'Mid-century target for net zero inadequate'

G20 climate summit in Naples, Italy.

- Energy and environment ministers from the Group of 20 nations participated in the summit.

Impact of climate change:

- Average global temperatures have already risen by more than 1 degree compared to the pre-industrial baseline
- Are on track to exceed the 1.5–2 degree ceiling.

Ineffectiveness of the NDC framework:

- The pledge of countries like the US and the U.K. fall short of the fair share of emission reduction by relatively larger margins than developing countries like India.
- The fair share represents the reductions countries must achieve to ensure that the GHG levels are below that to prevent a 1.5 temp. rise over the globe by the turn of the century.

Carbon neutrality/net zero emissions:

- The net zero emissions refer to a situation where a country is able to remove at least as much CO_2 from the atmosphere as it is emitting.

- This can be done by increasing forest cover or through technologies such as carbon capture.
- There have been major net-zero commitments from the world's largest polluters in the past 12 months.
- However, some developing countries have resisted any such deadlines .
- Reaching a global consensus on the issue of carbon neutrality would be extremely difficult to reach given the scale of the differences between the different countries.

India's stand:

- India has stated that the pledges by some countries to achieve 'carbon neutrality' by mid-century were inadequate.
- India has urged G20 countries to commit to bringing down per capita emissions to Global average by 2030 considering the rights of developing countries to economic growth.
- Unlike some countries which have set carbon neutrality targets by 2050 or 2060, India has resisted committing to any such hard deadlines

given its developmental needs and the need for climate justice.

·Despite being the third largest greenhouse gas emitter in the world, India has one of the lowest per capita emissions.

Failure of G20 Climate summit

- Viewed as a setback as no consensus could be developed on Net Zero Emissions.
- COP26 marks the last chance to keep alive the chance of limiting temperature rise.

Significance:

·Despite differences, the G20 has put together a 58-point communique a

·All the countries agreed that decarbonisation was a necessary goal.

·This is also the first time that the G20 has accepted that climate and energy policies are closely interconnected.

* Revisit the idea of 'aging out' India's coal plants

- Union Budget 2020-21
  - ↳ Shut down of old coal power plants
  - ↳ to achieve India's Nationally Determined Contributions
- Also, there are new coal based power plants
  - ↳ which are more efficient, hence would reduce coal usage & cost savings
  - ↳ thus, Govt wants to retire coal plants more than 25 years old
- In favour of retiring old coal based plants
  - New coal based plants available
    - ↳ more efficient
  - Uneconomical for old plants
    - ↳ to install pollution control equipment to meet emission standards of MoEF&CC
    - ↳ hence better to retire them
- Causes of concern:
  - 20% of total thermal capacity
    - ↳ is from plants > 25 years old
    - ↳ could result in shortage of power

- Many old plants are economical
  - ↳ Rihand, Singrauli etc are > 30 years old
  - ↳ but have very low generation costs @ ₹1.7 / Kwh.
  - ↳ even lower than national avg.
  - ↳ may be due to being located near coal source.
- Efficiency ≠ Savings
  - ↳ as there are a variety of other factors that ↑ cost of production.
- On account of closure
  - ↳ Savings would be ~ ₹5000 crore annually
  - ↳ i.e. just 2% of total power generation cost.
  - ↳ such savings not sufficient to pay for the fixed costs (like debt repayment)
- The capacity value of these old capacity
  - ↳ is critical to meet instantaneous peak load & to meet load when renewable energy is unavailable.

- Way Forward
  - Some old plants must be retired
    - but not on basis of age
    - but a detailed analysis needs to be done considering other factors & cost

✗ Code Red (& other news on IPCC Report)

- IPCC's 6th Assessment Report
  - ↳ Climate Change 2021 : The Physical Sciences Basis
- findings :
  - India to witness ↑ heatwaves & flooding
  - ↑ in annual mean precipitation
    - ↳ with more severe rain expected in southern India in coming decades
    - ↳ Monsoon extremes likely to ↑
    - ↳ Lengthening of monsoon over India by end of 21st century
  - Heat extremes ↑ & cold extremes ↓
    - ↳ this trend will continue.
  - Warming of the Ocean
    - ↳ lead to rise in sea levels
    - ↳ cause frequent & severe coastal flooding
  - Shrinking glaciers in Hindu Kush Himalayas (HKH)
    - ↳ Snow cover will retreat to higher altitudes
    - ↳ Rising temp. & precipitation can ↑ glacial lake outburst floods & landslides.
    - ↳ Already since 1970, glaciers have

thinned, retreated & lost mass in HKH, while Karakoram glaciers are in a balanced state.

