



30 Days Revision Module Day 22 - Climate Change (UPSC Prelims 2021)

1) Which of the following are parts of Climate Change Action Programme (CCAP)

1. National Carbonaceous Aerosols Programme
2. Long Term Ecological Observations
3. Green India.

Select the correct answer using the code given below

- a. 1 and 2 only
- b. 2 and 3 only
- c. 1 and 3 only
- d. 1, 2 and 3

Answer : a

- Under Climate Change Action Programme (CCAP) scheme, two scientific programmes, National Carbonaceous Aerosols Programme (NCAP) and Long Term Ecological Observatories (LTEO) have been undertaken.
- National Mission for a Green India or the commonly called Green India Mission (GIM), is one of the eight Missions outlined under India's action plan for addressing the challenge of climate change -the National Action Plan on Climate Change (NAPCC).
- GIM, launched in February 2014, is aimed at protecting, restoring and enhancing India's diminishing forest cover and responding to climate change by a combination of adaptation and mitigation measures.

2) With reference to SUNRISE project, Consider the following statements

1. It is aimed at developing printed photo voltaic cells and new manufacturing processes which can be used to make solar energy products in India.
2. It is an Indo-British Collaboration.

Select the correct answer using the code given below

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2

Answer : c

- Solar Power For All - SUNRISE: Strategic University Network to Revolutionize Indian Solar Energy. It is a joint UK-India solar power project aiming to deliver low-cost photovoltaics to rural India
- The project is funded by GCRF (Global Challenges Research Fund), a UKRI fund set up to support research that addresses challenges faced by developing countries.
- Its goals include,

1. Building global collaboration

2. Developing research capability
3. Creating sustainable communities

3) Which one of the following statements regarding the Great Green Wall initiative is correct?

- a. It is India's new initiative to increase the green cover along the National Highways.
- b. China has taken this initiative along its Great Wall to increase its forest cover.
- c. It is Africa's flagship initiative to combat the increasing desertification.
- d. It is Brazil's initiative to increase the forest cover in the Amazon region.

Answer : c

- The Great Green Wall is launched in 2007 by the African Union, this game-changing African-led initiative aims to restore Africa's degraded landscapes and transform millions of lives in one of the world's poorest regions, the Sahel.

4) Which of the following can provide the function of carbon sequestration?

1. Afforestation
2. Ocean fertilization
3. Regular tillage
4. Trapping flue gas

Select the correct answer using the code given below.

- a. 1 only
- b. 1 and 2 only
- c. 1, 2 and 4
- d. 3 and 4

Answer : c

- Trees and other vegetation suck up carbon dioxide from the atmosphere, sequestering nearly a third of global emissions. Researchers have found that afforestation and reforestation, enhanced soil carbon in croplands and grasslands.
- Ocean fertilization or ocean nourishment is a type of climate engineering based on the purposeful introduction of nutrients to the upper ocean to increase marine food production and to remove carbon dioxide from the atmosphere.
- It is widely believed that soil disturbance by tillage was a primary cause of the historical loss of soil organic carbon (SOC) and that substantial SOC sequestration can be accomplished by changing from conventional plowing to less intensive methods known as conservation tillage.
- In Carbon capture and storage, where carbon dioxide is removed from flue gases by trapping them(e.g., at power stations) before being stored in underground

5) Which of the following are the sources of Particulate Matter 2.5?

1. Road dust
2. Burning of coal
3. Forest fire
4. Construction equipment
5. Tobacco smoke
6. Burning candles

Select the correct answer using the code given below.

- a. 1, 2, 3 and 4 only
- b. 2, 3 and 5 only
- c. 1, 4, 5 and 6 only
- d. 1, 2, 3, 4, 5 and 6



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Answer : d

- Particulate Matter is an important constituent of the atmosphere. The sources of PM can be natural or man-made sources.
- There are a number of natural sources that inject millions of tons of PM into the atmosphere. They include volcanic eruption, wind and dust storms, forest fire, salt spray, rock debris, reactions between gaseous emissions, and soil erosion.
- Man-made activities such as fuel combustion, persistent candle burning, tobacco smoke, industrial processes, steel industry, petroleum foundries, cement, glass manufacturing industry, construction activities, smelting and mining operations, fly-ash emissions from power plant, burning of coal, and agricultural refuse also contribute to PM in the atmosphere.

