

# C4: CLIMATE MITIGATION





**Carbon Initiative Forum is non-profit that aims to empower the youth through the mainstreaming of climate policy in education.** We see a void in the public space on policy discussions about the climate. There hasn't been enough awareness, conversation and therefore expectation from the public towards policy makers and corporations is lacking. We want to make climate a voting issue in India and create a space, through CIF, for dialogue, discussion and chiefly an impetus from youth and other individuals to drive actions at various governance levels.

**We are a comprehensive platform to ask the right questions to the right people and gain clarity and our target audience includes youth of age group 14-28 years.**

## OUR MISSION IS TO EDUCATE & ENGAGE ON CLIMATE POLICY

“ Our planet needs each one of us right now. We need you to inspire change to control climate change. ”

“ On our platform, understand what the policy makers are doing to limit global warming, engage with us and enhance awareness on it. ”

“ We enable the youth to become better future climate decision makers by educating them on climate change and climate policy. ”

### OUR OBJECTIVES

- Create city level chapters that work on city level issues
- Our vision is to become a national platform, growing and collated by the people
- Enable a larger movement and consequently a larger impact towards climate action

### **VOLUNTEER LIKE A PLANETEER!**

Whether you're a lifelong environmentalist, a new activist just starting out, or someone totally new to the concept of climate change, join our **#CIFClimateClub** or **#LocalCityChapter** and be the planeteeers our planet needs.

**LEAD THE WAY. INSPIRE THE YOUTH. CLIMATE POLICY NEEDS YOU.**



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# What is climate mitigation?

Reducing climate change – involves reducing the flow of heat-trapping greenhouse gases into the atmosphere, either by reducing sources of these gases (for example, the burning of fossil fuels for electricity, heat or transport) or enhancing the “sinks” that accumulate and store these gases (such as the oceans, forests and soil).

Mitigation can mean using new technologies and renewable energies, making older equipment more energy

efficient, or changing management practices or consumer behaviour. It can be as complex as a plan for a new city, or as simple as improvements to a cook stove design. The goal of mitigation is 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 threatened and to enable economic development to proceed in a sustainable manner”.<sup>[1]</sup>

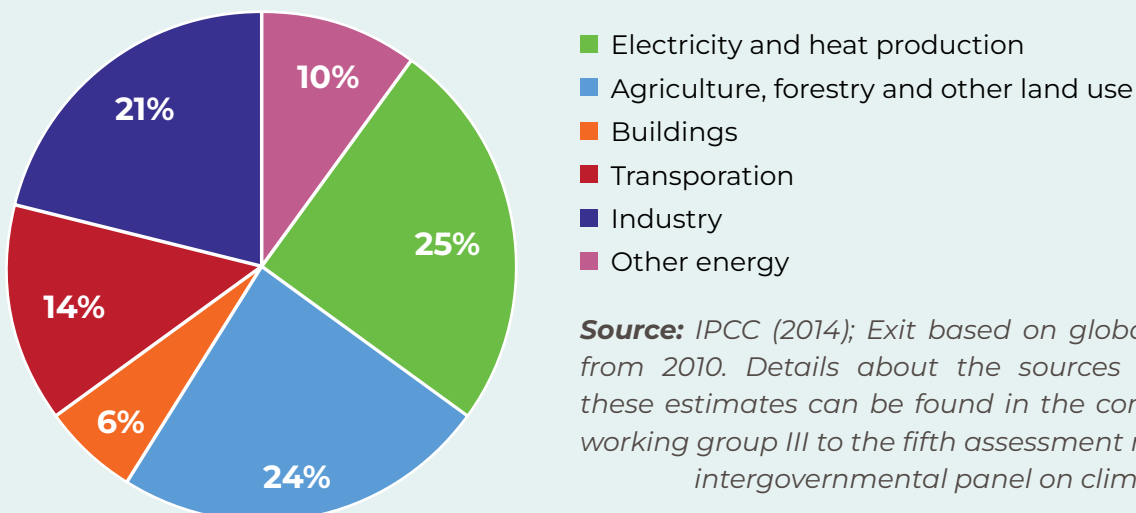
## Mitigation in major sectors

Mitigation options are available in every major sector. Mitigation can be more cost-effective if using an integrated approach that combines measures to reduce energy use and the greenhouse gas intensity of end-use sectors, decarbonize energy supply, reduce net emissions and enhance carbon sinks in land-based sectors.

### GHG mitigation actions have mainly been taken in 5 sectors



### Global greenhouse gas emissions by economic sector



**Source:** IPCC (2014); *Exit based on global emissions from 2010. Details about the sources included in these estimates can be found in the contribution of working group III to the fifth assessment report of the intergovernmental panel on climate change.*



Well-designed systemic and cross-sectoral mitigation strategies are more cost-effective in cutting emissions than a focus on individual technologies and sectors with efforts in one sector affecting the need for mitigation in others.

