

Policy Framework for Climate Mitigation

- Way forward for India

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Science of Climate Change

CO2 Emissions (in Giga tonnes Carbon/year)		1980 to 1989	1990 to 1999	2000 to 2005
EMIT	Emissions (fossil fuel, cement)	5.4 ± 0.3	6.4 ± 0.4	7.2 ± 0.3
ABSORB	Ocean-atmosphere flux	- 1.8 ± 0.8	- 2.2 ± 0.4	- 2.2 ± 0.5
ABSORB	Land-atmosphere flux	- 0.3 ± 0.9	- 1.0 ± 0.6	- 0.9 ± 0.6
INCREASE	Atmospheric increase	3.3 ± 0.1	3.2 ± 0.1	4.1 ± 0.1

Earth's CO2 Absorption Capacity is **3.1 Gt C**
Present CO2 Annual **Increase** is **4.1 Gt C**

Atmospheric Concentration of CO2 has increased from **280 to 379 ppm**
If we include other GHGs the CO2 eq concentration is roughly **450 ppm**

IPCC best estimate for **350 - 400 ppm CO2**; i.e. roughly **450 - 490 ppm CO2-eq**
indicates a temperature of **2-2.4 Deg C**

Science Contd...

Positive Feedbacks kick in beyond 2°C or even lower temps

To achieve stabilization at 400 ppm CO₂ or to prevent 2-2.4 °C temp rise, emissions need to peak between year 2000-2015 and reduce globally by 85% by 2050 – IPCC.

Recent observations indicate a much shorter time frame

Global Stocks of Carbon

Oceans -39,000 GtC; Soils- 2000 GtC and Vegetation – 500 GtC

200 GtC have accumulated in the atmosphere.

Distinction between **Decarbonizing the Economy** and **Decarbonizing the Atmosphere**

Power and Energy: Shift away from all forms of conventional energy use and towards all forms of renewables and strive for energy conservation.

Policy Options	Policy Instruments
<ul style="list-style-type: none"> • Push for a RE law / RE National Action Plan / Study need for Climate Law • SERCs to set long term progressive RE targets • Creation of State and Central Clean Energy and Energy Conservation funds • Disincentivize dependence on imports of fossil fuels; • Externality and subsidy accounting and correct pricing to reflect true costs of fossil energy, power and water use. • Inter-State transfer of RE power • Reduction in subsidies for conventional energy, transfer to RE / EE • Policy for priority list for power use to reduce wastage in un-critical needs in cities. • Local micro-grids based only on RE for remote areas. 	<ul style="list-style-type: none"> • Renewable Portfolio Standards (RPS) Feed-in Tariffs for RE; Tradable RE Certificates for inter-state RE transfer; Fixed long term PPAs for RE. • Production linked incentive schemes like PTC • Priority sector lending status for Renewables, Energy Efficiency and Conservation • Levy of cess on use of conventional power / fossil fuels • Heavier customs duty on imported energy equipment / fossil fuels • Tariff hikes to reflect true social and environmental costs

Materials: *Move away from energy intensive materials towards renewable and low embodied energy materials*

Policy Options	Policy Instruments
<ul style="list-style-type: none"> • Drastic reduction in use of energy intensive materials (Cement/Steel/Aluminium/glass plastics etc) • Promotion of alternative natural and renewable materials • Stabilized soil blocks and concrete products using fly-ash to replace cement • Increase of R&D in alternate materials • Recycling of non-biodegradable materials to respective industries 	<ul style="list-style-type: none"> • Higher taxes and prices of critical energy intensive materials • Restriction on exports of critical finished products of energy intensive materials

Transport

Strategy	Policy Options	Policy Instruments
<ul style="list-style-type: none"> • Drastically reduce road transport • Disincentivize personal private transport; • Move towards urban public mass transport options; • Inter-modal shifts from roads towards railways powered by renewable electricity 	<ul style="list-style-type: none"> • Disincentivize further Automobiliation, Road / Bridge / Highway • Disincentivize Aviation and its infrastructure. • True pricing of all petroleum transport fuels to include subsidies and externality costs. • Disincentivize biofuels affecting food security • Proper Transportation Demand Management; comprehensive source-destination studies for transport planning. Integrate sustainable land use and transport policies in cities • Incentivize public mass transportation in urban areas; Non-motorized transport promotion; • Establish Clean Transport Fund by taxing private vehicles. 	<ul style="list-style-type: none"> • Higher taxes on fossil fuels; Levy of cess on private transport fuels for Clean Transport Fund • Higher State taxes for motorized transport • Limiting vehicle registrations • Incentivize in-land water transport wherever possible