- Thawing of Permafrost.
- Stronger & Wetter Tropical Cyclones
- Melting Arctic Ice.
- Disruptions to global water cycle.
- Agri & ecological droughts

– Current global scenario:

- India → 3rd largest GHG emitter
  → US emits 9 times more GHG per capita than India (2018)
- World on track for global temp. warming by at least 2.7°C by 2100
  ↳ 'Code Red for humanity'
- Still countries avoiding dependence on coal & fossil fuels
- Paris Agreement (2015)
  ↳ but still no consensus on raising aims to reduce emissions.
- World heading towards a catastrophe.

- Way Forward :
  - Deep cuts to CO_2 & other GHG emissions
  - Countries should move to **net zero emissions i.e.**
    - ↳ No additional GHG gases are emitted by 2050.
  - Each countries' INDC's (under Paris Agreement) must rise to reduce emissions
  - Access to low Carbon technologies
  - Funding mitigation & adaptation
  - Developed countries with legacy emissions
    - ↳ should enforce deep cuts, transfer tech to emerging economies without conditions
    - ↳ & heavily fund mitigation & adaptation
  - Developing countries will then be in a better position to enforce steeper emission cuts
- The IPCC report sets the stage for the **COP 26 Conference meet in Glasgow** in Nov 2021

Sea level rise is certain

(IPCC) Assessment Report from Working Group I – 'Climate Change 2021: The Physical Science Basis' provides one of the most expansive scientific reviews on the science and impacts of climate change.

- The report discusses five different shared socio-economic pathways for the future with varying levels of greenhouse gas (GHG) emissions.
- Even in the intermediate scenario, it is extremely likely that average warming will exceed 2°C near mid-century.

Sea Level Rise - A Major Concern:

- Sea level rise will continue after emissions no longer increase, because oceans respond slowly to warming.

- The centennial-scale irreversibility of sea-level rise has implications for the future even under the low emissions scenarios.
- Sea level rise occurs mainly due to the expansion of warm ocean waters, the melting of glaciers on land, and the melting of ice sheets in Greenland and Antarctica.
- The global mean sea level (GMSL) rose by 0.2m between 1901 and 2018.
- Projections based on structured expert judgments indicate that sea-level rise as high as 2.3m by 2100 cannot be ruled out.
- According to the UN Environment Programme Emissions Gap Report, the world is heading for a temperature rise above 3°C this century .
- And there is deep uncertainty in sea-level projections for warming above 3°C.

- Understanding the risks involved from climate change and sea-level rise in the 21st and 22nd centuries is crucial.
    - Close to 700 million people worldwide live along the coast.

Vulnerability in India:

- Communities along the coast in India are vulnerable to sea-level rise and storms.
- With climate change, storms will become more intense and frequent. They will be accompanied by storm surges, heavy rain and flooding.
- Even the 0.1m to 0.2m rise expected along India in the next few decades can cause frequent coastal flooding.

Way Forward:

- The uncertainty regarding a metre or more of sea-level rise before 2100 is

* Immediate action needed to limit global warming

- The 'United in Science 2021' report
  - Released by World Meteorological Org
  - Inputs from UNEP, WHO, IPCC, Global Carbon Project, World Climate Research Prog, etc
- Findings:
  - Notes that that climate change and its impacts are accelerating.
  - Temporary reduction in C emissions due to lockdowns had not slowed global warming.