*Decarbonizing (reducing the carbon intensity of) electricity generation is a key component of cost-effective mitigation strategies in achieving low stabilisation levels.*

*Behaviour, lifestyle and culture have a considerable influence on energy use and associated emissions, with high mitigation potential in some sectors, in particular when complimenting technological and structural change.*

*The most cost-effective mitigation options in forestry are afforestation, sustainable forest management and reducing deforestation, with large differences in their relative importance across regions. In agriculture, cropland management, grazing land management and restoration of organic soils are the most cost-effective mitigation options.*

*Bioenergy can play a critical role for mitigation, but is affected by issues such as the sustainability of practices and the efficiency of bioenergy systems.*

**Mitigation can positively or negatively influence the achievement of other societal goals, such as those related to human health, food security, biodiversity, local environmental quality, energy access, livelihoods and equitable sustainable development. On the other hand, policies towards other societal goals can influence the achievement of mitigation and adaptation objectives. These influences can be substantial, although sometimes difficult to quantify, especially in welfare terms. This multi-objective perspective is important in part because it helps to identify areas where support for policies that advance multiple goals will be robust.**

**Policy linkages among regional, national and sub-national climate policies offer potential climate change mitigation benefits. Regional initiatives between national and global scales are being developed and implemented, but their impact on global mitigation has been limited to date (IPCC, 2021).<sup>[2]</sup>**

# Technology transfer

## What is technology transfer to support climate action?

Technology transfer is defined as: a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, non-governmental organisations (NGOs) and research institutions. *Since technology is a source of greenhouse gas (GHG) emissions, achieving global reduction of GHGs requires innovation to make current technologies cleaner and climate-resilient.*

**The Convention notes that all Parties shall promote and cooperate in the development and transfer of technologies that reduce emissions of GHGs. It also urges developed country Parties to take all practicable steps to promote, facilitate and finance the transfer of, or access to, climate technologies to other Parties, particularly to developing countries.**

Furthermore, the Convention states that the extent to which developing country Parties will effectively implement their commitments will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology.

Technology policy (development, diffusion and transfer) complements other mitigation policies across all scales from international to sub-national, but *worldwide investment in research in support of GHG mitigation is small relative to overall public research spending.*<sup>[3]</sup>

Developing and transferring technologies to support national action on climate change has been an essential element from the beginning of the UNFCCC process. In 1992, when countries established the Convention, they included specific provisions on technology with the aim of achieving the ultimate objective of the Convention.



# Integration of resources, conservation and restoration of forests

Land degradation in the form of soil carbon loss is estimated to have been ongoing for at least 12,000 years, but increased exponentially in the last 200 years. *Forest restoration is defined as “actions to reinstate ecological processes, which accelerate recovery of forest structure, ecological functioning and biodiversity levels towards those typical of climax forest” i.e. the end-stage of natural forest succession.*

Forest conservation is the practice of planting and maintaining forested areas for the benefit and sustainability of future generations. *Sustainable forest management (SFM) is defined as a “dynamic and evolving concept, which aims to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations.”*

**Managing forests’ sustainably means optimising their benefits, including timber and food security, to meet society’s needs in a way that conserves and maintains forest ecosystems for the benefit of present and future generations. Despite the significant progress made towards SFM at the global level, its implementation is highly variable, particularly in the tropics where the capacity to utilise or enforce SFM policies, laws and regulations remains uneven. Furthermore, other land uses such as agriculture are often financially more attractive in the short term compared to forest management, motivating deforestation and land-use changes.**



The Food and Agriculture Organisation of the United Nations (FAO) helps countries overcome these challenges by providing policy advice, technical support and capacity building through field projects, workshops, and hands-on training. The organisation also helps countries in assessing their forest resources, defining the elements of SFM and monitoring their progress towards it. FAO helps identify, test and promote innovative, multipurpose forest management approaches and techniques that respond to the need for mitigating and adapting to a changing climate, increased demand for wood and non-wood forest products and services, and threats from fires, pests and natural disasters.<sup>[4]</sup>



## Nature based solutions (NBs) - State of finance for nature

Nature loss is at the heart of many societal challenges, while nature-based solutions hold the potential to address interlinked crises. The pace of species extinction, global warming, the growing number of extreme weather events and zoonotic diseases like Covid-19, have further reinforced the need to invest in sustainable action that enhances the resilience of ecosystems and addresses societal challenges, such as food security, climate change, water security, human health and enhanced resilience to disaster risk.

If the world is to meet the climate change, biodiversity, and land degradation targets, it needs to close a USD 4.1 trillion financing gap in nature by 2050. *The current investments in Nature-based solutions (NbS) amount to USD 133 billion – most of which comes from public sources. Public funds make up 86% and private finance 14%. NbS poses an opportunity for private sector investment in pursuit of sources of revenue, to reap the benefits of increased resilience, to reduce costs and to enhance reputation and purpose.*

**The total volume of finance flowing into nature is considerably smaller than the flow of climate finance. Looking to the future, investment in NbS ought to at least triple in real terms by 2030 and increase four-fold by 2050 if the world is to meet its climate change, biodiversity and land degradation targets. This acceleration would equate to cumulative total investment of up to USD 8.1 trillion, and a future annual investment rate of USD 536 billion.**

***The compilation of data on capital investment in nature across all sectors and for all major economies has proven challenging and the estimates are highly uncertain.<sup>[5]</sup>***



# Climate change - Policy and mitigation

In 2018, the Intergovernmental Panel on Climate Change (IPCC) published the Special Report on Global Warming of 1.5 degree C. The report details the impacts of a 1.5 degree C temperature rise and proposes mitigation strategies

to remain below the 1.5 degree C target. *It will require lowering global carbon dioxide (CO<sub>2</sub>) emissions in 2030 by 45% compared to 2010 and will require net-zero emissions around 2050.*



## General policies

### Market-Based Instruments

- Market-based approaches include carbon taxes, subsidies, and cap-and-trade programs.
- In a tradable carbon permit system, permits equal to an allowed level of emissions are distributed or auctioned. Parties with emissions below their allowance are able to sell their excess permits to other parties that have exceeded their emissions allowance.
- Market-based instruments are recognized for their potential to reduce emissions by allowing for flexibility and ingenuity in the private sector.

