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EDITORIAL ANALYSIS → 19 JULY 2022 → THE HINDU:

CLIMATE CHANGE:

- **How does the climate change?**

- Climate change encompasses both the large-scale changes in weather patterns that arise from global warming caused by human-induced greenhouse gas emissions.
- Although there have been other eras of climate change, since the middle of the 20th century, people have had an impact on the Earth's climate system that is unprecedented and has led to change on a global level.
- Climate change is the periodic alteration of the Earth's climate caused by variations in the atmosphere and by interactions between the atmosphere and other geological, chemical, biological, and geographical elements that are part of the Earth's system.
- Weather patterns may become less predictable due to climate change. Unpredictable weather patterns can make it challenging to maintain and develop crops, putting fragile nations like India that rely heavily on agriculture at risk.
- Additionally, it is bringing on harmful weather conditions including more frequent and powerful hurricanes, flooding, cyclones, etc.
- Sea levels are increasing as a result of the faster melting of polar ice due to climate change's rising temperatures. As a result of the increased floods and erosion, this is harming the coastlines.
- Human activity is to blame for the current rapid climate change, which threatens humankind's basic existence.
- Emissions of gases that have a greenhouse effect, of which carbon dioxide (CO2) and methane make up more than 90%, are the main cause of warming.
- The primary source of these emissions is the burning of fossil fuels (coal, oil, and natural gas) for energy consumption, with smaller amounts coming from manufacturing, agriculture, and deforestation.

- Climate feedbacks, such as the disappearance of sunlight-reflecting snow and ice, an increase in water vapour (a greenhouse gas in and of itself), and modifications to land and ocean carbon sinks, can speed up or slow down temperature rise.
- The increase in land temperatures is around twice that of the global average, which has caused the desert to spread and increased occurrence of heat waves and wildfires.
- In the Arctic, where it has led to permafrost melting, glacier retreat, and sea ice loss, temperature rise is also amplified.
- Warmer temperatures increase evaporation rates, which leads to more violent storms and harsh weather conditions.
- Numerous species may be forced to relocate or go extinct as their environment changes, most noticeably in coral reefs, mountains, and the Arctic.
- Food insecurity, water scarcity, flooding, infectious diseases, high heat, economic losses, and eviction are all threats posed by climate change to individuals.
- The World Health Organization has declared climate change to be the biggest threat to world health in the twenty-first century as a result of these human-caused effects.
- Even if attempts to limit future warming are successful, certain effects, such as rising sea levels, rising ocean temperatures, and ocean acidification, would last for generations.

- According to a number of publications from the Intergovernmental Panel on Climate Change (IPCC), these effects will intensify noticeably if global warming continues to rise to 1.5 °C (2.7 °F) and beyond. Additionally, increased warming increases the possibility that crucial thresholds known as tipping points will be reached.

- Through mitigation measures, countries collectively pledged to keep global warming "far under 2.0 °C (3.6 °F)". Global warming would still reach roughly 2.8 °C (5.0 °F) by the end of the century even with pledges made under the Agreement.

- **Why does the world get warmer?**

- The atmospheric buildup of carbon dioxide (CO_2) and other air pollutants, which absorb sunlight and solar energy that has reflected off the earth's surface, is what causes global warming. Normally, this radiation would escape into space, but because these pollutants may linger in the atmosphere for many years or even decades, they trap the heat and make the planet hotter. The greenhouse effect is the result of these heat-trapping pollutants, notably carbon dioxide, methane, nitrous oxide, water vapour, and synthetic fluorinated gases, which are referred to as greenhouse gases.

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- **Causes of climate change include:**

- **Natural Elements:**

- The Earth's climate changes as a result of several natural forces. Over a period of thousands to millions of years, they have an impact on the climate.
- Continental Drift: Before 200 million years ago, the continents of today were not the same.
- They were created millions of years ago when plate reversals caused the landmass to start drifting apart.
- Due to the movement's effects on the landmass's physical characteristics, position, and position of water bodies, including the flow of ocean currents and winds, climate change was impacted.
- Even now, the landmass is still migrating. As the Indian subcontinent moves closer to the Asian mainland, the Himalayan range is rising by around 1 millimetre annually.
- Changes in the Earth's orbit: The Earth's orbit affects the seasonal distribution of sunlight that reaches the planet's surface.
- The distribution of things around the planet can change as a result of a little modification in the Earth's orbit.
- The usual sunshine hasn't changed all that much. However, it has a significant impact on the seasonal and geographic distribution. Three different forms of orbital fluctuations exist: precession of the Earth's axis, variations in the tilt angle of the Earth's axis of rotation, and variations in the eccentricity of the Earth. Together, this can lead to Milankovitch cycles, which are well known for their connection to the glacial and interglacial periods and have a significant effect on climate. Findings from the Intergovernmental Panel on Climate Change demonstrated how the Milankovitch cycles affected how ice formed.