6) Consider the following statements about Leaded Petrol

1. According to UNEP, World has completely eradicated the use of Leaded Petrol.
2. Leaded Petrol mainly affects the emission control system such as catalytic converters.
3. India's phase down of leaded petrol got completed way back in 2000.

Which of the statements given above is/are correct?

- a. 2 only
- b. 1 and 2 only
- c. 1 and 3 only
- d. 1, 2 and 3

Answer : d

Leaded Petrol

- According to UNEP, globally, automotive fuel is completely lead-free now. Not a single fuel outlet sells leaded petrol anymore anywhere.
- Algeria was the last country to use the fuel.
- This feat is achieved after UNEP-led global Partnership for Clean Fuels and Vehicles (PCFV) began its campaign in 2002 to eliminate lead in petrol.
- Fumes from petrol vehicles using leaded petrol have been a significant source of lead exposures which affects multiple body systems and is particularly harmful to young children.
- It affects the brain, liver, kidneys and bones. Lead is measured in blood to understand exposure.
- Lead in bone is released into blood during pregnancy and becomes a source of exposure to the developing foetus.
- It affects emissions control systems of vehicles particularly catalytic converters.
- India started its phase down in 1994 and completed in 2000.

7) With reference to the findings of 6th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), consider the following statements

1. The ocean surface will continue to warm more than the land surface.
2. The Arctic will continue to warm more than the global surface temperature.
3. Human-induced global warming has been more rapid in Africa than the rest of the world.

Which of the statement(s) given above is/are correct?

- a. 2 only
- b. 1 and 3 only
- c. 2 and 3 only
- d. 1, 2 and 3

Answer : c

Highlights of the IPCC 6th Assessment Report

- Human's role in climate crisis - Human activity is the cause of climate change and this is an unequivocal fact.
- Global temperatures have already risen by 1.1 degrees Celsius since the 19th century.
- Average global temperatures will continue to rise and could increase by 5.7°C by the end of this century as compared to 1850-1900.
- No region on Earth has escaped the impacts of the climate crisis.
- Extreme Weather Events - Every additional 0.5°C rise in temperature amplifies the intensity and frequency of heatwaves, heavy precipitation and droughts.
- The land surface will continue to warm more than the ocean surface.
- Ice free Arctic - The Arctic will continue to warm more than global surface temperature.
- The temperature on the coldest days will increase by three times in the Arctic.
- As a result, the frequency of marine heatwaves will continue to increase in the tropical ocean and the Arctic.
- This will amplify permafrost thawing and loss of seasonal snow cover of land and sea ice.
- The Arctic is likely to be practically sea ice-free at least once before 2050.
- Highest CO₂ Levels - The levels of CO₂, the primary driver of global heating, were higher in 2019 than at any time in "at least 2 million years".
- Methane Cuts - In addition to slashing CO₂ emissions, the world must also deliver "strong, rapid and sustained reductions" in methane in order to get to grips with the climate crisis.
- Sea Level Rise - A warmer climate will intensify very wet and very dry weather and climate events and seasons leading to flooding

8) With reference to Net Zero Emissions, consider the following statements:

1. It is a condition in which a country would bring down its emissions to zero, taking pre-industrial levels as base range.
2. India has not yet committed to a net zero timeline.

Which of the statement(s) given above is/are correct?

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2

Answer : b

Net Zero Emissions

- It is also referred to as carbon-neutrality.
- It does not mean that a country would bring down its emissions to zero.
- Rather, net-zero is a state in which a country's emissions are compensated by absorption and removal of greenhouse gases from the atmosphere.
- Absorption of the emissions can be increased by creating more carbon sinks such as forests, while removal of gases from the atmosphere requires futuristic technologies such as carbon capture and storage.
- This way, it is even possible for a country to have negative emissions, if the absorption and removal exceed the actual emissions.
- A good example is Bhutan which is often described as carbon-negative because it absorbs more than it emits.
- India is currently the World's third biggest emitter of greenhouse gases, after the US and China.
- India has not yet committed to a net zero timeline.

- Several other countries, including the UK and France, have already enacted laws promising to achieve a net-zero emission scenario by the middle of the century.
- The European Union is working a similar Europe-wide law, while many other countries including Canada, South Korea, Japan and Germany have expressed their intention to commit themselves to a net-zero future.
- Even China has promised to go net-zero by 2060.

9) Which of the following is the nodal agency for landslide studies in India?