### Regulatory Instruments

- Regulatory approaches include non-tradable permits, technology and emissions standards, product bans, and government investment.

### Voluntary Agreements

- Voluntary agreements are generally made between a government agency and one or more private parties to “achieve environmental objectives or to improve environmental performance beyond compliance.”<sup>[6]</sup>

# Mitigation measures

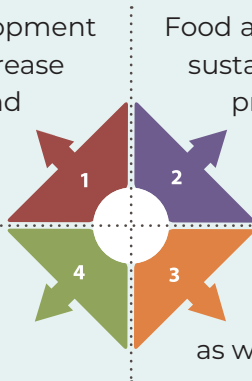
These include policies concerning energy, transportation, food and agriculture, and land use that will reduce GHG emissions

Energy policies that can promote development and use of renewable energy, decrease production and use of fossil fuels, and reduce overall energy demand.

Food and agriculture policies that can promote sustainable practices, enhance food security, promote growth and consumption of fruits and vegetables as well as decrease consumption of meat.

Land-use policies that aim to protect existing forests and promote growth of new forests.

Transportation policies that promote fuel efficiency and active transport, such as walking and bicycling.



## General mitigation intervention types and examples of related mitigation activities<sup>[7]</sup>

INSTRUMENT TYPE	EXAMPLES OF RELATED MITIGATION ACTIVITIES
<b>General (cross-sectoral)</b>	
<b>Fossil fuel substitution</b>	Deployment of renewable and low-carbon energy sources; fuel switching within the group of fossil fuels; specific biofuels in various modes; substitution of fuelled engines by electric motors; decarbonization of heat
<b>Energy efficiency</b>	Energy recovery and cogeneration in manufacturing; building insulation; efficient device design (appliance, lighting, stoves, etc.); use of light materials; voltage optimization; smart grids; efficient energy transportation and storage solutions; district heating
<b>Sequestration, capture and storage</b>	Improved soil sequestration in agricultural fields through agroforestry; electrolysis; carbon capturing materials (asphalts, etc.); geochemical storage of CO <sub>2</sub> ; enhanced oil recovery; chemical looping adsorption; membrane gas separation or gas hydrate technologies
<b>Specific interventions in the waste sector</b>	
<b>Recycling and composting</b>	Gas collection in landfills; material recovery; mechanical biological treatment; composting; anaerobic digestion

### Specific interventions in industry sector

#### Recycling and re-use of materials

Re-use of structural steel; crushed concrete and asphalt used as structural fill or in pavement; recycled coal ash in the manufacturing of ceiling tiles and cement

### Specific interventions in the agriculture and livestock sector

#### Soil and fertilizer management

Use of compost, manure or synthetic nitrogen fertilizers; minimum tillage; improved collection, storage or treatment of manure; reduced irrigation of paddy rice

#### Improved husbandry

Pasture improvement using rotational or controlled grazing; improved diets for livestock; improved animal feeding management; breed diversification

### Specific interventions in the forestry and land management sector

#### Forest protection and sustainable management

Conservation of existing carbon pools in forest vegetation and soil by controlling deforestation; control of fires and pest outbreaks; reducing slash and burn agriculture; management of forests for sustainable timber production (e.g. extending rotation cycles, reducing damage to remaining trees, reducing logging waste, implementing soil conservation practices, fertilization and using wood in a more efficient way)

#### Reforestation/afforestation

Improved biomass stocks by planting trees on non-forested agricultural lands, including monocultures or mixed species plantings

#### Avoided desertification/sustainable management

Re-vegetation (establishment of vegetation that does not meet the definitions of afforestation and reforestation); improved fire and grazing management; control of erosion; integrated crop, soil and water management