Industry

Strategy	Policy Options	Policy Instrument
<ul style="list-style-type: none"> ▪ Reducing industrial energy load through adoption of DSM, energy conservation, shift to Renewable and clean technologies ▪ Industrial re-location and decentralization ▪ Shift from coastal cities and coastal areas 	<ul style="list-style-type: none"> ▪ Promote best practices and new technologies in production of high energy-intensive materials ▪ Introduce material and water audit in all Industries along with energy audits ▪ Promote Industrial Waste to Energy biomethanation projects and captive power plants based on RE technologies. ▪ Disincentivize older, polluting and inefficient industries; plan for zero emission industrial estates in new growth centres ▪ Disincentivize further industrial growth in large cities ▪ Develop new forward looking industrial location policy. Create sustainable buffer by planned shift of industries from coastal areas to new growth centres 	<ul style="list-style-type: none"> ▪ Income tax credits to the investment made in energy efficient technologies and Renewable energy. ▪ Disincentivize energy intensive and polluting industries by imposing cess and hiking HT tariff ▪ Adequate budgetary provision for R & D and awareness generation ▪ Earlier policy instruments exist for industrial dispersal; new policy instruments across states may have to be created.

Mining: *Shift away from mining Carbon intensive energy and non-energy minerals*

Policy Options	Policy Instruments
<ul style="list-style-type: none"> • Disincentivize Energy Mining: Coal / oil / gas extraction • Disincentivize Iron ore/ bauxite/limestone extraction • Restriction of mining in forest Areas and regeneration / afforestation of lost forest areas due to mining • Move towards a proper System of National Accounts to account for losses of biodiversity, forest cover, health impacts etc from mining • Policy for mandatory capture of Coal Mine Methane 	<ul style="list-style-type: none"> • Restriction on exports of critical ores and finished products of critical infrastructure items • Higher Royalties and Taxes on Carbon intensive mined minerals

Building and Construction: Design and Construction of low energy and low embodied energy sustainable buildings for achieving total comfort.

Policy Options	Policy Instrument
<ul style="list-style-type: none"> ▪Use of energy efficient building material and design in building construction ▪Adopt best practices with new technologies in production of basic construction material: Cement, bricks, Steel and lime. ▪Promote utilization of reclaimed materials and waste material ▪Promote the 'Carbon Neutral building concept' in the Commercial building sector ▪Promote the traditional climate responsive architecture 	<ul style="list-style-type: none"> ▪Develop grade system to promote sustainable building practices in housing. ▪Provide soft loan/ subsidy to manufacturing industries producing low cost building material using waste material. ▪Mandate the use of Solar Hot Water System by offering rebate in property tax and electricity tariff during initial period. ▪Rework the commercial electricity tariff so as to reflect real cost of generation of fossil fuel based power generation.

Cities: Integrated sustainable and climate friendly urban planning with limiting city sprawl

Policy Options	Policy Instruments
<ul style="list-style-type: none"> •Integrated Development Action plan by empowering urban planning functions. •Mass urban public transport; •Incentivize non-motorized transport. Disincentivize motorized private personal transport. •Promote use of renewable energy options like captive renewable electricity, solar hot water, urban biogas plants etc. •Eco-friendly sustainable housing and reduction in waste generation. •Decentralized waste disposal •Large scale recycling of urban solid non-biodegradable wastes to respective industries. •Promotion of organic city farming / Promote urban forests •Restrict urban growth to limit city size to sustainable proportions •Disaster Management/Adaptation Action Plan in place for extreme weather events, climate induced epidemics and sea level rise where applicable. 	<ul style="list-style-type: none"> •Tax Rebates and Credits for use of renewable energy, reduction in energy use, local waste disposal through composting or biomethanation •Rework property and vehicle taxes •Incentivize recycling industries, tax waste generating products

Taxation: *Review taxation strategies and policy to incentivize clean technologies and disincentivize GHG intensive ones.*

Policy Options	Policy instruments
<ul style="list-style-type: none"> ▪ Imposition of Carbon Taxes through a variety of instruments ▪ Tax Incentives for low GHG emitting options 	<ul style="list-style-type: none"> ▪ Carbon tax on fuels, on the basis of carbon content. ▪ Tax computed on the basis of vehicle efficiency. ▪ General tax on fossil fuel based energy use (Electricity and Heat) ▪ Sector specific taxation ▪ Taxes on non-carbon GHGs ▪ Incentives for GHG emissions reduction or higher efficiencies ▪ Congestion tax to reduce vehicle use.