- Geological Survey of India
- National Disaster Management Authority
- National Institute of Public Finance and Policy
- Building Materials and Technology Promotion Council

Answer : a

- The Geological Survey of India (GSI), an attached office under the Ministry of Mines (MoM), is the nodal agency for landslide studies in India providing quality geo-scientific information in order to minimize loss of life and damage to property from landslide hazards.
- The Landslide Hazard Zonation Map of India marks over 70% of the State as 'high risk' and 14% as 'severe' to 'very high risk'.

10) Assertion (A): Polar Amplification is much stronger in the Arctic than in Antarctica.

Reason (R): The Arctic is an ocean covered by sea ice, while Antarctica is an elevated continent covered in more permanent ice and snow.

Select the correct answer using the codes given below

- Both A and R are true and R is the correct explanation of A
- Both A and R are true but R is not the correct explanation of A
- A is true but R is false
- A is false but R is true

Answer : a

Polar Amplification

- It is much stronger in the Arctic than in Antarctica.
- This difference is because the Arctic is an ocean covered by sea ice, while Antarctica is an elevated continent covered in more permanent ice and snow.
- In fact, the Antarctic continent has not warmed in the past seven decades, despite a steady increase in the atmospheric concentrations of greenhouse gases.
- The exception is the Antarctic peninsula, which juts out further north into the Southern Ocean and has been warming faster than any other terrestrial environment in the southern hemisphere during the latter half of the 20th century.
- Satellite data also show that between 2002 and 2020, Antarctica lost an average of 149 billion metric tonnes of ice per year, partly because the oceans around the continent are warming.

11) Consider the following statements about Kigali Amendment to the Montreal Protocol

1. It aims to phase down all the ozone depleting substances by cutting both their production and consumption.
2. It is legally binding and came into force in 2019.
3. Under the amendment, India's reduction of Hydrofluorocarbon (HFC) will begin from 2028 and target is to reduce it by 80% by the year 2047.

Which of the statement(s) given above is/are correct?

- 2 only

- b. 3 only
- c. 1 and 3 only
- d. 2 and 3 only

Answer : d

Kigali Amendment to Montreal Protocol

- Union Cabinet has recently approved the ratification of the Kigali Amendment to the Montreal Protocol on Substances that deplete the ozone layer.
- In 2016, Kigali amendment was agreed by more than 170 countries and came into force in 2019.
- It is legally binding.
- The amendment aims to phase down Hydrofluorocarbon (HFC) i.e to achieve over 80% reduction in HFC by 2047.
- HFCs were introduced as a replacement to ozone depleting substances such as chlorofluorocarbons and hydro chlorofluorocarbons.
- Thus, HFCs have zero ozone depleting potential but known to be hundreds, even thousands, of times more potent than carbon dioxide in their ability to cause global warming.
- With the Kigali Amendment, the Montreal Protocol has become an even more powerful instrument against global warming.
- Under the amendment, India's reduction of Hydrofluorocarbon (HFC) will begin from 2028 and target is to reduce it by 80% by the year 2047.

12) Global Stocktake which is frequently seen in news is related to which of the following entities?

- a. International Solar Alliance
- b. Paris Agreement
- c. Minamata Convention on Mercury
- d. Outer Space Treaty

Answer : b

- "Global Stocktake" – a moment every five years for all countries to pause and account for what has been achieved so far, and what must still be done, to achieve the goals of the Paris Agreement.

13) Which of the following are short-lived climate Pollutants?

- a. Black carbon, methane, tropospheric ozone and hydrofluorocarbons
- b. Black carbon, methane, Carbon dioxide and tropospheric ozone
- c. Water Vapour, Brown carbon and Chlorofluorocarbons
- d. Mercury, Black Carbon, Tropospheric ozone and Water vapour

Answer : a

- Short-lived climate pollutants (SLCPs) include black carbon, methane, tropospheric ozone, and hydrofluorocarbons (HFCs) and are commonly associated with refrigeration, diesel-fueled vehicles, and solid-fuel cooking fires. In the fight to tackle climate change, reducing SLCPs plays a crucial role.

14) "Race To Zero" Campaign is an initiative of

- a. European Union
- b. UNFCCC
- c. FAO
- d. WHO

Answer : b

- Race to Zero is the international campaign for a healthy, resilient, zero-carbon recovery.
- Led by the UNFCCC Champions for Climate Action, it aims to bring together net-zero commitments from cities, businesses and investors across the climate action community in the run up to COP26.
- Members of Race to Zero automatically join countries in the Climate Ambition Alliance, and their participation is registered on the Global Climate Action portal.