## Sectoral Policy Instruments<sup>[2]</sup>

POLICY INSTRUMENTS	ENERGY	TRANSPORT	BUILDINGS
<b>Economic Instruments – Taxes (carbon taxes may be economy-wide)</b>	<ul style="list-style-type: none"> <li>• Carbon taxes.</li> </ul>	<ul style="list-style-type: none"> <li>• Fuel taxes.</li> <li>• Congestion charges, vehicle registration fees, road tolls</li> <li>• Vehicle taxes.</li> </ul>	<ul style="list-style-type: none"> <li>• Carbon and/or energy taxes (either sectoral or economy wide).</li> </ul>
<b>Economic Instruments – Tradable Allowances (may be economy-wide)</b>	<ul style="list-style-type: none"> <li>• Emission trading. (e.g., EU, ETC).</li> <li>• Emission credits under Kyoto protocol's Clean Development Mechanism (CDM).</li> <li>• Tradable Green Certificates.</li> </ul>	<ul style="list-style-type: none"> <li>• Fuel and vehicle standards.</li> </ul>	<ul style="list-style-type: none"> <li>• Tradable certificates for energy efficiency improvements (white certificates).</li> </ul>
<b>Economic Instruments – Subsidies</b>	<ul style="list-style-type: none"> <li>• Fossil fuel subsidy removal.</li> <li>• Feed-in-tariffs for renewable energy.</li> </ul>	<ul style="list-style-type: none"> <li>• Biofuel subsidies.</li> <li>• Vehicle purchase subsidies.</li> <li>• Feebates.</li> </ul>	<ul style="list-style-type: none"> <li>• Subsidies or tax exemptions for investment in efficient buildings, retrofits and products.</li> <li>• Subsidized loans.</li> </ul>
<b>Regulatory Approaches</b>	<ul style="list-style-type: none"> <li>• Efficiency or environmental performance standards.</li> <li>• Renewable Portfolio Standards (RPS) for renewable energy.</li> <li>• Equitable access to electricity grid.</li> <li>• Legal status of long-term CO2 storage.</li> </ul>	<ul style="list-style-type: none"> <li>• Fuel economy performance standards.</li> <li>• Fuel quality standards.</li> <li>• GHG emission performance standards.</li> <li>• Regulatory restrictions to encourage modal shifts (road to rail).</li> <li>• Restriction on use of vehicles in certain areas.</li> <li>• Environmental capacity constraints on airports.</li> <li>• Urban planning and zoning restrictions.</li> </ul>	<ul style="list-style-type: none"> <li>• Building codes and standards.</li> <li>• Equipment and appliance standards.</li> <li>• Mandates for energy retailers to assist customers invest in energy efficiency.</li> </ul>
<b>Information Programmes</b>		<ul style="list-style-type: none"> <li>• Fuel labelling.</li> <li>• Vehicle efficiency labelling.</li> </ul>	<ul style="list-style-type: none"> <li>• Energy audits.</li> <li>• Labelling programmes.</li> <li>• Energy advice programs.</li> </ul>
<b>Government Provision of Public Goods or Services</b>	<ul style="list-style-type: none"> <li>• Research and development.</li> <li>• Infrastructure expansion (district heating/cooling or common carrier).</li> </ul>	<ul style="list-style-type: none"> <li>• Investment in transit and human powered transport.</li> <li>• Investment in alternative fuel infrastructure.</li> <li>• Low-emission vehicle procurement.</li> </ul>	<ul style="list-style-type: none"> <li>• Public procurement of efficient buildings and appliances.</li> </ul>
<b>Voluntary Action</b>			<ul style="list-style-type: none"> <li>• Labelling programmes for efficient buildings.</li> <li>• Product eco-labelling.</li> </ul>

## Sectoral Policy Instruments<sup>[2]</sup>

POLICY INSTRUMENTS	INDUSTRY	AGRICULTURE, FORESTRY AND OTHER LAND-USE (AFOLU)	HUMAN SETTLEMENTS AND INFRASTRUCTURE
<b>Economic Instruments – Taxes (carbon taxes may be economy-wide)</b>	<ul style="list-style-type: none"> <li>• Carbon tax or energy tax.</li> <li>• Waste disposal taxes or charges.</li> </ul>	<ul style="list-style-type: none"> <li>• Fertilizer or nitrogen taxes to reduce nitrous oxide (N<sub>2</sub>O).</li> </ul>	<ul style="list-style-type: none"> <li>• Sprawl taxes, Impact fees, exactions, split-rate property taxes, tax increment finance, betterment taxes, congestion charges.</li> </ul>
<b>Economic Instruments – Tradable Allowances (may be economy-wide)</b>	<ul style="list-style-type: none"> <li>• Emission trading</li> <li>• Emission credits under CDM.</li> <li>• Tradable Green Certificates.</li> </ul>	<ul style="list-style-type: none"> <li>• Emission credits under CDM.</li> <li>• Compliance schemes outside Kyoto protocol (national schemes).</li> <li>• Voluntary carbon markets.</li> </ul>	<ul style="list-style-type: none"> <li>• Urban-scale cap and trade.</li> </ul>
<b>Economic Instruments – Subsidies</b>	<ul style="list-style-type: none"> <li>• Subsidies (e.g., for energy audits).</li> <li>• Fiscal incentives (e.g., for fuel switching).</li> </ul>	<ul style="list-style-type: none"> <li>• Credit lines for low-carbon agriculture and sustainable forestry.</li> </ul>	<ul style="list-style-type: none"> <li>• Special improvement or redevelopment of districts.</li> </ul>
<b>Regulatory Approaches</b>	<ul style="list-style-type: none"> <li>• Energy efficiency standards for equipment.</li> <li>• Energy management systems (also voluntary).</li> <li>• Voluntary agreements (where bound by regulation).</li> <li>• Labelling and public procurement regulations.</li> </ul>	<ul style="list-style-type: none"> <li>• National policies to support REDD+ including monitoring, reporting and verification.</li> <li>• Forest laws to reduce deforestation.</li> <li>• Air and water pollution control GHG precursors.</li> <li>• Land use planning and governance.</li> </ul>	<ul style="list-style-type: none"> <li>• Mixed use zoning.</li> <li>• Development restrictions.</li> <li>• Affordable housing mandates.</li> <li>• Site access controls</li> <li>• Transfer development rights.</li> <li>• Design codes.</li> <li>• Building codes.</li> <li>• Street codes.</li> <li>• Design standards.</li> </ul>
<b>Information Programmes</b>	<ul style="list-style-type: none"> <li>• Energy audits.</li> <li>• Benchmarking.</li> <li>• Brokerage for industrial cooperation.</li> </ul>	<ul style="list-style-type: none"> <li>• Certification schemes for sustainable forest practices.</li> <li>• Information policies to support REDD+ including monitoring, reporting and verification.</li> </ul>	
<b>Government Provision of Public Goods or Services</b>	<ul style="list-style-type: none"> <li>• Training and education</li> <li>• Brokerage for industrial cooperation.</li> </ul>	<ul style="list-style-type: none"> <li>• Protection of national, state, and local forests.</li> <li>• Investment in improvement and diffusion of innovative technologies in agriculture and forestry.</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of utility infrastructure, such as electricity distribution, district heating/cooling and wastewater connections, etc.</li> <li>• Park improvements.</li> <li>• Trail improvements.</li> <li>• Urban rail.</li> </ul>
<b>Voluntary Action</b>	<ul style="list-style-type: none"> <li>• Voluntary agreements on energy targets or adoption of energy management systems, or resource efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Promotion of sustainability by developing standards and educational campaigns</li> </ul>	

