



Climate Change: Impact, Mitigation, Adaptation and Solutions

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Abstract

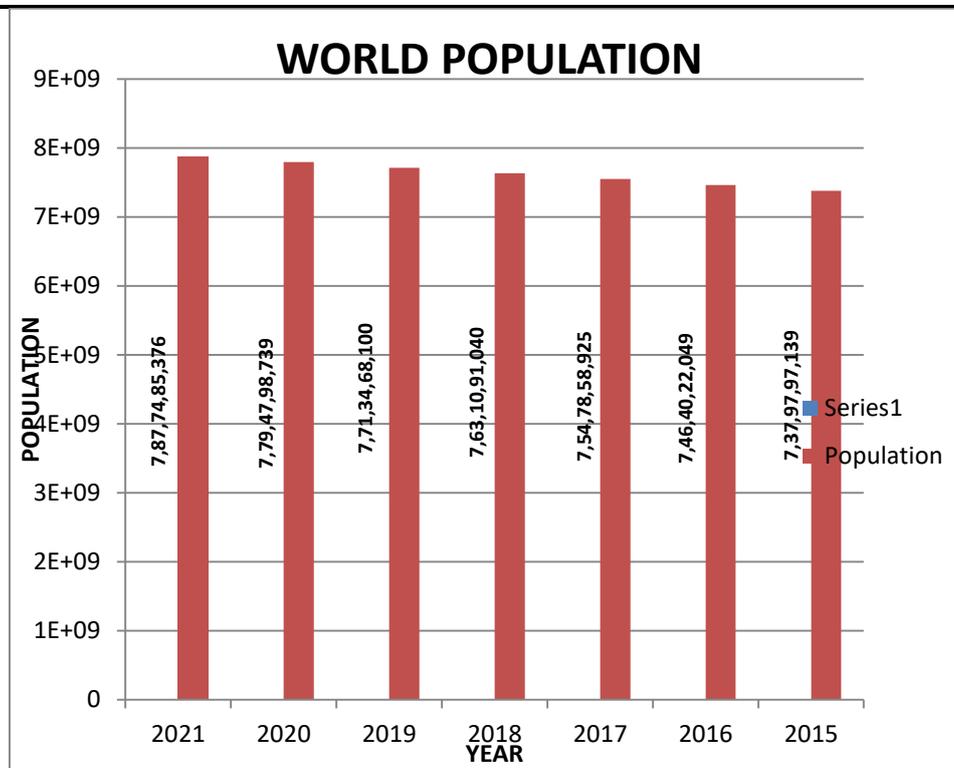
Climate change, driven by human activities such as burning fossil fuels and deforestation, is altering global weather patterns, increasing temperatures, and intensifying extreme events like floods and droughts. Its impacts include rising sea levels, loss of biodiversity, and disruption to ecosystems and human livelihoods. Mitigation efforts focus on reducing greenhouse gas emissions through renewable energy, reforestation, and energy efficiency. Adaptation involves adjusting societal systems to cope with climate impacts, such as building resilient infrastructure and improving disaster management. Solutions require global cooperation, policy changes, and innovation in technology, alongside behavioural shifts toward sustainability. Addressing climate change is vital to securing a stable and healthy future for the planet.

Keywords: Mitigation, Adaptation, Climate Change, Solutions, Global

Introduction

Over the past few decades, human actions such as deforestation, greenhouse gas emissions, and reckless use of fossil fuels have caused substantial climate change around the world. Before the Industrial Revolution, there were 280 parts per million (ppm) of CO₂ in the atmosphere. By 2014, that number had risen to 400 ppm and has been rising ever since. Global climate projections suggest that increased greenhouse gases will cause temperatures to rise by 1.5 to 4.5 °C by 2050. According to climate change projections, India will experience warming that is greater than the global average and fewer days of extreme cold. Tropical cyclones are expected to increase the frequency of heavy rain and strong winds. According to scientists at NOAA's National Centers for Environmental Information, 2021 had the sixth warmest global surface temperatures since records were kept in 1880. 2021 is tied with 2018 as the sixth warmest year, according to a separate analysis of global temperature data released today by NASA. The average global surface temperature in 2021 was 1.51 °F (0.84 °C) above the 20th century average, making it the sixth warmest year on record among all the years 1880 to 2021.