- **Platonic movement:**

- The mantle plumes and convection currents were forced to adapt due to the change in temperature in the Earth's core, which caused the Earth Plates to be rearranged.
- The patterns of climate and atmosphere both globally and locally may be affected by this.
- The positioning of the continents determines the shape of the oceans. As a result, the positioning of the continents affects how the ocean flows. The location of the sea also significantly affects how heat and moisture are transported around the world and impacts the climate globally. The construction of

the Isthmus of Panama, which prevented the direct mixing of the Atlantic and Pacific oceans, around 5 million years ago, is a recent example of tectonic control over ocean circulation.

- Volcanic Activity: When a volcano erupts, gases and dust are released, partially obstructing the sun's beams. This can cause the weather to chill. Although volcanic activity only lasts for a few days, the gases and ashes that are emitted can last for a very long time, causing it to affect climate patterns. As a result of volcanic activity, sulphur oxide can react with water to generate minute droplets of sulfuric acid. Because they are so tiny, many of these droplets can linger in the atmosphere for many years.
- Ocean Currents: One of the main elements of the climate system is the ocean current.
- The movement of the water against the sea surface is caused by horizontal winds.
- The climate of the area is influenced by the water's temperature variations.

- **Environmental factors:**

- Since the turn of the 20th century, scientists have researched the effects of climate change brought on by human activity. One of the main components of climate change is global warming, which is the gradual increase in the Earth's climate system's average temperature. The rise in the earth's surface temperature is primarily due to human activity. These are the manmade elements driving climate change:

- **Greenhouse Gases:** The greenhouse gases are substances that absorb solar heat energy. The release of greenhouse gases into the atmosphere has grown rapidly since the start of the Industrial Revolution. More absorption and heat retention have resulted from this. The global temperature rose as a result of this. The majority of the infrared released by the Earth's surface is absorbed by the greenhouse gases, which mostly do not absorb the sun energy.
- One of the primary greenhouse gases is water vapour (the majority of the GHG in the atmosphere but the impact is less).
- The influence of carbon dioxide that is emitted due to anthropogenic and natural processes increases as a result of greater time spent in the atmosphere. Since the beginning of the industrial revolution, the concentration of CO2 has increased by 30%. Deforestation, in addition to the industrial revolution, has been linked to an increase in CO
- Chlorofluorocarbons, a man-made substance regulated by the Montreal Protocol because of its harmful effects on the ozone layers, are utilised for industrial reasons, particularly in refrigerants and air conditioning.
- As organic matter decomposes, methane is released. Because it can absorb more heat than CO2, it is more powerful.

- The agricultural industry generates nitrous oxide, particularly during the creation and application of organic fertilisers as well as while burning fossil fuels.

- **Change of the land use pattern:**

- It's estimated that the industrial age was responsible for half of the change in land use.
- The majority of the trees were replaced by pasture meadows and agricultural cultivation.
- The planet's surface cooled as a result of the increased albedo (an object's reflectance in space) caused by deforestation in the snow-covered high altitude areas. The amount of solar radiation absorbed by the globe increases with decreasing albedo, which causes temperatures to rise. The Earth will cool if its albedo is higher and it is more reflective, as more radiation will be reflected back into space. Tropical deforestation influences soil moisture properties, desertification, and evapotranspiration rates (the quantity of water vapour sent into the atmosphere by evaporation and transpiration from trees). The removal of forest cover for agriculture and irrigated farming in dry and semi-arid lands can increase solar energy absorption and the quantity of moisture evaporated into the atmosphere, according to satellite photography.

- **Aerosols in the atmosphere:**

- In change to changing the microphysical and chemical characteristics of clouds, atmospheric aerosol can scatter and absorb solar and infrared energy. The planet cools as a result of dispersed solar energy. Instead of enabling the sunlight to be absorbed by the Earth's surface, however, the aerosols' absorption of solar radiation raises the temperature of the air. Aerosols' ability to either reflect or absorb solar energy has a direct impact on climate change. By changing the formation and characteristics of the cloud, they can also have indirect consequences. Wind and upper-level atmospheric circulation can potentially carry them thousands of kilometres from their origination.
- Natural aerosols and anthropogenic aerosols are the two different types of aerosols.
- Sulphate aerosols are produced by volcanic eruptions, one of the sources of natural aerosols, and biogenic sources, such as planktons (can produce dimethyl sulphide).
- The ammonia used for fertilisers or released by the burning of plants and other organic materials is a primary source for nitrate aerosols, among other anthropogenic aerosols. Sulphur dioxide is created when coal and oil are burned, and it is a primary contributor to sulphate aerosols. When biomass is burned, organic droplets and soot particles may be released. Wide-ranging aerosols are released into the atmosphere as a result of industrial activity. Numerous contaminants that are produced by vehicle emissions might either start out as aerosols or turn into them as a result of atmospheric chemical