15) With respect to Short Lived Climate Forcers (SLCFs), consider the following statements:

1. These are compounds that warm or cool the Earth's climate over shorter time scales.
2. It includes gases as well as tiny particles called aerosols.
3. They are emitted both naturally and as a result of human activities.

Which of the statements given above are correct?

- a. 1 and 2 only
- b. 1 and 3 only
- c. 2 and 3 only
- d. 1, 2 and 3

Answer : d

Short Lived Climate Forcers (SLCFs)

- These are compounds that warm or cool the Earth's climate over shorter time scales - from days to years. They do not remain in the atmosphere for very long.
- Climatic effects of Carbon dioxide, a greenhouse gas, lasts for decades, centuries or even more.
- The SLCFs include gases as well as tiny particles called aerosols, and they can have a warming or cooling effect on the climate.
- **Warming SLCFs** are either greenhouse gases (e.g., ozone or methane) or particles like black carbon (also known as soot), which warm the climate by absorbing energy and are sometimes referred to as short-lived climate pollutants.
- **Cooling SLCFs**, on the other hand, are mostly made of aerosol particles (e.g., sulphates, nitrates and organic aerosols) that cool down the climate by reflecting away more incoming sunlight.
- Some SLCFs do not directly affect the climate but produce climate-active compounds and are referred to as **Precursors**.
- Some of the SLCF Precursors includes sulphur dioxide (which produces sulphates) and nitrogen oxides (which produce nitrates and ozone).
- SLCFs are emitted both naturally and as a result of human activities, such as agriculture or extraction of fossil fuels.
- Emissions have increased since the start of industrialization, and humans are now the dominant source for several SLCFs and SLCF precursors.

16) Consider the following statements regarding Nitrous Oxide.

1. It is the third-highest concentration — after CO₂ and methane — in the Earth's atmosphere.
2. It is a greenhouse gas 300 times more potent than carbon dioxide and can live in the atmosphere for up to 125 years.
3. It is also the only remaining threat to the ozone layer, for it accumulates in the atmosphere over a long period of time.
4. A major proportion of the N₂O emissions in the last four decades came mainly from the agricultural sector.

Which of the statements given above are correct?

- a. 1 and 2 only
- b. 2 and 3 only
- c. 1, 2 and 4 only
- d. 1, 2, 3 and 4

Answer : d

- Nitrous Oxide has the third-highest concentration after CO₂ and methane in our atmosphere among greenhouse gases responsible for global warming.
- It is a greenhouse gas 300 times more potent than carbon dioxide (CO₂) increased by 30% between 1980 and 2016, according to a research paper published in Nature October 7, 2020.
- N₂O can live in the atmosphere for up to 125 years. Its global concentration levels increased from 270 parts per billion (ppb) in 1750 to 331 ppb in 2018, a jump of 20%.
- N₂O is also the only remaining threat to the ozone layer, for it accumulates in the atmosphere over a long period of time, just like CO₂.
- A major proportion of the N₂O emissions in the last four decades came from the agricultural sector, mainly because of the use of nitrogen-based fertilizers. The growing demand for food and feed for animals will further increase global nitrous oxide emissions

17) Which of the following statements regarding different pollutants is **not correct**?

- a. Although ozone is an essential gas that protects the Earth from the sun's harmful radiation, it is a greenhouse gas with highly toxic effects at ground level.
- b. Ozone occurs naturally in the atmosphere and has no anthropogenic sources that contribute to its addition as a pollutant in the atmosphere.
- c. Nitrous oxide is a greenhouse gas that contributes to global warming, while nitric oxide and nitrogen dioxide causes global cooling by destroying methane molecules.
- d. Lightning, agricultural fertilization and the use of nitrogen-fixing plants are some of the natural sources that contribute to atmospheric NO_x.