Climate Change: Resulting Human Population



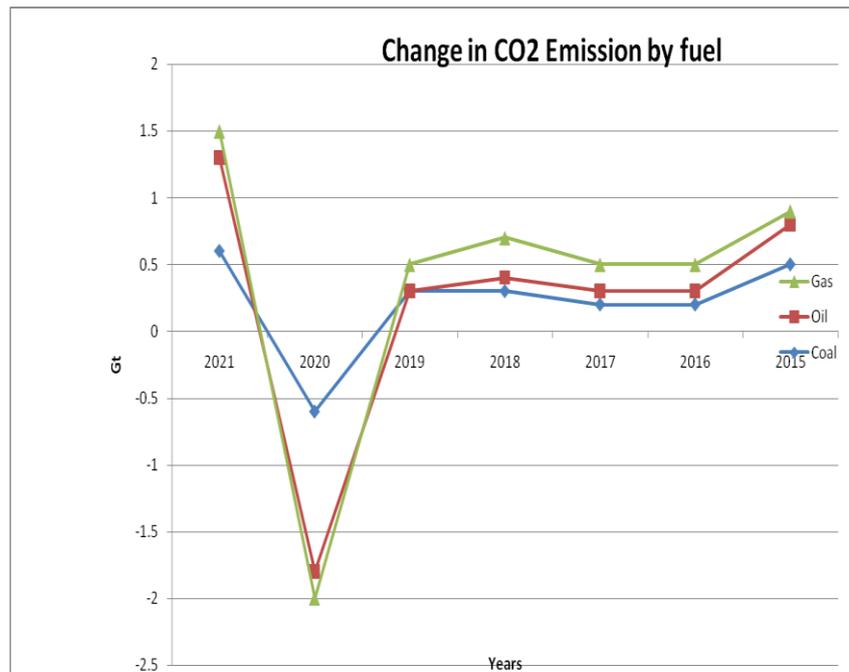
Human health and well-being are threatened now and in the future as a result of population growth and climate change. Problems associated with a growing population are increasing, in part due to rising emissions that have a negative impact on the climate. Existing dangers are amplified by population growth, which places greater demands on climate-sensitive resources such as food and water. Despite these feedbacks, population policies are often overlooked when considering strategies to mitigate global warming concerns.

The assumption that there is a simple and direct link between human population and environmental impacts such as deforestation, species loss and greenhouse gas emissions is often raised in attempts to link population growth and environmental degradation and, more recently, population growth and climate change. . Even if the primary causes of the problems are far away, such as when forests are cut down for timber, to produce livestock, or to grow cash crops for export, those living near areas of environmental degradation are responsible.

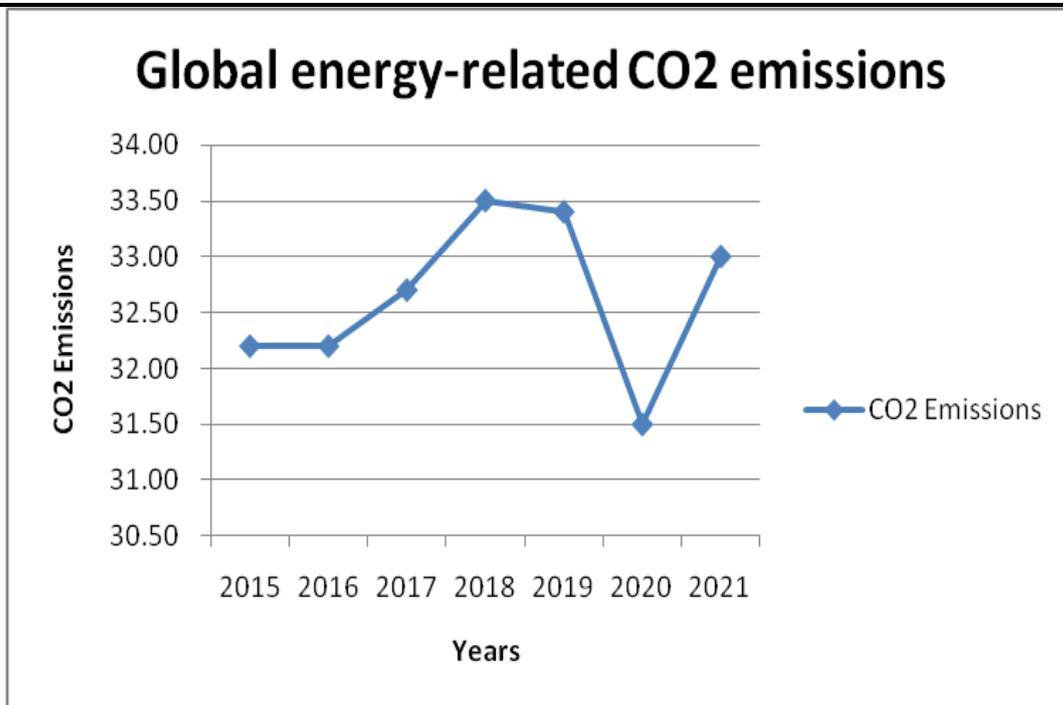
The scarcity of resources, typically the result of a system that is almost entirely focused on profits rather than social demands, was explained away and population control was justified by theories of overpopulation that were presented as principles that seemed to be “natural. An economic and governance structure that places greater emphasis on wider community benefits than corporate profits and an extractive framework would address the root causes of scarcity.