## National level policies - Case of India

Climate Change is a global phenomenon but with local consequences. There are both external and domestic dimensions to India's Climate Change policy which has been articulated through two key documents. One is the *National Action Plan on Climate Change (NAPCC)* adopted on June 30, 2008. The other is *India's Nationally Determined Commitments (NDC)* submitted to the UN Framework Convention on Climate Change (UNFCCC) on October 2, 2015. The NAPCC has an essentially domestic focus. The NDC is a statement of intent on Climate Change action announced in the run up to the Paris Climate Change summit held in December the same year.

The NAPCC acknowledged that Climate Change and Energy Security were two sides of the same coin; that India had to make a strategic shift from its current reliance on fossil fuels to a pattern of economic activity based progressively on renewable sources of energy such as solar energy and cleaner sources such as nuclear energy. Thus, a co-benefit approach underlies India's climate change strategy.



### The 8 missions under NAPCC are,

#### THE NATIONAL SOLAR MISSION

An initiative inaugurated in 2010 with the objective of establishing India as a global leader in solar energy by creating the policy conditions for its deployment across the country. The mission now boasts a target of 100 GW of solar PV by 2022.

#### THE NATIONAL MISSION FOR ENHANCED ENERGY EFFICIENCY

The mission aims at implementing a host of programmes that will improve energy efficiency in the energy-consuming industries and sectors. Incentives are among others: energy-savings certificates, reduced taxes for energy-efficient appliances and public private partnerships.



## THE NATIONAL MISSION ON SUSTAINABLE HABITAT

Launched in 2010, the mission aims to make cities sustainable through improvements in energy efficiency in buildings, management of solid waste and shift to public transport. Thereby, making sure that cities are resilient to face the aftermath effects of climate change.



## THE NATIONAL WATER MISSION

Is mounted to ensure integrated water resource management helping to conserve water, minimize wastage and ensure more equitable distribution both across and within states. The mission aims to increase water use efficiency by 20%, promote R&D as well as timely review of National Water Policy.



## THE NATIONAL MISSION FOR SUSTAINING THE HIMALAYAN ECOSYSTEM

A multi-pronged, cross-cutting mission which seeks to facilitate the formulation of appropriate policy measures and time-bound action programmes to sustain ecological resilience and ensure the continued provisions of key ecosystem services in the Himalayas.



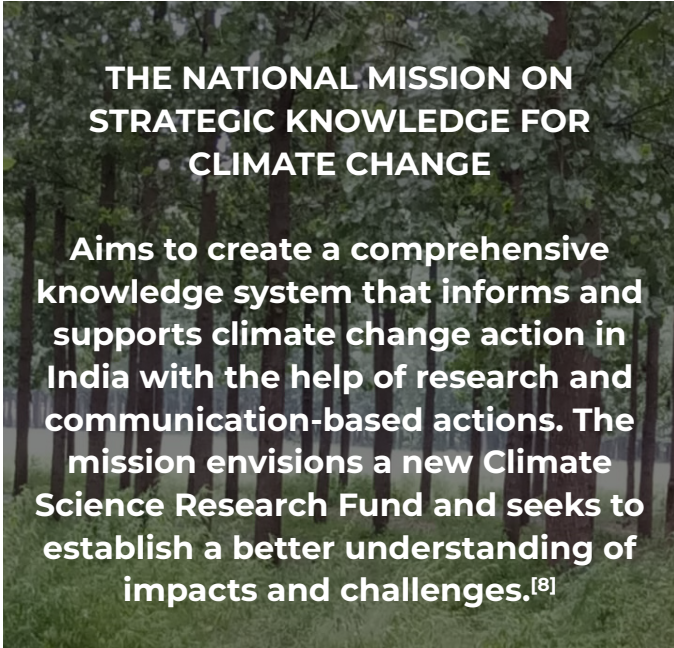
## THE NATIONAL MISSION FOR A 'GREEN INDIA'

The mission envisages a holistic view of greening that extends beyond tree planting with the aim of protecting, restoring and enhancing India's forest cover. The target under the mission is 10 million ha on forest and non-forest lands for increasing the forest/tree cover and to improve the quality of existing forest.



## THE NATIONAL MISSION FOR SUSTAINABLE AGRICULTURE

Formulated for enhancing agricultural productivity especially in rainfed areas focusing on integrated farming, water use efficiency, soil health management and synergizing resource conservation through adoption of a sustainable development pathway.



## THE NATIONAL MISSION ON STRATEGIC KNOWLEDGE FOR CLIMATE CHANGE

Aims to create a comprehensive knowledge system that informs and supports climate change action in India with the help of research and communication-based actions. The mission envisions a new Climate Science Research Fund and seeks to establish a better understanding of impacts and challenges.<sup>[8]</sup>

## National Hydrogen Energy Mission - India

Hydrogen and Ammonia are envisaged to be the future fuels to replace fossil fuels. Production of these fuels by using power from renewable energy, termed as green hydrogen and green ammonia, is one of the major requirements towards environmentally sustainable energy security of the nation.

The Government of India is taking various measures to facilitate the transition from fossil fuel and fossil fuel based feed stocks to green hydrogen and green ammonia. *The National Hydrogen Energy Mission was announced in the Union Budget 2021 by the Finance Minister, who said it will be launched in 2021-22.* India has set ambitious targets in the renewable energy sector and the push for hydrogen energy will help steer the country in the right direction in this respect.

