



The Climate Periscope
Save the climate, save the world

Climate Change Mitigation and Adaptation

If greenhouse gas emission is allowed to continue to grow as rapidly as it is now growing, it is expected that, by 2100, the global average air temperature over the earth's surface will warm by around 4°C above pre-industrial levels. This will most likely escalate the already dangerous impacts of climate change. However, if emissions are significantly reduced quickly enough, there is a chance that global average warming will not exceed 2°C above the pre-industrial levels and thereby avert some of the potentially dangerous impacts of climate change. It is for this reason that climate change mitigation and adaptation strategies need to be adopted in order to at least reduce the deleterious impacts of climate change.

Climate change mitigation basically involves taking action to reduce the amount of greenhouse gas being released into the atmosphere through human activities. It covers actions that are aimed at removing some of the greenhouse gases already present in the atmosphere. Climate change adaptation on the other hand refers to those actions that are aimed at minimising the negative effects of climate change and taking advantage of the beneficial effects that it may produce. This is because it is now settled that even if substantial progress is made in a bid to mitigate climate change by reducing further emissions of greenhouse gases or capturing the greenhouse gases already in the atmosphere today, some degree of climate change will still occur. Thus it is necessary to put in place measures to alleviate the adverse impacts of climate change. Adaptation is about building resilience and reducing vulnerability to the adverse effects of climate change.

Climate Change Mitigation Measures

- ***Improvement in Energy Efficiency***

Energy efficiency in simple terms means using less energy to perform the same task, which saves money and reduces the emission of greenhouse gases. It involves using smarter technologies and practices, such as electric vehicles, energy-efficient appliances and LED lighting, among others, to reduce energy waste without compromising results.

This may be achieved through intentional personal choices and government policy introducing energy efficiency standards and labelling for different products. In the United States energy efficiency standards and labelling for a broad range of products were introduced between the mid-1980s and 2015. This helped to reduce the energy consumption of these products by about 10% to 25% and avoided about 2.3 billion tons of carbon dioxide (CO₂) emissions, which is roughly equivalent to the annual emissions from 500 million automobiles. Additionally, it is projected to cumulatively save consumers and businesses in the United States about \$1.7 trillion by 2030.

[see, <https://www.eesi.org/papers/view/fact-sheet-energy-efficiency-standards-for-appliances-lighting-and-equipmen#>]

Improvement in energy efficiency is a task that we can all contribute to. Small changes like replacing high energy bulbs with low energy bulbs and use of more energy efficient electrical appliances in homes can contribute significantly to the reduction in the amount of carbon emissions from homes. So, the next time that you want to purchase an appliance for your home, look out for the most energy efficient ones so that together we can work towards a safer and cleaner environment for all.

- ***Transition from Fossil Fuel***

Fossil fuels like coal, oil, and gas are the largest contributors to climate change, responsible for roughly 68% of global greenhouse gas emissions and nearly 90% of all carbon dioxide emissions. They release heat-trapping greenhouse gases such as carbon dioxide and methane when burned primarily for electricity, heat, and transportation. This process leads to a rise in global temperatures, causing climate change.

The UN's Intergovernmental Panel on Climate Change warns that fossil fuel emissions must be halved by 2030 if global warming is to be limited to 1.5°C above pre-industrial levels. That is why energy transition is the most significant issue in the fight against climate change.

The energy transition is the shift from fossil fuels to renewable energy sources like wind and solar in order to reduce greenhouse gas emissions. Climate change is driven by these emissions, and transitioning to clean energy is the primary strategy to limit global warming and mitigate the impacts of climate change.

Energy transition requires scaling up renewable energy use by increasing the production of renewable energy from sources like solar, wind, hydropower, and geothermal energy; decarbonizing key sectors by reducing emissions from sectors that are heavily reliant on fossil fuels, such as power generation, transportation, and industry; creating an environment that supports innovation, such as energy storage solutions, and adopting innovative financing mechanisms to fund the necessary changes, among others. This transition must of course be just so that the transition benefits everyone and leaves no one behind.

- ***Changes in Land Use and Agricultural Practices***

Changes in land use have the potential to greatly reduce carbon emissions and contribute significantly to the reduction in the rate of climate change. One way of doing this is through the use of Biochar (charcoal added to the soil to enhance crop yields and nutrition). Biochar is a carbon rich organic matter that remains after heating of organic material in the absence of oxygen through a process called pyrolysis. Instead of burning agricultural and forestry waste to release greenhouse gases into the atmosphere, they could be converted into biochar, which stores carbon in the soil for hundreds of years. This can serve the twin purpose of reducing greenhouse gas emissions and improving soil health.