The justification for coercive population control measures and human rights abuses such as forced sterilization and family size restrictions, which disproportionately affect black, brown and indigenous peoples as well as the poor, is also done under the pretext of overpopulation. . Furthermore, despite the fact that some Western states offer per-child subsidies to increase their native populations, anti-immigration activists continue to call for tighter regulation of legal immigration and refugee inflows from the Global South, citing the threat of future consumption, patterns and environmental degradation.

Global CO2 Emissions



The largest drop in CO₂ emissions on record occurred in 2020, when they fell by 5.8%, or roughly 2 Gt CO₂, nearly five times the drop that followed the global financial crisis in 2009. As a result of the pandemic's greater impact on demand for coal and oil than for other energy sources, CO₂ emissions fell more than energy demand in 2020, while renewables increased. Despite the decline in 2020, global energy-related CO₂ emissions remained at 31.5 Gt, helping CO₂ reach a record high annual average concentration in the atmosphere in 2020 of 412.5 ppm, more than 50% higher than in early 2020. Industrial revolution. Global energy-related CO₂ emissions are expected to rise, increasing by 4.8 percent in 2021 as demand for coal, oil and gas improves along with the economy. An increase in carbon dioxide emissions of around 1,500 Mt would be the largest single increase since the carbon-intensive economic recovery after the global financial crisis more than a decade ago, and would reduce global CO₂ emissions by 400 Mt, or 1.2 percent, in 2021 compared to 2019. Despite global economic activity increasing above 2019 levels and global energy demand recovering above 2019 levels, we do not expect CO₂ emissions to reach pre-crisis levels in 2021. Oil-related emissions are expected to recover only half of the reductions in 2020, leaving 500 Mt CO₂ below 2019 levels in 2021, despite a 650 Mt increase in CO₂ from oil. The ongoing effects of the Covid19 epidemic and the associated restrictions on transport activities in 2021 are the only factors contributing to the expected partial recovery.



While emissions from road transport and domestic aviation are expected to be almost 350 Mt CO₂ (or 5%) below 2019 levels in 2021, CO₂ emissions from international air transport are expected to be 200 Mt CO₂ (or a third) below pre-pandemic levels. If global traffic were to fully resume, oil-related emissions would increase above 2019 levels and global CO₂ emissions would increase by more than 1.5 percent, well above 2019 levels. Global coal consumption is expected to increase in 2021, leading to an increase of CO₂ by 640 Mt. This would increase coal-related CO₂ emissions to 14.8 Gt CO₂, 0.4 percent more than in 2019 and only 350 Mt CO₂ close to the global coal-related CO₂ peak of 2014. In 2020 energy accounted for less than half of the reduction in emissions caused by coal; however, it now accounts for 80% of the return, partly due to rapidly growing coal production in Asia. Natural gas burning is expected to increase CO₂ emissions by more than 215 Mt CO₂ in 2021, reaching an all-time high of 7.35 Gt CO₂, or 22% of global CO₂ emissions. Gas consumption in buildings and industry is mostly responsible for this pattern, with demand in public and commercial buildings falling the most in 2020 but increasing the most in 2021.