*The Mission aims to aid the government in meeting its climate targets and making India a green hydrogen hub. This will help in meeting the target of production of 5 million tonnes of Green hydrogen by 2030 and the related development of renewable energy capacity.*

The implementation of this policy will provide clean fuel to the common people. This will reduce dependence on fossil fuel and also reduce crude oil imports. The objective also is for India to emerge as an export Hub for Green Hydrogen and Green Ammonia. *The policy promotes Renewable Energy (RE) generation as RE will be the basic ingredient in making green hydrogen.* This in turn, will help in meeting the international commitments for clean energy.

**The Ministry of New Renewable Energy (MNRE) has been supporting a broad based Research Development and Demonstration (R&D) programme on Hydrogen Energy and Fuel. Projects are supported in industrial, academic and research institutions to address challenges in production of hydrogen from renewable energy sources, its safe and efficient storage, and its utilisation for energy and transport applications through combustion or fuel cells. This has resulted in development and demonstration of internal combustion engines, two wheelers, three wheelers, and mini buses that run on hydrogen fuel. Two hydrogen refuelling stations have been established (one each at Indian Oil R&D Centre, Faridabad and National Institute of Solar Energy, Gurugram).<sup>[9]</sup>**





# Mitigation improvement strategies

The development of mitigation strategies should flow from the risk management process with clear links to functional lead agencies, as identified

in the State Disaster Management Plan, to ensure each risk and strategy is coordinated and managed by the responsible agency.

**Prevention and mitigation strategies should be based on the risk assessment and can be considered in relation to:<sup>[10]</sup>**

01

## Land use planning and building codes

Land use planning can be an effective method to reduce the impact of natural hazards and, where possible, avoid risk to life, property and environmental systems from natural hazards.

02

## Essential infrastructure

A community's social and economic well-being relies upon the continuity of essential services provided by critical infrastructure. This critical infrastructure supports the most basic needs: safe drinking water, food, reliable transport, accessible public health services, energy for homes and industry, access to banking, finance and government services, and communications networks to connect us socially and in business.



**03**

### Structural works

Structural disaster mitigation strategies involve the application of engineered solutions as disaster mitigation strategies including physical structures which are constructed or modified to reduce or eliminate disaster impacts.

**04**

### Landscape and environment

The appropriate management and protection of landscapes and the environment is important. All organisations, including governments at all levels, must consider the effects of development relative to the landscape and environment.



### Examples of mitigation strategies

- 1 Design improvements to infrastructure or services
- 2 Capital works such as levee bank construction to reduce the impacts of flooding
- 3 Land use planning and design decisions that avoid developments and community infrastructure in areas prone to hazards

- 4 Resilience activities including partnership building and engagement between sectors
- 5 Community education programs to build knowledge of the appropriate actions to prepare for and respond to a disaster event
- 6 Annual programs (e.g. vegetation management around essential services and essential infrastructure such as power lines)
- 7 Hazard specific control activities such as flood levees or bushfire mitigation strategies
- 8 Community awareness campaigns to increase knowledge of how to prepare for disaster events

The concept of betterment, often considered predominantly within post-disaster recovery and reconstruction, should also form a key consideration pre-

disaster through proactive mitigation strategies which aim to enhance and harden infrastructure to a more disaster resilient standard.<sup>[10]</sup>

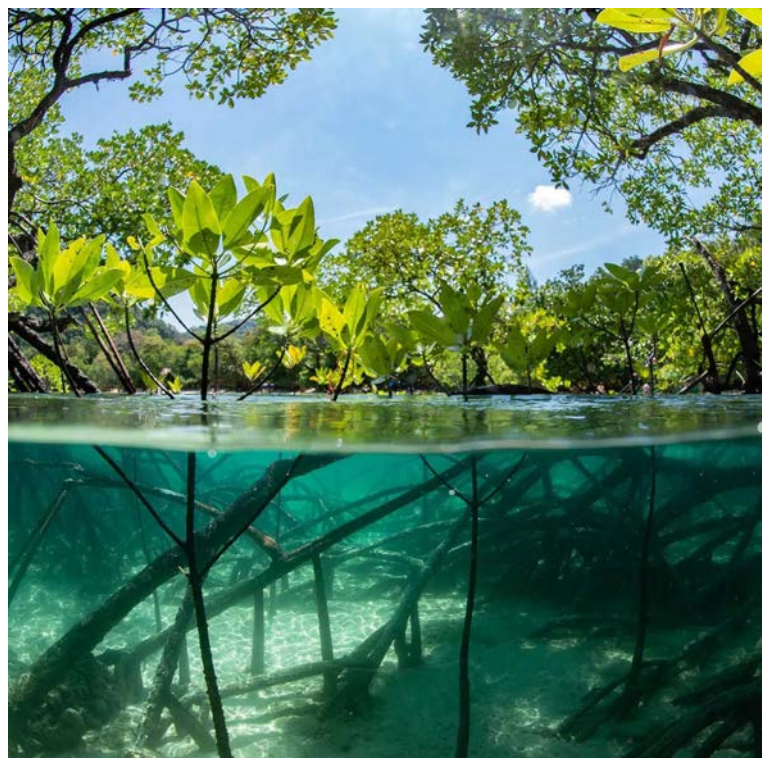


# Importance of private sector in climate mitigation

The importance of tackling climate change and other environmental issues is now well recognised by different parts of the private sector. The financial sector has acknowledged that addressing global environmental challenges, such as climate change, is key to managing business risks and ensuring long-term returns on investment. Governments play a key role to make businesses more aware of climate risks and boost private sector engagement through partnerships.