Changes in agricultural practice in the livestock sector can also help to reduce methane emissions from livestock, which account for about 14.5% of global CO₂eq emissions. The amount of enteric methane expelled by an animal is directly related to the level of feed intake, the type and quality of feed, the amount of energy it consumes, size, growth rate, level of production, and

environmental temperature. One way of reducing enteric emissions from livestock is by processing animal diets to improve feed digestibility and through the use of feed additives. This can be achieved through (1) grinding grains to reduce their particle size. This increases the surface area for enzymatic digestion, but the optimal size depends on the animal species; (2) compressing feed into pellets. This can improve starch gelatinization, enhance feed intake, and reduce selective feeding; (3) adding specific enzymes, such as xylanases, to animal feed to break down complex carbohydrates and improve the digestibility of nutrients; (4) shredding forage, thereby increasing the surface area for microbial attachment and improving digestion; (5) adding specific amino acids like methionine, lysine, and threonine to animal feed to improve protein utilization; (6) avoiding overfeeding and feeding smaller, more frequent portions to maintain rumen function and improve nutrient absorption and (7) reducing stress from factors like heat or noise, which can negatively impact digestion. This can be achieved through environmental modifications like providing shade or using sprinklers for heat stress, and minimizing noise pollution. These processes among others can reduce methane emissions in livestock by 25% to 30%. The UN Food and Agriculture Organisation estimates that changes in the existing livestock production system is capable of cutting agricultural emissions by about 30%. [<https://news.un.org/en/story/2013/09/450752#>].

- ***Reforestation and Afforestation***

Reforestation (replanting trees in cleared areas) and afforestation (planting forests on non-forested land) are key climate change mitigation strategies. Trees absorb carbon dioxide from the atmosphere through photosynthesis and store the carbon in their wood, leaves, roots, and the soil, which reduces the overall concentration of greenhouse gases. They help to lower greenhouse gas concentrations in the atmosphere, acting as a form of natural carbon removal. The more trees are planted, the more carbon that is removed from the atmosphere. By planting more trees there will be an increase in carbon sinks which help to remove greenhouse gases from the atmosphere, while creating new forests and restoring old ones directly help to combat deforestation, a major contributor to climate change.

- ***Geoengineering***

Geoengineering is the deliberate large-scale intervention in the earth's natural systems to counteract human-induced climate change. A range of different geoengineering techniques have been proposed, in two broad categories, namely: Carbon removal/capture techniques which remove carbon dioxide from the atmosphere and solar radiation management techniques that reflect a small percentage of the sun's light and heat back into space.

Carbon capture techniques address the root cause of climate change by removing greenhouse gases from the atmosphere, while solar radiation management techniques aim to reflect more sunlight away from Earth to reduce warming, thereby causing the Earth to absorb less solar radiation.

Some geoengineering techniques include: carbon sequestration (capturing and storing atmospheric carbon dioxide underground), increase in the surface reflectivity of the planet by brightening human structures (by painting them white for example), planting of crops with a high reflectivity, covering deserts with reflective material, enhancement of marine cloud reflectivity,

mimicking the effects of volcanic eruptions by injecting sulphate aerosols into the lower stratosphere, placing shields or deflectors in space to reduce the amount of solar energy reaching the earth, among others.

- ***Carbon pricing and market mechanisms***

Carbon pricing and market mechanisms are becoming an increasingly popular instrument for international and domestic climate change mitigation efforts.

Carbon pricing is a strategy to put a price on greenhouse gas emissions, while market mechanisms are the primary tools used to implement it. There are generally two market-based approaches for adding a price on emissions. Policy makers can set a limit or cap on the amount of emissions allowable and allow emitters who want to emit more carbon than is permissible to buy permits from those who have been able to emit less than the allowable volume of carbon. This approach is also known as a cap and trade system. Alternatively, a tax can be placed on carbon emissions to encourage greater efficiency in the use of energy. Here, polluters pay a fixed fee to the government for each ton of greenhouse gas that they emit, while a cap-and-trade system limits emissions by capping the number of available permits, and keeps costs low by allowing emitters to purchase more permits from other polluters that can reduce their emissions cheaply.