Climate Change: Impacts on Agriculture

The length of the growing season (LGP) is expected to increase due to global warming; however, physiological development is accelerated due to increased day and night temperatures, resulting in rapid maturity and lower yields. Increased night breathing could also reduce yields. Precipitation variability is likely to increase as a result of global climate change. The LGP is projected to shorten as rainfall decreases and atmospheric demands increase due to rising temperatures. If farmers do not understand the extension of the growing season, they will experience increased crop failures due to late season drought. From July to August and also from September to October, there is a marked shift in rainfall patterns in the eastern dry agro-climatic zone of Karnataka (which includes parts of Bangalore and Kolar districts as well as parts of Tumkur district). If the crops are sown in July, the plants will produce significantly less grain due to the moisture caused by the decrease in September rainfall and the interception of the October rains. After the soil was prepared by the June and July rainfall, the crops (a long-duration variety with a 115-day growing season) could be sown in August. In years when the southwest monsoon arrives early, sowing during the last week of July is recommended. August crops would reach their peak growth in October. Better crop yields are expected as the crop does not suffer from a lack of moisture during its main growing season due to higher October rainfall. An increase in average temperature above a certain point will reduce agricultural productivity. The minimum temperature change is more important than the largest temperature change. For example, rice grain yields fell by 10% with each 1°C increase in the minimum growing season temperature above 32°C. Increases in temperature of 1°C, 2°C, and 3°C, holding all other climatic factors constant,

reduced rice grain yields by 5.4 percent, 7.4 percent, and 25.1 percent, respectively, in Punjab, India. In order to assess the effects of daily temperature and radiation changes on the yield and yield components of aromatic and non-aromatic rice varieties under field conditions, as well as to document their influence on grain and seed quality, field experiments and laboratory analyzes with five high-yielding rice varieties, including aromatic and of non-aromatic varieties, were carried out in 2005 at IARI, New Delhi. MNT (P 0.001) and radiation (P 0.001) had the greatest effect on grain yield of all five species, with MNT and radiation accounting for 87 and 77 percent of the yield change, respectively. A very small temperature range of 23°C to 24°C was found to give maximum yields, with a temperature increase of 1°C or 2°C greatly reducing grain production. Along the high ranges of India's Western Ghats, surface air and daytime temperatures are forecast to rise, posing a threat to heat-sensitive crops such as black pepper, cardamom, tea, coffee, cashew and other plantation crops.

ICRISAT used crop models (DSSAT and APSIM) to investigate the effects of climate change on crop growth, development and productivity under different climate change scenarios. Climatic changes in arid regions, which are characterized by high temperatures, can shorten the sorghum harvest time in Maharashtra by 15 days, according to the simulation results. Due to the increased need for evapotranspiration, increased temperature causes reduced radiation interception, harvest index, biomass accumulation and increased water stress in plants. In Parbhani, Maharashtra, the 3.3°C temperature increase projected by the end of the century is expected to reduce sorghum yields by 27 percent.

Climate Smart Agriculture (CSA)

In the face of climate change, climate-smart agriculture provides a strategy to meet short- and long-term agricultural development targets while also serving as a bridge to other development initiatives. It aims to assist governments and other actors in establishing the policy, technological, and financial circumstances that will allow them to:

1. Increase agricultural production and incomes in a sustainable manner in order to achieve national food security and development goals.
2. Increase agriculture and food system resilience and capacity to respond to climate change.
3. Look for ways to reduce greenhouse gas emissions and boost carbon sequestration.

In climate-smart agriculture, these three circumstances are referred to as the "triple win" (food security, adaptation, and mitigation). Climate-smart agriculture uses techniques and equipment to increase output while simultaneously helping farmers adapt to climate change and reduce greenhouse gas emissions. Climate-smart strategies can include a wide range of elements, from farm-level practises to policy and finance systems.

Climate adaptation is the ability of a system to alter in response to climate change in order to reduce potential harm, take advantage of opportunities, or deal with the effects. Changes in natural or human systems in response to current or future climatic stimuli or their repercussions are referred to as adaptation to climate change, with the aim of minimising harm and maximising benefits. Different types of adaptation include autonomous and planned adaptation, anticipatory and reactive adaptation, and private and public adaptation.

Climate adaptation

Adaptation solutions must be adequately established in order to increase agricultural production's resistance to climate change. In several parts of the country, improved farming methods have emerged throughout time. Management methods that are used in the face of weather anomalies might be used as possible climate change adaption measures. Climate change resilience necessitates the identification of climate-smart crops and management strategies, as well as a high level of community knowledge. One of the most important

ways for increasing the productivity and sustainability of rainfed agriculture is to intercrop with grain legumes.