interactions. According to research, the Northern Hemisphere has a radiation concentration that is 50% higher than the Southern Hemisphere because the concentration of aerosols is approximately three times higher in the Northern Hemisphere.

- **Climate change effects include:**

- **A temperature increase in the atmosphere:**

- The Earth is getting hotter as a result of greenhouse gases caused by human activity.
- The hottest six years ever recorded were the last six.
- The current surge in heat-related illnesses and deaths, the rise in sea levels, and the intensification of natural disasters are all primarily caused by the rising temperature.
- The average temperature of the Earth rose by 1°F throughout the 20th century. This is thought to be the fastest increase in a millennium.
- According to research predictions, the average surface temperature could rise by 3-5°F by the end of this century if GHGs are not lowered.

- **Landscape change:**

- Global climate, altered weather patterns, and a shift in temperature have caused trees and plants to migrate to the poles and mountains.
- The animals that depend on the vegetation will be compelled to follow it as it attempts to adapt to climate change by shifting to cooler locations in order to survive. While some people succeed, many others fail.
- The melting of the ice poses a threat to other animals, such as polar bears, which depend on cold environments for habitat.
- Thus, many species, including the human population, are at serious risk of extinction due to the current fast change in the landscape.

- **Ecosystem vulnerability:**

- Global warming is altering the weather and vegetation patterns, which forces some species to relocate to colder regions in order to survive.
- Many species are in risk of extinction as a result of this. If the current trend continues, it is predicted that one-fourth of Earth's species may go extinct by 2050.

- **Rising sea levels:**

- Due to thermal expansion, a rise in Earth's temperature causes the sea level to rise (a condition wherein the warm water takes up more area than cooler water). This issue is exacerbated by glacial melt.
- Rising sea levels pose a hazard to the people who live in low-lying areas, on islands, and along coasts.
- It erodes coastlines, wrecks homes, and obliterates ecosystems like mangroves and wetlands that guard coastlines against storms.
- The sea level has risen 4 to 8 inches during the past 100 years, and it will continue to climb between 4 and 36 inches over the following 100 years.

- **Seawater acidification:**

- The amount of CO2 absorbed by the ocean has increased as the atmospheric CO2 concentration has risen. As a result, the ocean is acidic.
- Plankton, molluscs, and other marine creatures, among others, may suffer harm as a result of the ocean's increased acidity. Since it is challenging for corals to build and maintain the skeletal structures necessary for survival, they are particularly vulnerable to this.

- **The likelihood of both natural and man-made disasters rising:**

- Because of the high ambient temperature, moisture from the soil and water is evaporating quickly.
- The result is drought. Drought-affected areas are more vulnerable to the harmful consequences of flooding.
- The droughts could get worse and happen more frequently under the current circumstances. The effects on agriculture, water security, and public health could be disturbing.
- Droughts are growing longer and more severe in countries in Asia and Africa, which are already experiencing this problem.
- In addition to exacerbating droughts, the rising temperature is also increasing the number of forest fires around the world.
- Hurricanes and tropical storms are becoming more frequent and intense due to climate change, which has a terrible effect on both human societies and the environment.
- The increase in ocean temperature is to blame for this, as warm seas affect the energy of hurricanes and tropical storms.

- Intensifying hurricanes and tropical storms are also a result of increasing sea levels, the disappearance of wetlands, and increased coastal urbanisation.

- **Health problems:**

- Globally high temperatures can cause health problems and even fatalities.
- Many people have died worldwide as a result of the rising heat waves brought on by climate change.
- For instance, in 2003, India and Europe both saw more than 1,500 fatalities as a result of the intense heat waves.
- As a result of the long-term warm weather allowing disease-carrying insects, animals, and bacteria to survive longer, climate change enhances the spread of dangerous diseases.
- Inhospitable cooler locations may now be home to diseases and pests that were formerly restricted to the tropics.
- As a result of climate change, there is now an increase in fatalities from diseases, natural catastrophes, and high temperatures.
- According to the World Health Organization, between 2030 and 2050, climate change may result in an additional 250,000 fatalities year from starvation, malaria, diarrhoea, and excessive heat.