* Biden unveils plan to cut methane emissions

- **Global Methane Pledge**
  - A U.S.-EU led effort to cut methane emissions by a third by the end of this decade.
  - Announced at the Major Economies Forum on Energy and Climate
  - Methane, a GHG, is 80 times more potent than CO_2
  - 40% of methane emitted is from natural sources
  - 60% comes from human-influenced sources, including livestock farming, rice agriculture, biomass burning etc
- **Major Economies Forum on Energy and Climate (MEF):**
  - Launched in 2009.

- To facilitate dialogue among major developed and developing economies,
- Help generate the political leadership necessary to achieve a successful outcome on climate change
- Advance joint ventures that increase the supply of clean energy.

* Climate change is a key driver of financial risk

- Climate risks can impact the financial sector through two broad channels:

1. Physical Risks:

- They are financial losses resulting from the increasing severity and frequency of extreme weather events .
- Factors are directly observable and these events inflict direct economic costs and financial losses on financial firms
- Chronic physical risks are longer-term events as they arise from gradual shifts of weather patterns.

2. Transition Risks:

- They arise as the world tries to adjust towards a low-carbon economy.

- Reflects as compliance cost when one adjusts to a low-carbon economy.
- Includes changes in govt policies, market and customer sentiments and the necessity for technological up-gradation.
- Mitigation plans could cause a decrease in financial valuation or a downgrade of credit ratings for businesses which are violating climate norms.

– Thus, it is important for the financial firms to understand these risk drivers which are likely to affect them.

* The carbon markets conundrum at COP26

- Clean Development Mechanism of Kyoto Protocol

- A project (eg-solar) in a developing nation
- Causes fall in emissions.
- It will receive 'carbon credits', called Certified Emission Reductions (CERs) based on the amount of emissions reduced.
- An industrialized country (or a company based there) can buy these CERs
- No need to invest in emissions reductions at home.
- India, China & Brazil, gained significantly under (CDM) of the Kyoto Protocol.

- Prospective Benefit of CDM for India

- India recorded 1,703 projects under the CDM -> second-highest in the world.
- Total CERs issued for these projects are around 255 million .

- Overall anticipated inflow of approximately U.S. $2.55 billion
- At a conservative price of U.S. $10 per CER.
- Therefore, logically, India has a lot to gain from a thriving carbon market.

– Article 6 of the Paris Agreement

- Countries that struggle to meet their ER targets can purchase emissions reductions .
- Purchase from other nations that have already cut their emissions more than the amount they had pledged.

– Challenges to CDM benefits under Art 6

- It sets mitigation targets for the developing countries which were not present under the Kyoto Protocol.
- Dilemma of Developing countries
  - Either sell their carbon credits in return for foreign investment flows

- Or use these to achieve their own mitigation targets.

– The three critical issues in Article 6 are

1. CDM transition:

•Credits to the developing countries were issued under the due diligence of UNFCCC.

•Thus it should honour the previous decisions.

•While there is greater acceptance for transition of projects/activities, the same is not the case for transition of credits.

•Some countries have questioned the process of awarding such credits and also the enviro integrity of the credits.

•If the decision regarding the transition of CDM is not favourable, it could lead to a loss of billions of dollars worth of potential revenue to India alone.

2. Accounting rules

- Article 6.4 establishes a UN mechanism to trade credits for specific projects
- It is meant to incentivize the pvt & public entities to undertake mitigation activities.
- A country can purchase emission-reductions from public & pvt entities of the host country & use them to meet its NDC targets.
- But this may not be adjusted against the host country's NDC targets
- They are additional efforts by the Pvt and Public entities to mitigate emissions.

3. Share of Proceeds (SOP) to the Adaptation Fund

- Article 6.2 allows for the international transfer of carbon credits between countries
- Developing nations -> SOP must be uniformly applied to Art 6.2 & 6.4 to fund adaptation.
- Developed countries want to restrict its application to Article 6.4.