The following are some of the most productive intercropping alternatives for intensifying and diversifying rainfed cropping systems:

- ✓ Groundnut with maize
- ✓ Pigeonpea with maize
- ✓ Pigeonpea with soyabean

Some of the other initiatives include ridge planting methods, seed treatment, Integrated Pest Management (IPM), adoption of better crop types and production technologies, and promotion of community-based seed producing organisations and market connections. Encouragement should be given to IPM strategies for minimising pod borer in chickpea and pigeonpea, as well as seed treatment with *Trichoderma* spp. and fungicides for managing seedling infections. IWM's ability to increase water usage effectiveness is essential for rainfed agriculture. An alternate source of irrigation water is the appropriately managed reuse of municipal drainage and wastewater.

Climate Mitigation

Improvements in organic matter management include encouraging aerobic degradation through composting or incorporating it into the soil during off-season drained periods; using rice cultivars with few unproductive tillers, high root oxidative activity, and high harvest index; and applying fermented manures like bicarbonate of soda. Changes in water management, particularly short-term drainage is to promote mid-season aeration. By changing the content of the feed, one can either increase milk and meat production or decrease the amount of feed that is converted to gas, hence lowering ruminant methane emissions. The most effective management tactic for lowering nitrous oxide emissions is site-specific, effective nutrient management. Nitrification inhibitors such as dicyandiamide and nitrapyrin may be able to reduce emissions (DCD). A different strategy called direct seeded rice (DSR) can save time and money by requiring less labour and irrigation water. Upgrading rainfed areas through DSR can aid in soil and water conservation while also addressing risks from climate change in the face of rising population and food demand. Conservation agricultural technology aids in coping with the effects of climate change.

Systems on Vertisols based on legumes are more sustainable than systems based only on cereal. A wide range of techniques for managing soil and crops have an impact on soil C sequestration. The solutions with a reasonably high potential for storing carbon and increasing and recovering soil fertility over time include conservation tillage, high-rate organic matter application, integrated nutrient management, restoration of eroded soils, and soil and water conservation.

The Leaf Colour Chart (LCC) is a simple and low-cost technique for evaluating plant nitrogen status. The LCC encourages the timely and efficient application of nitrogen fertiliser in rice and wheat to save money on fertiliser and reduce fertilizer-related pollution of surface and groundwater. In the hands of farmers, it is a potential environmentally benign and low-cost instrument.

Agriculture and renewable energy are a good mix. Renewable energy sources such as wind, sun, and biomass may be gathered indefinitely. Biomass, which is produced directly in the villages, has a lot of potential for effective use in residential, production agriculture, livestock raising, and agro-processing activities via thermal and bio-conversion routes, among other renewable energy sources. Sun cookers for cooking, solar driers for drying agricultural products, solar water heaters, and solar photovoltaic systems for pumping devices used for irrigation and drinking water are all becoming more popular in rural India. Farmers can lease property to wind developers, use the wind to generate electricity for their farms, or start their own wind farm.

Change in India and variability in climate

Numerous studies have shown that climate change in India is real and it poses a significant challenge to Indian agriculture, especially in the semi-arid tropics (SAT). India is the largest producer of rainfed crops both in terms of the amount produced and the value of the crops produced. Rainfed agriculture is carried out under a variety of soil types, agro-climatic conditions, and rainfall scenarios. Rainfed regions in India contribute substantially toward food grain production including 44% of rice, 87% of coarse cereals (sorghum (*Sorghum bicolor*), pearl millet (*Pennisetum glaucum*), maize (*Zea mays*)), and 85% of food legumes, 72% of oilseeds, 65% of cotton, and 90% of minor millets. Overall, the rainfed areas produce 40% of the food grains, support two-thirds of the livestock population, and are critical to food security, equity, and sustainability.

India is home to 18% of world's population, 15% of the world livestock, 4.2% of fresh water resources, 1% of forests, and 0.5% of pasture land, but only has 2.3% of the geographical area. Changes in temperature, increasing rainfall variability, and higher carbon dioxide concentrations are all signs of climate change. The length of the rainfed crop-growing season is anticipated to shift as a result of climate change. In India, rainfed agriculture is critical for maintaining food security for the poorer and larger segments of the population, yet it frequently corresponds with high rates of poverty and malnutrition.