- **Monetary effects:**

- According to estimates, the annual cost of climate change might range from 5 to 20 percent of the global GDP if action is not taken to reduce carbon emissions.
- In contrast, it would only cost 1% of GDP to mitigate the worst impacts of climate change.
- Shoreline ecosystems may be changed by climate change. Ports, near-shore infrastructure, and habitats may need to be relocated as a result, which would cost millions of dollars.
- Increased hurricane activity and other natural catastrophes can result in significant financial losses due to infrastructure and property destruction.
- The prospect of mass famine for thousands of people can be brought on by declining agricultural yields as a result of protracted droughts and hot heat.
- The annual revenue from coral reefs is over $375 billion in products and services. Their very existence is currently in danger.

- **Productivity in agriculture and food security:**

- Solar radiation, a comfortable temperature, and precipitation are all necessary for crop cultivation.

- As a result, climate patterns have always been important for agriculture.
- Affected by the current climate change are agricultural productivity, the availability of food, and food security.
- These outcomes have a biophysical, ecological, and financial impact.

- **They produced:**

- Zones of agriculture and climate are shifting toward the poles.
- Due to the change in atmospheric temperature, the pattern of agricultural production has changed.
- The rise in atmospheric CO2 has led to an increase in agricultural output.
- unpredictable patterns of precipitation
- The vulnerability of the impoverished and those without access to land has grown.

- **India is impacted by climate change:**

- **India ranked sixth among nations most impacted by climate change:**

- When Germanwatch, an environmental non-profit research tank, announced in 2018 that India was the sixth most severely impacted nation worldwide by climate change, it was not shocking.
- The nation has experienced at least one extreme climate event every month for the past two years.
- India ranks fourth among South Asian nations in terms of risk, behind Pakistan, Afghanistan, and Bangladesh, according to the World Risk Index 2020.
- There is no denying the existence of climate change and the catastrophic consequences it will have.
- Internal migration has historically taken place in India for reasons related to kinship, work opportunities, access to better healthcare, and education.
- In recent years, climate calamities have also played a role in forced and unplanned migration as well as forced and intentional relocation in India.
- Nearly 7 million Indians left their homes or moved owing to climate-related hardship in 2018 alone.

- South Asia is one of the primary regions that will be most sensitive to climate change in the future.
- Due to its varied topography and rapid exploitation of natural resources as a result of the current trend of precipitous urbanisation, industrialization, and economic growth, India in particular will be sensitive to climate change.
- Each day, environmental contamination causes a worsening of the quality of the water and air.

- The nation's agricultural output, biodiversity, and coastal ecosystems are particularly vulnerable to climate change.
- The intensification and increase in frequency of natural catastrophes are having a negative impact on India's already fragile economy.
- Such calamities have a variety of negative repercussions, including poverty, disease vulnerability, loss of income, and ruined livelihoods.
- The World Bank predicts that a 2°C rise in global average temperature over the next few decades will only worsen the unpredictability of India's monsoon season.
- Many parts in India are expected to become inundated by the changing rain patterns, while others are expected to experience water scarcity.
- The bulk of the people in India depends on the agriculture industry for survival, and more than 60% of India's agriculture is dependent on rain. India is now more vulnerable to climate change as a result.
- With a 2-2.5°C temperature increase, it is predicted that the Indus, Ganges, and Brahmaputra river basins' water levels will decrease by the 2050s. The food security of nearly 63 million people may be in risk because of this.
- The poor will be more at risk from climate change since many of them rely on agriculture that depends on rain.
- By the 2040s, a 2°C rise will have an impact on crop production and cut crop output by 12 percent, necessitating additional imports to satisfy domestic demand.
- Reliable water resources in India may be at risk due to melting glaciers and snowmelt.
- Snow and glacier meltwater are the main sources of water for major rivers including the Ganges, Indus, and Brahmaputra. They are more susceptible to global warming as a result.
- Agriculture may be threatened by climate change and the risk of floods in low-lying areas will likely increase.