**The private sector is a critical partner in delivering effective development co-operation on environmental issues. Business practice has been associated with environmental pollution and degradation, especially in countries where safeguard systems and environmental governance need strengthening. Yet, companies also play an important role in driving green growth in developing countries. Multinational companies can promote greener behavior across the supply chains that they manage, investors and banks are potential sources of investment for clean infrastructure, and businesses and entrepreneurs provide the skills and knowledge leading to innovation in clean technologies and resource efficiency.**

Recognising this, development co-operation providers are increasingly engaging the private sector to promote green growth. *A review of development*



*finance flows shows that up to 20% of climate-related development finance in 2013 supported activities to engage the private sector, with the majority of finance being deployed toward climate change mitigation.<sup>[7]</sup>*

Cognisant of the detrimental impacts of climate change on business, the private sector urged governments to reach an agreement in Paris. Over 600 global companies and investors have made voluntary commitments to reduce their carbon footprints through targets to reduce their GHG emissions and/or energy consumption. Despite ambitions to mitigate climate change, there is ample scope for the private sector to increase its investments in climate change mitigation. At least USD 23 trillion of investment opportunities exist for climate smart investments in emerging markets, especially in green buildings and sustainable transport (International Finance Corporation, 2016). While certain climate investment markets, such as renewables and

energy efficiency, have matured, plenty of investment opportunities remain in energy distribution, storage and battery technologies. Investment challenges are greater in cement, steel, aviation, manufacturing, agriculture and land-use because solutions are less well understood and greater innovation is required.<sup>[12]</sup>



**In India, the private sector plays a pivotal role in creating low-carbon sustainable economies and has embarked on a number of voluntary actions on climate change that can contribute towards achieving its NDC goals. India signed 'Declaration of the private sector on climate change' on 5th November 2020 which included 24 key industry captains and the Ministry of Environment, Forest and Climate Change at the virtual India CEO forum on Climate Change. The environment minister further said that this declaration by private sector companies, voluntarily, is a historic step.<sup>[13]</sup>**

## Introduction to carbon budget, carbon price and carbon tax

The phrase put a price on carbon has now become well known with momentum growing among countries and businesses to put a price on carbon pollution as a means of bringing down emissions and driving investment into cleaner options.

*So what does it mean to put a price on carbon, and why do many government and business leaders support it?*



### What is a carbon budget?

A carbon budget is the cumulative amount of carbon dioxide (CO<sub>2</sub>) emissions permitted over a period of time to keep within a certain temperature threshold. Global warming is fundamentally linked to the absolute concentration of greenhouse gasses in

the atmosphere. To stabilize global temperature at any level vs pre-industrial, then there is a finite amount of emissions that can be released before net emissions need to reach zero. For CO<sub>2</sub> emissions this can be referred to as a carbon budget.<sup>[14]</sup>



## What is carbon pricing?

Carbon pricing is an instrument that captures the external costs of greenhouse gas (GHG) emissions—the costs of emissions that the public pays for, such as damage to crops, health care costs from heat waves and droughts, and loss of property from flooding and sea level rise—and ties them to their sources through a price, usually in the form of a price on the carbon dioxide (CO<sub>2</sub>) emitted. A price on carbon helps shift the burden for the damage from

GHG emissions back to those who are responsible for it and who can avoid it.

Considering different carbon pricing approaches, an emissions trading system (ETS), on the one hand, provides certainty about the environmental impact, but the price remains flexible. A carbon tax, on the other hand, guarantees the carbon price in the economic system against an uncertain environmental outcome.

### **There are two main ways of pricing carbon: emissions trading systems (ETS) and carbon taxes.**

- **An ETS - sometimes referred to as a cap-and-trade system, caps the total level of greenhouse gas emissions and allows those industries with low emissions to sell their extra allowances to larger emitters. By creating supply and demand for emissions allowances, an ETS establishes a market price for greenhouse gas emissions. The cap helps ensure that the required emission reductions will take place to keep the emitters (in aggregate) within their pre-allocated carbon budget.**
- **A carbon tax - directly sets a price on carbon by defining a tax rate on greenhouse gas emissions or - more commonly - on the carbon content of fossil fuels. It is different from an ETS in that the emission reduction outcome of a carbon tax is not predefined but the carbon price is.<sup>[15]</sup>**

## What is a carbon tax?

*It is a form of Pollution Tax. It levies a fee on the production, distribution or use of fossil fuels based on how much carbon their combustion emits. It is a cost-effective tool to reduce greenhouse gas emissions in the atmosphere. It is a kind of a Pigouvian tax (tax on negative externalities). It is based on the 'polluter pay' principle. The ultimate goal of a carbon tax is to reduce and eventually eliminate the use of fossil fuels.*



*The Government will set a price per ton on carbon. It gets translated into tax on the following,*