Climate change-related yield reductions are more likely to be seen in rainfed agriculture and in areas with limited water supplies. Crop yields in the country's dryland areas are fairly low (1-1.5 t ha⁻¹), which are two to five times lower than yields from researchers' plots. The current efficiency of rainwater utilisation in dryland agriculture ranges from 35 to 45 percent, and the tremendous potential of rainfed agriculture might be realised by utilising extant scientific advances, such as enhanced cultivars. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is one of the Consultative Group on International Agricultural Research's 15 Future Harvest Centers (CGIAR). It emphasizes that Integrated Genetic and Natural Resource Management (IGNRM) approaches, enhanced input-output market delivery systems for agricultural production, and knowledge dissemination through capacity building will be crucial to chances for sustained productivity growth in the SAT.

We are already committed to some degree of climate change, we must take a two-pronged approach to combating it:

1. Mitigating climate change via reducing emissions and stabilising levels of heat-trapping greenhouse gases in the atmosphere ("mitigation");
2. Adapting to climate change already underway ("adaptation").

Innovative Extension Systems for Climate Resilient Agriculture

Climatic change adaptation entails making modifications to reduce agriculture's sensitivity to existing and future climate variability. Farmers have long-held beliefs about when to sow and harvest crops, as well as how to manage them. Without an adequate network of extension services that can filter knowledge garnered via science to the grass roots, farmers may not have the essential information about feasible climate adaption choices. Furthermore, farmers must possess the essential abilities to adopt an alternate production approach. Farmers need to be provided with both climate and weather information for sustainable crop production under the climate change scenario, due to volatility in rainfall conditions and the possibility of extreme weather. Lack of awareness among farmers about appropriate agricultural practises has long been a fundamental limiting factor for boosting production levels, hence the agriculture extension system plays a critical role in expanding the knowledge and skills of farmers in order to improve agricultural output. As a result, enhancing agricultural extension services has a clear and unique role to play in raising farmer understanding of potential adaptive response choices. The key stakeholders in communicating with farmers about how to cope with climate change through adaptation measures are agricultural extension professionals. The science of climate change, as well as the numerous adaptation and mitigation measures accessible at

universities, research institutions, and government agencies, must be developed into relevant training modules for agricultural extension employees. Extension employees will become more knowledgeable about climate change as a result of this. Climate change seminars and workshops should be held on a regular basis, and extension employees should be allowed to participate so that they may get the necessary skills to assist farmers.

Knowledge Delivery Pathways is the other aspect of the extension system (KDP). Traditional methods of disseminating information include announcements, infographics (wall writing or banners), and planned television and radio shows, all of which are still viable options for mass communication. Farmers frequently want information about weather, appropriate agricultural techniques, insect/pest detection and management, as well as where to buy inputs and market their output. However, this information should arrive when it is most needed, and the standard KDP is insufficient to deliver this solution. To make current Agricultural Extension Systems really creative, it is necessary to revitalise them using novel ICT models for knowledge development and distribution.

Extension agents and farmers now have a variety of alternatives for accessing up-to-date information thanks to information communication platforms. The AES is being transformed by the Indian government and commercial firms. For information dissemination, a variety of technologies are utilised. For example, the Government of India has established a Kisan Call Center (KCC) to respond to information requests from farmers in 22 local languages. The Karnataka State Natural Disaster Management Center provides a service to its customers throughout the state that allows them to get daily weather updates, as well as alerts regarding weather anomalies. Private enterprises, in addition to the government, are developing novel agricultural extension solutions. For example, IFFCO Kisan Sanchar Limited has added audio messages for its agro-advisory system, while Thomson Reuters has launched 'Reuters Market Light,' a mobile-based integrated agro-advisory system. Farmers may make decisions about various agricultural activities based on information updates gained from such advisory systems, which ultimately helps farmers manage with climatic fluctuation and change.

Solutions

Climate change is one of the most difficult problems we face today. It has many facets - science, economics, society, politics, and moral and ethical issues – and is a global issue that will be felt on local scales for decades and centuries. Carbon dioxide, the heat-trapping greenhouse gas that has fuelled recent global warming, can stay in the atmosphere for hundreds of years, and the Earth (particularly the seas) takes a long time to adjust to warming. As a result, even if we completely ceased emitting greenhouse gases today, global warming and climate change would continue to afflict future generations. As a result, humanity has "committed" to a certain degree of climate change. Agriculture could help mitigate climate change by sequestering carbon (C) in soil and tree biomass, as well as lowering greenhouse gas (GHG) emissions. Increased C benefits some soil structures and functions, allowing for better water utilisation and, as a result, crop adaptation. Mitigation is limiting the flow of heat-trapping greenhouse gases into the atmosphere, either by reducing sources of these gases (such as the burning of fossil fuels for electricity, heat, or transportation) or by improving the "sinks" that gather and store these gases (such as the oceans, forests and soil).