Answer : b

- Ozone is a gas composed of three atoms of oxygen. Ozone occurs both in the Earth's upper atmosphere and at ground level.
- Ozone can be good or bad, depending on where it is found. Called stratospheric ozone, good ozone occurs naturally in the upper atmosphere, where it forms a protective layer that shields us from the sun's harmful ultraviolet rays. This beneficial ozone has been partially destroyed by manmade chemicals, causing what is sometimes called a "hole in the ozone."
- Ozone at ground level is a harmful air pollutant, because of its effects on people and the environment, and it is the main ingredient in "smog."
- Motor vehicle exhaust, industrial emissions, and chemical solvents are the major anthropogenic sources of these ozone precursors.
- Although the ozone precursors often originate in urban areas, winds can carry NO_x hundreds of kilometers, causing ozone formation to occur in less populated regions as well.
- NO and NO₂ (nitric oxide or nitrogen oxide and nitrogen dioxide) emissions cause global cooling through the formation of (OH) radicals that destroy methane molecules, countering the effect of GHGs.
- Nitrous oxide is a greenhouse gas that contributes to global warming Human activities such as agriculture, fuel combustion, wastewater management, and industrial processes are increasing the amount of N₂O in the atmosphere.
- Natural sources of atmospheric NO_x include volcanoes, oceans, biological decay, agricultural fertilization and the use of nitrogen-fixing plants and lightning strikes. Human activities add another 24 million tons of nitrogen oxides to our atmosphere annually.

18) With reference to Spectrum Pollution, consider the following statements:

1. Spectrum pollution is caused both by natural and anthropogenic reasons.
2. The spectrum resource is not destroyed by use as it is infinitely renewable.
3. The intense interest in noise levels back in the days of short- and medium-wave radio has declined with the shift of critical wireless systems to higher frequencies.
4. Spectrum pollution is a special form of Light pollution.

Which of the statements given above are correct?

- a. 1, 2 and 3 only
- b. 2 and 4 only
- c. 2, 3 and 4 only
- d. 1, 2, 3 and 4

Answer : d

- Unlike the other important natural resources such as oil, coal, or natural gas, the spectrum resource is not destroyed by use - it is infinitely renewable.
- The level of aggregate radio noise from both natural and human sources tends to decrease as frequencies become higher, the intense interest in noise levels back in the days of short- and medium-wave radio has declined with the shift of critical wireless systems to higher frequencies.
- However, evidence is emerging that the radio noise floor is rising in higher-frequency bands that are especially important to both commercial and public safety applications.
- Spectrum pollution is a special form of Light pollution.

19) With respect to Methane Hydrates, consider the following statements:

1. It is a solid compound in which a large amount of methane gas molecules (CH_4) are caged within a crystalline structure of water.
2. The total amount of carbon in permafrost associated methane hydrates is much less than the carbon in permafrost soils.

Which of the statement(s) given above is/are correct?

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2



Answer : c

- It is a solid compound in which a large amount of methane gas molecules (CH_4) are caged within a crystalline structure of water under low temperature and high pressure, forming a solid similar to ice.
- It looks like ice, but starts burning when an open flame is brought close to it; methane hydrate is often called "fiery ice."
- They formed as frozen soils that were flooded when sea levels rose after the last ice age.
- If these hydrates thaw, they may release methane that can bubble up to the surface.
- The total amount of carbon in permafrost associated methane hydrates is much less than the carbon in permafrost soils.
- Global warming takes millennia to penetrate into the sediments beneath the ocean.
- As a result, only a small fraction of the existing hydrates could be destabilised during the coming century.
- Even when methane is released from hydrates, most of it is expected to be consumed and oxidised into carbon dioxide in the ocean before reaching the atmosphere.

20) The Arctic is warming twice as fast as the rest of the globe. This warming differential between the poles and the tropics is known as?

- a. Arctic Polarisation
- b. Arctic Sublimation
- c. Arctic Amplification
- d. Arctic Differentiation

Answer : c

Arctic Warming

- The Arctic is warming twice as fast as the rest of the world.
- The rapid Arctic warming is referred to as Arctic Amplification.
- Researchers suggest that it may be blamed for some of the extreme weather episodes.

Arctic Amplification

- It occurs whenever there is any change in the net radiation balance of Earth, and this produces a larger change in temperature near the poles than the global average.
- It is typically measured as the ratio of polar warming to tropical warming.
- This amplification is primarily caused by melting ice - a process that is increasing in the Arctic at a rate of 13% per decade.
- Ice is more reflective and less absorbent of sunlight than land or the surface of an ocean.
- When ice melts, it typically reveals darker areas of land or sea, and these results in increased sunlight absorption and associated warming.

Effects of Arctic warming

- One of the most significant effects of Arctic amplification is the weakening of west-to-east jet streams in the northern hemisphere.
- As the Arctic warms at a faster rate than the tropics, this results in a weaker atmospheric pressure gradient and hence lower wind speeds.



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