonnes from now onwards till 2030
  - By 2030, India will reduce the carbon intensity of its economy by less than 45 per cent
  - So, by the year 2070, India will achieve the target of Net Zero

# 500 GW of Non-fossil Fuel Energy Capacity by 2030

- India's Central Electricity Authority (CEA) has done a projection for the **country's energy mix for 2030**.
- According to this, India's installed capacity of non-fossil energy for electricity generation – solar, wind, hydel and nuclear in **2019 was 134 GW** and **by 2030 it will be 522 GW**.
- This will require solar energy installed capacity to go to 280 GW and wind energy to go to 140 GW.

# India will Meet 50 Per Cent of Energy Requirements from Renewables

- According to the CEA, in 2019, India was meeting **9.2 per cent of its electricity generation from renewables.**
- By 2021, with an increase in renewable energy capacity to 102 GW the generation had increased to roughly **12 per cent** and so, it means that we need to increase this to meet the 50 per cent electricity generation target by 2030.
- India's power requirement in 2030 is projected to be 2,518 BU and if we target to meet 50 per cent of our requirements from renewables, then **the installed capacity will have to increase from the planned 450 GW to 700 GW.**

# India will Reduce the Total Projected Carbon Emissions by One Billion Tonnes

- India's current CO<sub>2</sub> emissions (2021) are **2.88 Gt**.
- According to the Centre for Science and Environment (CSE)'s projections based on the median annual rate of change in the past decade 2010-2019, India's generation in a business-as-usual scenario will be **4.48 Gt in 2030**.
- According to this target, India will cut its carbon emission by **1 billion tons (1 Gt)** and therefore, our emissions in 2030 will be 3.48 Gt.
- This means that India has set an ambitious goal to cut its emissions by **22 per cent**.

# Carbon Intensity Reduction by 45 Per Cent

- India has achieved **25 per cent of emission intensity reduction** of gross domestic product between 2005 - 2016, and is on the path to achieve more than **40 per cent by 2030**.
- But this means **that India will have to take up enhanced measures** to reduce emissions from the transport sector, the energy-intensive industrial sector, especially cement, iron and steel, non-metallic minerals and chemicals.

# Net Zero by 2070

- According to the IPCC, **global emissions must halve by 2030 and reach Net Zero by 2050.**
- Given the enormous inequity in emissions in the world, the **Organization for Economic Cooperation and Development (OECD) countries must then reach Net Zero by 2030, China by 2040 and India and the rest of the world by 2050.**
- However, the targets for Net Zero are both inequitable and unambitious.
- According to this, **OECD countries have declared a Net Zero target for 2050 and China for 2060.**
- India's Net Zero target of 2070 is an extension of this.

# Also

- According to the International Energy Agency's World Energy Outlook 2021 (IEA's WEO), **India's emissions are likely to grow the fastest** among the major global economies and, unlike China and the US, its emissions are **not expected to peak in the next three decades**.
- As a result, India's share of annual global emissions is expected to **rise to 9 percent by 2030 and 11 percent by 2050**.
- India should peak by **2040-2045**.

# E-Amrit Portal

- e-AMRIT is a portal for **creating awareness about electric mobility in India.**
- It has been launched by **India at the COP26 Summit.**
- The portal aims to serve as a “one-stop site” for providing all the information related to electric vehicles.
- The portal aims at providing access to information such as **policies/incentives, charging station, business requirements, etc.** so that the transition from petrol and diesel run vehicles to electric vehicles becomes easier.
- The portal has been developed and hosted by **NITI Aayog** under a collaborative knowledge exchange programme with the UK government and as part of the **UK-India Joint Roadmap 2030.**

# State of the Global Climate 2021

- By **WMO**.
- The past seven years have been the **warmest seven years on record**.
- 2021 was “only” one of the seven warmest because of a **La Niña event** at the start and end of the year.
- This had a **temporary cooling effect** but did not reverse the overall trend of rising temperatures.
- The average global temperature in 2021 was about **1.11 (± 0.13) °C** above the pre-industrial level.
- **Four key climate change indicators** – greenhouse gas concentrations, sea level rise, ocean heat and ocean acidification – set new records in 2021.
- The WMO State of the Global Climate report, which will be used as an **official document** for the UN Climate Change negotiations known as COP27 to take place in Egypt later this year.

# IPCC

- It was set up in 1988 by the **World Meteorological Organisation (WMO)** and **United Nations Environment Programme (UNEP)** to provide **policymakers with regular assessments** of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation.
- IPCC assessments **provide a scientific basis for governments at all levels to develop climate related policies**, and they **underlie negotiations** at the UN Climate Conference – the **United Nations Framework Convention on Climate Change (UNFCCC)**.

# IPCC Assessment Reports

- They are the most **comprehensive evaluations of the state of the earth's climate.**
- **First came out in 1990.**
- The Paris Agreement, negotiated on the basis of the **Fifth Assessment Report.**
- The Assessment Reports - by three working groups of scientists.
  - **Working Group-I** - Deals with the scientific basis for climate change.
  - **Working Group-II** - Looks at the likely impacts, vulnerabilities and adaptation issues.
  - **Working Group-III** - Deals with actions that can be taken to combat climate change

# IPCC AR6

- Of these, the first study was published in 2021, the second report February 2022, and the third in April 2022.
- **The final synthesis report is due to be finished by late 2022.**
- **First part noted that global net-zero by 2050 was the minimum required to keep the temperature rise to 1.5 degree Celsius.**
- The average surface temperature of the Earth will **cross 1.5 °C** over pre-industrial levels in the next 20 years, by 2040 and **2°C by the middle of the century** without sharp reduction of emissions.
- This is the **first time** that the IPCC has said that the **1.5°C warming was inevitable** even in the **best case scenario**.

# IPCC AR6

- **Second part** - Over 3.5 billion people, over **45%** of the **global population**, were living in areas **highly vulnerable to climate change**.
- The report identifies **India** as one of the **vulnerable hotspots**, with several regions and **important cities** facing **very high risk of climate disasters** such as **flooding, sea-level rise and heat-waves**.

# IPCC AR6

- **Third part** - Upon adding up the NDCs announced by countries till October 2021, the IPCC finds that it is likely that **warming will exceed 1.5 degrees Celsius** in this century, thereby failing the **Paris Agreement's mandate**.
- In its **best-case scenario**, known as the **C1 pathway**, the IPCC outlines what the world needs to do to limit temperatures to 1.5°C, with limited or no 'overshoot'.
- To achieve the C1 pathway, **global GHG emissions must fall by 43% by 2030**.

# Other Takeaways

- **Greenhouse gas (GHG) emissions** were 54 per cent higher in 2019 than they were in 1990, but **growth is slowing**
- Carbon inequality remains pervasive as ever with **Least Developed Countries (LDCs) emitting only 3.3 per cent of global emissions in 2019.**
- Their average per capita emissions in the period 1990-2019 were only 1.7 tonnes CO<sub>2</sub>e, compared to the global average of 6.9 tCO<sub>2</sub>e.

# Triple Planetary Crisis

- The **triple planetary crisis** refers to the three main interlinked issues that humanity currently faces - **climate change, pollution and biodiversity loss.**
- Each of these issues has its **own causes and effects** and each issue needs to be resolved if we are to have a viable future on this planet.

# Thank you