In the construction and industrial sectors, we must improve efficiency and electrify energy consumption. We must reduce heat-trapping emissions from the food and agriculture sectors while also improving soil and forest health and carbon storage capacity. Absolute, profound reductions in emissions must remain the principal way of limiting global warming, but we will also require technology and behaviours that remove carbon dioxide from the atmosphere.

We must take steps to reduce our lifestyles and diets' total climate footprint, particularly for those parts of the population that have a disproportionately large footprint. Moving to more sustainable eating habits and food systems can help cut heat-trapping emissions while also enhancing health and lowering pollution.

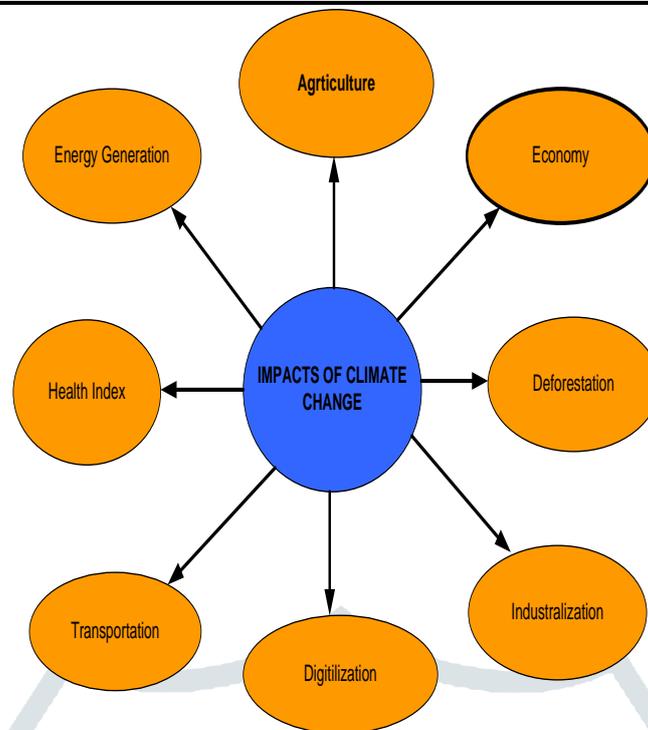
Changes in how we build and renovate our towns and cities, such as land use decisions and transportation and walk ability investments, may help reduce emissions while also contributing to healthier communities. Finally, we must eliminate fossil fuel firms' negative influence on climate and sustainable energy legislation, and hold them accountable for their activities.

The necessity of looking at different uses of watershed resources, rather than just the hydrology, is exemplified by the integrated watershed management method. It aims to strike a balance between human and environmental requirements while also protecting ecosystem services and biodiversity (Bakker 2012). Even with rising population pressures and demand for increased productivity and various uses of forests and adjacent landscapes, managing watersheds in this way allows society and the environment to be taken into account (Dortignac 1967). For the purposes of this paper, we define integrated watershed management as an adaptive, integrated, and multidisciplinary systems approach to management that aims to maintain productivity and ecosystem integrity in a watershed's water, soil, plants, and animals, thereby protecting and restoring ecosystem services for environmental, social, and economic benefits.

Mitigation aims to avoid significant human interference with the climate system and 'stabilise greenhouse gas levels in a timeframe sufficient to allow ecosystems to adapt naturally to climate change, ensure that food production is not jeopardised, and enable economic development to proceed in a sustainable manner'.

Adapting to living in a changing environment entails making adjustments to the current or predicted future climate. The goal is to lessen our vulnerability to climate change's negative consequences (like sea-level encroachment, more intense extreme weather events or food insecurity). It also includes making the most of any potentially good climate change opportunities (for example, longer growing seasons or increased yields in some regions).