* PM to attend climate meet in Glasgow

- UN Climate Change Conference (COP26). - Glasgow
- The COP26 has four goals:
  - To achieve global net-zero by the mid of the century and keep 1.5° within reach.
  - To adapt to protect communities and natural habitats from impact of climate change.
  - Mobilisation of finances.
  - To work together & help in the fulfilment of the Paris Agreement.
- Conference of Parties:
  - Under the United Nations Climate Change Framework Convention
  - Formed to work towards stabilising the concentrations of GHGs in the atmosphere.
  - Meeting each year since 1995
  - 198 parties and includes US, India and China.
  - India hosted COP8 in 2002

* CO_2 emissions in 2020 above decadal avg.

- **The Bulletin**
  - ↳ Report by **World Meteorological Org.**
  - ↳ has data from National Oceanic & Atmospheric Administration (NOAA)
  - **Annual Greenhouse Gas Index (AGGI)**

- Findings:
  - ↑ in emissions from 2019 to 2020 as compared to ↑ from 2018 to 2019
    - ↳ CO_2 ⇒ slightly lower
    - ↳ CH_4 ⇒ higher
    - ↳ N_2O ⇒ higher
  - ↑ in emissions
    - ↳ CO_2, CH_4, N_2O ⇒ higher than avg. annual growth rate over the past decade.
  - B/w 1990 to 2020
    - ↳ Radiative forcing by **long lived GHGs (LLGHGs)** ↑ by 47%.
    - ↳ CO_2 accounts for 80% of this ↑.

- Concentration of all 3 — CO_2, CH_4 & N_2O are (120–260%) higher than pre-industrial levels (1750)
- CO_2 emissions by human activities
  - ↳ $\frac{1}{2}$ remains in the atmosphere
  - ↳ $\frac{1}{2}$ sinks in the oceans & land ecosystems.
  - ↳ Capacity of oceans & land eco. to act as sinks is reducing.
- Temperature rise by end of century
  - ↳ in excess of 1.5–2°C above pre-industrial levels.

* Why India shouldn't sign on to net zero

- Global Carbon Budget
  - ↳ Cumulative Emission limit is 1350 billion tonnes of CO_2 for a 2°C target.
  - ↳ For 1.5°C target it is just 500 billion tonnes of CO_2
  - ↳ This limit of 500 bn tonnes will be breached by emissions of the top 3 emitters ⇒ China, US & EU.
  - ↳ These 3 will breach the 1.5°C target, even after taking account of their net zero commitments & enhanced emission reduction commitments for 2030.
  - ↳ So the promise of 1.5°C limit is already broken.

- Why India shouldn't sign on to net zero -

(1) Neither Paris Agreement nor climate science requires that net zero be reached individually by countries by 2050.

(2) The top 3 emitters - China, US & EU already will breach the 1.5°C rise target.

(3) India's cumulative emissions → not more than 4.3% cumulative emissions of CO_2 since the pre-industrial era.
↳ With per capita emissions less than half of world avg.
↳ Thus, India's contribution to global emissions is disproportionately low.

(4) Failure of developed world to meet its pre-2020 obligations.
↳ climate finance & Tech transfer.

(5) Global Carbon Budget was & is being exploited by the Global North.
↳ US & EU contributed to 45% of the past cumulative emissions

(6) India's own development needs
↳ responsible use of coal, oil & gas.
↳ to come out of lower middle income economy status
↳ to eradicate poverty, hunger & malnutrition
↳ Provide employment & livelihood

(7) India's sectoral emissions

- Energy sector > Agriculture
- Agri needs more support to double farmers' income & build resilient infrastructure.

Explaining the global warming phenomenon

Background

The Nobel Prize for Physics for 2021 has been awarded to climatologists Syukuro Manabe and Klaus Hasselmann, and physicist Giorgio Parisi

- For groundbreaking contributions in the understanding of complex physical systems.
- This is the first time Noble Prize given to climatologists since it's inception in 1901.

Syukuro Manabe's Work

- Model atmospheric warming due to the increase in carbon dioxide in the 1950s and 1960s.
- His model estimated that a doubling of carbon dioxide would lead to a temperature rise of 2 degrees
- His model confirmed that the rise in temperature was due to the increase in carbon dioxide instead of the Sun's radiation.