These systems work by creating a financial incentive to reduce emissions, either by making it more expensive to pollute (carbon tax) or by creating a market for the right to emit (carbon market).

Climate Change Adaptation Strategies

Climate change adaptation strategies involve adopting proactive measures to reduce vulnerability to climate impacts. The following are some of the recommended strategies.

- ***Adaptation in Agriculture and Water Management***

In agriculture climate change adaptation can take the form of development of new strains of drought resistant crops or livestock that are better suited to climate change induced changes in farming and environmental conditions; practicing regenerative agriculture; adjusting times of sowing and harvesting; adoption of better water management techniques through dams, distribution channels and implementing water-efficient irrigation strategies; as well as adjusting times of sowing and harvesting. A reduction in reliance on industrialised mono-cropping and diversification of the range of crops can equally reduce vulnerability to climate change.

- ***Information and Technology***

Information and technology are very crucial to climate change adaptation. They provide countries with the capacity and the resources to track meteorological patterns, forecast impacts and assess risks in order to make good decisions on investments and develop policies that can reduce

vulnerability. Technology is also necessary in order to provide timely information to individuals that may be affected by climate change. Having access to technology for adaptation and early information about abrupt changes in rainfall patterns or temperature can make the difference between a bountiful harvest and crop failure or between life and death.

- ***Education and Poverty Reduction***

Adaptation is essentially about building resilience and the adaptive capacity of people. Increased adaptive capacity results from reduced poverty and enhanced human development. Building adaptive capacity also entails the production and dissemination of appropriate climate information tailored to end-users needs and delivered in a timely manner. Knowledge and education are also necessary in order to give the people a political voice to articulate their views and enforce their rights to a healthy environment.

- ***Effective Legal, Institutional and Policy arrangements***

Climate change is still an evolving environmental challenge. Thus some of the challenges that come with it are still developing. Therefore there is a need to have specialised research institutions that can carry out a comprehensive and localised risk and vulnerability assessment in order to identify the short term and long term impact of climate change in a particular locality and recommend the necessary policy and legal response to such threats. National governments have a specific role in establishing the policy and regulatory environment to encourage adaptation by individuals, households and private sector businesses. They can strengthen the knowledge base of climate risk assessments and the early warning chain of climate change trends. They can improve seasonal forecasts and weather alerts through satellites, national radio stations, megaphones and cell phones. Governments can also provide the policy and legal framework for climate risk reduction measures related to land use planning, health and other sectors and ensure that infrastructure investments take climate change into account.

- ***Insurance***

Insurance could be used as a veritable tool in adaptation to the severe impacts of climate. Insurers could for example lower premiums for businesses that construct buildings in flood prone areas. They could as well offer insurance to farmers that cultivate their crops in areas with increased risk of climate change prone disasters. Some pilot projects around the world are showing promise that insurance could be of immense help in reducing the damaging impacts of climate. The World Bank and the International Finance Corporation have been at the forefront of developing

innovative insurance products in emerging markets and providing seed funding to help various organisations grow their climate related insurance programmes. For example, the Global Innovation Lab for Climate Finance has been developing financial schemes, which include insurance, to utilise private investments to help emerging economies reduce the impacts of climate change. The organisation has also backed green bonds that promote a project aiming to encourage people in Indonesia, Bangladesh and the Philippines to buy property insurance. The World Food Programme, Oxfam America and the R4 Rural Resilience Initiative have also teamed up to create a programme that allows low-income farmers to pay for crop insurance using their own labour. All these efforts show that insurance can be very useful to individuals and governments in adapting to the increased risks of climate change.

- ***Other Climate Change Adaptation Techniques***

Climate change increases risk, particularly for those who rely on weather patterns, agriculture, water, and other natural resources for their livelihoods. The magnitude, timing, and location of these climate impacts are inherently unpredictable, but the threats are not likely to be new; they will, in most cases, be magnifications of existing threats. So adaptation techniques must be flexible and amenable to unforeseen climate change impacts. Thus adaptation techniques cannot be exhaustively treated. The following are other techniques that can be adopted to adapt to the negative impacts of climate change depending on the circumstance of each case; relocation of people from affected areas, building of sea walls and storm surge barriers, dune re-enforcement, land acquisition and creation of marshlands/wetlands as buffer against sea level rise and flooding as well as the protection of existing natural barriers; bolstering social capital and resilience, creating early warning systems and preparedness plans, improving public health infrastructure and bolstering disease surveillance in order to counter as early as possible any negative health effect of climate change.

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