- 1. Tax on electricity*
- 2. Tax on Natural Gas or Oil.*

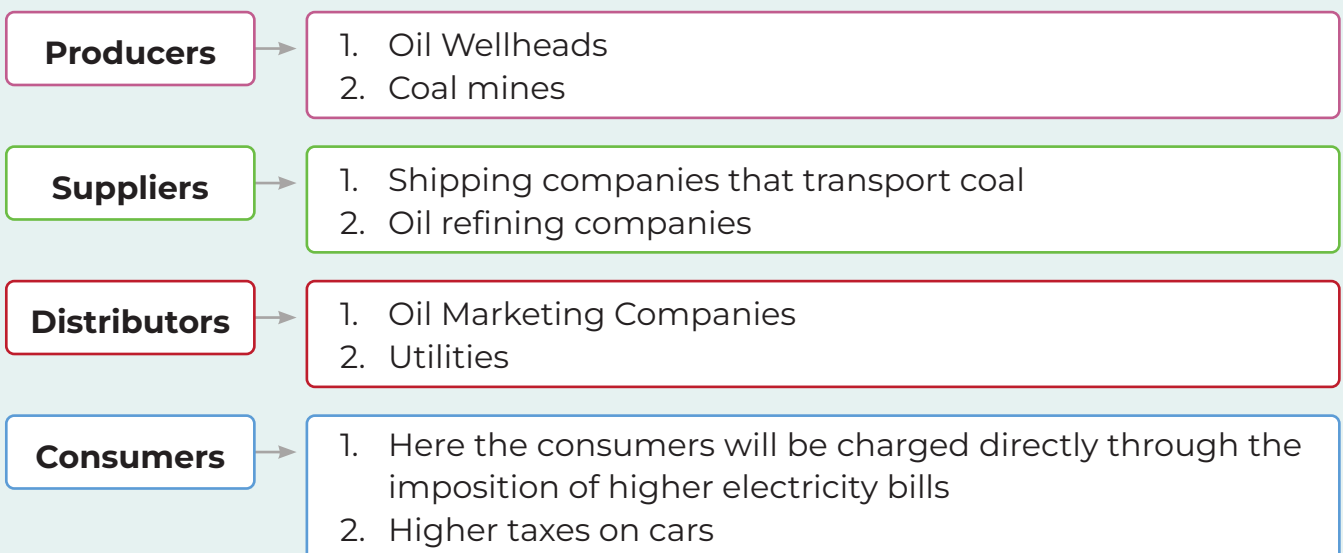
## Different fuels – Different carbon tax

*The Carbon tax will not be the same for different fuels because the carbon content is not the same in all the fuels. The amount of carbon dioxide released is directly proportional to the fuel's carbon*

*content. Taxes on different fuels will be based on the British Thermal Unit (Btu) heat units. It won't be based on weight or volume. This is done to encourage the use of efficient fuels.*

## Who gets taxed?

Carbon tax would be levied at different stages of consumption and production. Examples are listed below,



A carbon tax is seen as reducing emissions by making it more expensive to use carbon-based fuels, therefore giving companies a reason to become more energy-efficient, so as to save money.

A carbon tax would also increase the costs of gasoline and electricity, therefore giving consumers a reason to switch to clean energy.<sup>[16]</sup>

### Carbon tax – India<sup>[17]</sup>

India imposed a Carbon tax of Rs. 50 per ton of coal produced and imported, in 2010.

In 2014, it was increased to Rs 100.

In 2015, it was further increased to Rs 200.

Currently, the carbon tax is Rs 400 per ton.



## Why do we care about fossil fuel subsidies?

***We shouldn't waste tax dollars fueling the climate crisis - The problem with fossil fuel subsidies***

Subsidies are intended to protect consumers by keeping prices low, but they come at a high cost. Subsidies have sizable fiscal costs (leading to higher taxes/ borrowing or lower spending),

promote inefficient allocation of an economy's resources (hindering growth), encourage pollution (contributing to climate change and premature deaths from local air pollution), and are not well





targeted at the poor (mostly benefiting higher income households). Removing subsidies and using the revenue gain for better targeted social spending, reductions in inefficient taxes, and productive investments can promote sustainable and equitable outcomes. Fossil fuel subsidy removal would also reduce energy security concerns related to volatile fossil fuel supplies.

In 2009, the Group of 20 advanced and emerging market economies called for a phase out of inefficient fossil fuel subsidies in all countries and reaffirmed this again in 2012. *At COP26 in 2021, 197 countries agreed to accelerate efforts to phase-out inefficient fossil fuel subsidies.*

**Despite the potential gains, many countries have had difficulty reforming subsidies. When reforms are made, prices increase, and this has often led to widespread public protests. The absence of public support for subsidy reform is in part due to a lack of confidence in the ability of governments to shift the resulting budgetary savings to programs that would compensate the poor and middle class for the higher energy prices they face.<sup>[18]</sup>**



## Individual Action

There are many actions that individuals can take to reduce their GHG emissions; many involve energy conservation and also save money.

When purchasing appliances, look for the Energy Star label and choose the most energy efficient model	Speak up about making climate a 'voting issue' in your country	Purchase from companies which are environmentally friendly but make sure to ask for proof to back their claims	Buy seasonal and local
Reuse, reduce and repair	Demand better action from politicians	A quality LED produces the most light with the least electricity	Introduce renewable energy into your life in whatever ways you can
Decrease the amount you drive by using public transportation, riding a bike, walking, or telecommuting	Speak up at work, friends or family	Ask your electricity supplier about options for purchasing energy from renewable sources	Opt for paperless transactions
Eat more plants	Cut your waste generation	Choose a fuel-efficient or electric vehicle and keep your car well maintained, including properly inflated tires	
	Buy clothes that last - it's time to end the consumerist mindset		

***We are in the midst of three planetary crises – the climate crisis, the nature crisis, and the pollution and waste crisis. Fuelled by unsustainable consumption and production, the three crises are destroying the natural systems that allow our economies to thrive. In this decade that will define how we live on the planet, we need to crowd in people and action like never before.<sup>[19]</sup>***

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