Klaus Hasselmann's Work

- Built a stochastic climate model that connects climate and weather.
- Developed methods to identify the human fingerprint on climate change
- His model carried information about warming due to solar radiation, greenhouse gases and other causes.

Giorgio Parisi's Work

- Identify a structure to the replicas by a replica trick and describe it mathematically

- His method being used eventually to solve problems in the field of complex systems of physics, mathematics, biology, neuroscience

↳ Significance

Their work helps us to understand dynamic phenomenon from centimetres to the size of the planet

* Indian site highlights emissions gap.

- Climate Equity Monitor (CEM)
  - Website made by Indian climate experts
  - Lists the historical CO_2 emissions of developed countries.
  - Indian Govt has officially endorsed it.
  - (www.climateequitymonitor.in)
- Findings in CEM
  - Highlights disparity b/w the emissions of developed & developing countries.
    - ↳ US, Canada, Aus & W. Europe countries have a net Carbon debt
    - ↳ developing countries like India & China have net credit.
  - India's position:
    - ↳ 3rd largest emitter of C emissions annually
    - ↳ but is 6th when historical emissions are considered.
    - ↳ And is one of the lowest when considered in terms of per capita emissions

- Thus, India's demands for climate justice
  ↳ & reluctant to agree to a fixed time frame to reach net zero.
- Debunks the narrative of many developed countries & global NGOs
  ↳ that focus on what developing countries must do.
- It will monitor the performance of
  ↳ Annex-I Parties under UNFCCC (developed)
  ↳ Non Annex-I Parties (developing countries)

– Website developed by
  - M S Swaminathan Research Foundation, Chennai
  - NIAS, Bengaluru
    etc

* India will achieve net zero by 2070 : PM

- COP 26 Summit, Glasgow
  - PM declared India's net zero target : 2070
  - Earlier, India had strongly resisted demands for a net zero target by developed countries.
- Path to achieve net zero for India -
  - By 2030 → ensure 50% of its energy needs from renewable sources.
    → reduce C emissions by a billion tonnes
    → reduce Emissions Intensity per unit of GDP by less than 45%
    → install systems to generate 500 GW of renewable energy (↑ of 50 GW from existing target of 450 GW)
  - India needs climate justice.
    ↳ Rich, developed countries with historical C emissions should provide at least $1 trillion in climate finance
    ↳ To assist developing countries.
  - Principles of Equity & CBDR-RC (Common

but Differentiated Responsibilities & Respective Capabilities) needs to be followed.

– Way Forward:

- India will now require shift to clean energy sources ⇒ may impose cost.
- No focus on climate adaptation & mitigation in global negotiations
- Changes needed in cropping patterns
  ↳ To make agri resilient.
- Sustainable practices of certain communities
  ↳ should be made part of school curricula
- Lessons from India's schemes – Jal Jeevan Mission, SBM, Ujwala etc.

Achieving 2070 net-zero target could boost India's GDP: report

Report by High-Level Policy Commission:

- Achieving the "net zero carbon" emission target by 2070 will help boost India's GDP by more than 4.7% of the projected baseline growth by 2036 which accounts for over $371 bn.
    - It was one of the five commitments (Panchamrit) made by PM Modi at COP26, Glasgow.
- Sticking to the deadline and making constant efforts could help generate close to 15 mn new jobs by 2047.
- Reduction in the demand for fossil fuels on account of shifting towards non-fossil fuels will help improve the trade balance of the country by about $236 bn.
- Achieving the net zero targets by 2050
    - India could improve its annual GDP by about 7.3% which accounts for over $470 bn and help generate 20 mn new jobs by 2032.

Path Ahead

- The target of 2070 would require an investment of over $10.1 tn.
    - Whereas achieving the targets by 2050 would require $13.5 tn.
- Proper implementation of viable policy options to decarbonise India's energy infrastructure and

economy can help India to reach its net zero targets by mid-cent.

- Comprehensive planning will help attract additional investments which will help in freeing up the existing resources to address adverse impacts of climate policies such as carbon taxes.
- Curbing the use of new coal by 2023 and shifting away from unabated coal power by 2040 will also help India achieve its targets much earlier.