People and communities have adjusted to and adapted with changes in climate and extremes to varying degrees of success throughout history. Climate change (and particularly drought) has had a role in the development and fall of civilizations. For the past 12,000 years, Earth's climate has been largely stable, which has been critical for the development of our modern civilization and life as we know it. The constant climate to which we have become used has shaped modern life. We will have to learn to adapt as our climate changes. The more drastically the climate changes, the more challenging it may become. While climate change is a global phenomenon, it has a local impact. As a response, cities and municipalities are at the forefront of adaptation. Cities and local communities around the world have been working on tackling their own climate concerns in the absence of national or international climate policy direction. They're striving to reinforce flood defences, prepare for heat waves and greater temperatures, and install water-permeable pavements to better handle floods and runoff.



Climate Changes: Impacts on Energy Generation. The world is under attack in ways it has never seen before. Global warming is being caused by rising greenhouse gas (GHG) emissions from burning fossil fuels and deforestation, which is destabilising the climate and putting lives, livelihoods, and entire ecosystems at danger.

Countries are aiming for net zero emissions by the middle of the century to attain this goal—a point that represents the balance between inevitable GHG emissions and their removal from the environment via reforestation or carbon capture and storage technology.

Clean energy research and deployment includes much more than just technology innovation. Solar, wind, bioenergy, and other sustainable energy sources, as well as the economics of electric power systems, infrastructure, energy storage, batteries for electric vehicles, smart home technologies, data security, and privacy, are just a few of the topics covered by relevant research. All of these factors must come together to ensure that clean energy fulfils its mandate. In addition, a successful transition to net zero will necessitate corporate engagement, government regulations and intergovernmental agreements, as well as public buy-in.

Climate change - the biggest health threat facing humanity

Climate change is the greatest health challenge facing humanity, and health professionals around the world are already responding to the consequences of this emerging disaster.

The Intergovernmental Panel on Climate Change (IPCC) has decided that the world must limit temperature rise to 1.5°C to avoid catastrophic health impacts and millions of deaths related to climate change. Past emissions have already made some degree of global warming and other climate impacts inevitable. Even 1.5°C of global warming is not considered safe; every tenth of a degree of warming would have a significant impact on people's lives and health.

While no one is immune to these dangers, those whose health is most affected by a climate disaster are those who contribute the least to its causes and are least able to protect themselves and their families—individuals from low-income and disadvantaged nations and communities.

A climate catastrophe has the potential to reverse fifty years of achievements in development, global health and poverty reduction, as well as to exacerbate current health disparities between and within people. It threatens the achievement of universal health coverage (UHC) in various ways, including exacerbating

existing barriers to accessing health services that are often needed at the most inopportune times. More than 930 million individuals, or approximately 12% of the world's population, spend at least 10% of their household budget on health care. As the poorest people are largely uninsured, health shocks and burdens already push roughly 100 million people into poverty each year, and the effects of climate change will exacerbate this trend.

Climate change is already impacting health in a variety of ways, including increased mortality and disease from increasingly frequent extreme weather events such as heat waves, storms and floods, disruption of the food system, and increases in zoonoses and food, water and vectors. - communicable diseases and mental health. In addition, climate change harms many social determinants of human health, such as livelihoods, equity and access to health care, as well as social support networks. The most vulnerable and disadvantaged, including women, children, ethnic minorities, poor communities, migrants or displaced persons, older populations and people with health problems, are disproportionately affected by climate-related health problems.

Although it is undeniable that climate change affects human health, correctly estimating the magnitude and impact of many climate-sensitive health risks remains difficult. On the other hand, scientific discoveries are gradually allowing us to attribute the increase in disease and death to human-caused warming, as well as to more precisely define the dangers and extent of these health risks.

People's sensitivity, their resilience to the current pace of climate change, and the extent and pace of adaptation will determine the health consequences of climate change in the short to medium term. In the long term, the consequences will increasingly be determined by how many transformative measures are taken now to reduce emissions and avoid strict temperature thresholds and possibly irreversible tipping points.

Conclusion

Addressing climate change is both an urgent and complex challenge requiring collective global efforts. The consequences of inaction—rising sea levels, extreme weather, and biodiversity loss—threaten ecosystems and human societies. Mitigation through emission reductions and sustainable practices is crucial in slowing global warming, while adaptation strategies help communities build resilience against its unavoidable impacts. A comprehensive approach combining technological innovation, policy reforms, and individual actions is essential for sustainable solutions. Ultimately, combating climate change demands a unified commitment to safeguarding the environment and ensuring a livable planet for future generations.

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