- **Increase in cyclone intensity:**

- The height of the sea surge might rise to 7.46 metres.
- More than the average for the world, sea levels will rise.
- Darjeeling Hill and the Sunderbans will receive more rain

- **The Himalayan area of India:**

- The Himalayas, which make up around 16.2% of the country's total territory, are not only an important watershed for India but also play a significant part in the monsoon cycle. The entire subcontinent may be impacted by the mountain range's response to climate change.
- In the past 30 years, the Himalayas' mean temperature has risen by 0.6°C, and warmer days are happening more frequently.
- India's northeastern states, especially sections of Assam and Manipur, are at risk.
- Landslides and a large-scale loss of food security could result from flash floods brought on by glacial lake outbursts.
- In comparison to other glaciers across the world, those in the Himalayas are melting more quickly. Over the past few years, apple productivity has dropped by 2–3%. This will decline even more.
- The Himalayan region is expected to experience a 2–12% rise in the number of rainy days.

- **India's Climate Change Initiatives:**

- With around 5% of the world's emissions, India ranks as the third-largest economy and fifth-largest producer of greenhouse gases (GHG). Between 1990 and 2005, India's emissions climbed by 65 percent, and by 2020, they are expected to increase by a further 70 percent.
- India's emissions are low by other standards compared to those of other significant economies. Only 2% of all emissions connected to energy since 1850 come from India. India's emissions are 93 percent lower than those of the United States and 70 percent lower than the global average per person.
- India is also one of the nations most affected by the effects of climate change. The issue of ending poverty is being made more difficult by changing rainfall patterns, recurrent floods, harsher cyclones, droughts, and soil erosion, which calls for allocating limited national resources for reducing human casualties.
- India is taking aggressive steps to implement adaptation and mitigation measures despite resource restrictions, including significantly reducing the energy intensity of our economic growth, improving energy efficiency across sectors, and boosting the use of renewable energy sources.
- Few countries have increased the Clean Energy Cess on coal, but India has, and the Clean Energy Fund already has nearly $3 billion US to support the development of clean technologies. The National Solar Mission of India is expanding five times, from 20,000 to 100,000 megawatts.
- This will result in an additional expenditure of $100 billion and annual CO2 emissions reductions of around 165 million tonnes.
- For aggressive afforestation, which would increase the number of carbon sinks, India is releasing 6 billion US dollars all at once.

- The "National Adaptation Fund," the creation of Ultra Mega Solar Projects, Ultra-Modern Super Critical Coal Based Thermal Power Technology, and Solar Parks on Canals have all received funding from India totaling roughly 200 million US dollars.
- Another effort, "100 Smart Cities," has been funded with 1.2 billion US dollars and includes integrated strategies for adaptation and mitigation to lessen metropolitan areas' vulnerability and exposure to climate change as well as to increase their energy efficiency. India has strict regulations in place for the cement business.
- Our action plan for cleaning the Ganga, one of the world's longest rivers, will have numerous positive effects on pollution reduction and climate adaption. Additionally, we have taken steps to conserve forest, Himalayan, and coastal habitats.
- In addition to launching a National Air Quality Scheme, India has started making plans to create a national air quality index. To encourage renewable energy, ultra mega solar projects are being built in Tamil Nadu, Rajasthan, Gujarat, Andhra Pradesh, and Ladakh.
- **National Climate Change Action Plan**

- **ISA: International Solar Alliance:**

- State Action Plan on Climate Change (SAPCC): The eight National Missions under the NAPCC have been matched with climate policies developed by state governments. The strategies put a strong emphasis on a climate of concerns, including resource conservation, energy efficiency, and climate adaptation.
- FAME Scheme for E-mobility: In an effort to increase the country's sales of environmentally friendly automobiles, the Union Government introduced the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) - India Scheme in April 2015. The National Mission for Electric Mobility includes it.
- Smart Cities Atal Mission for Rejuvenation & Urban Transformation (AMRUT).
- Pradhan Ujjwala Mantri Five crore recipients of the below-poverty-line programme receive LPG connections. The connections are provided in the names of women beneficiaries in an effort to lessen their reliance on traditional fuels like cow dung and fossil fuels for cooking, which in turn will lessen air pollution.
- Prime Minister Narendra Modi introduced the UJALA programme in January 2015 with the goal of replacing 77 crore incandescent lamps with LED bulbs. Utilizing LED bulbs will not only lower electricity costs but also contribute to environmental protection.

- **India's participation in global climate change forums:**

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- India is actively committing itself to the mission to tackle climate change by adopting voluntary targets at the international fora. It is also significantly assisting in the fight against climate change.
- The internal pressure to address issues like the need for eradicating poverty, food and nutritional security, achieving universal access to health care and education, water security, renewable energy, and employment has led to India's proactive engagement in climate change mitigation.
- According to India, the primary distinction between developing countries and developed countries should be drawn in terms of the need for inclusive growth, sustainable development, the eradication of poverty, and universal access to energy. The Conventions now use the historical emissions of developed countries to distinguish between developed and developing countries.