Finance: *Channelize the investment flows towards low GHG emitting options and away from GHG intensive ones.*

Policy Options	Policy instruments
<ul style="list-style-type: none"> ▪ Creation of specific funds for investment into RE/EE ▪ Mainstreaming investments from large pools of savings in the economy (banking, insurance, pensions funds) into low carbon investments ▪ Encouraging the financial sector to follow socially responsible investment paths ▪ Incentives for green hedge funds and venture capital funds 	<ul style="list-style-type: none"> ▪ Inclusion of green sectors in the priority sector lending ▪ Creation of Clean Energy and Energy Conservation Funds under the EC Act 2001 ▪ Capital/Interest Subsidy for emerging new clean technologies. ▪ Tax credits: Investment tax credit and production tax credit for clean technologies ▪ Regulatory direction to prioritize investments from large savings pools into low carbon and socially responsible investments. ▪ Regulatory provision for low insurance premium for renewable technologies and energy efficient technologies ▪ Social and environmental guidelines for project financing by regulatory authorities ▪ Mandatory Emissions reporting by companies in annual reports

Environment

Strategy	Policy Options	Policy instruments
Tighten Environmental Controls and Implementation	<ul style="list-style-type: none"> ▪Material and water audits for fossil fuel power plants, energy intensive materials and industries, other industries, municipalities and mining sector 	<ul style="list-style-type: none"> ▪Water/Air/Solid Waste Acts and Rules ▪Tighten EIA procedures and compliance ▪Petition Regulatory Commissions in case of non-compliance
Encourage Clean Technologies across major sectors	<ul style="list-style-type: none"> ▪ Incentivize clean technologies across major sectors 	<ul style="list-style-type: none"> ▪Additional R&D funding ▪Carbon displacement subsidies through policy
Valuation of environmental and social externalities of production processes	<ul style="list-style-type: none"> ▪To apply to all major sector – power, materials, transportation, mining to determine contribution of externalized costs 	<ul style="list-style-type: none"> ▪Programme of R&D funding on mid to long term basis
Damage Valuation due to future climate change	<ul style="list-style-type: none"> ▪Damage assessment to be done on sectoral and regional basis for further developing policies for adaptation and mitigation 	<ul style="list-style-type: none"> ▪Long term committed R&D funding programme

Agriculture

Strategy	Policy Options	Policy instrument
Massive shift from chemical – industrial agriculture to organic bio-diverse sustainable agriculture	<ul style="list-style-type: none"> ▪ Policy priority to carbon sequestration in soil on a very long-term basis ▪ Incentivize carbon recycling ▪ Incentivize urban – rural carbon recycling linkage ▪ Disincentivize fertilizers and pesticides ▪ Disincentivize production for long distance markets except food ▪ Incentivize food production over cash crops including biofuels, ▪ Incentivize C4 crops 	<ul style="list-style-type: none"> ▪To be developed under a new Agriculture Policy and new National Farmers Policy. The existing policy framework is not climate friendly ▪Incentivize R&D on sustainable agriculture related topics ▪Disincentivize R&D on energy incentive crops / strategies
Valuation of externalities of chemical-industrial agriculture	Internalize valuation of externalities for major crops-rice, wheat, sugarcane and cotton	Committed research funding for externalities research.
Valuation of Climate change damages on agriculture production	Devise appropriate insurance policies to compensate damage	Low cost crop insurance cover to be developed particularly for poorer sections

Irrigation

Strategy	Policy Options	Policy Instruments
Shift to spatially decentralized and equitable irrigation policies	<ul style="list-style-type: none"> ▪ Increase support for watershed based, local source based productive irrigation across semi-arid, hilly and forest tracts. ▪ Use satellite based information for detailed mapping of small watershed boundaries ▪ Minimize water distribution losses from existing large schemes. ▪ Keep water in public domain. ▪ Review long distance/inter basin transfers 	<ul style="list-style-type: none"> ▪ Review National Water Policy ▪ Cess on water rates in existing irrigation and on urban employed to fund decentralized irrigation. ▪ Increase water rates for industry and power generation ▪ Disincentivize water use for bottling, soft drinks, swimming pools, golf courses and such socially unnecessary uses.
Reduce G.Water extraction	Policy framework to control saline ingress Policy Framework to limit G.Water extraction	<ul style="list-style-type: none"> ▪ Environment Protection Act ▪ G. Water Acts
Reduce agriculture water consumption	<ul style="list-style-type: none"> ▪ Reduce areas under water intensive crops ▪ Strictly enforce volumetric limits on flood irrigation ▪ Preserve ground water for drought years 	<ul style="list-style-type: none"> ▪ Restrict further growth of water-intensive crops
Prioritize refreeze of glacial melt water	Support construction of small structures.	<ul style="list-style-type: none"> ▪ Long term committed funding

Forestry

Strategy	Policy Options	Policy Instruments
Massive countrywide afforestation programme – Himalayas, W&E Ghats, Central India and Watershed and river valley ridgelines and dam catchments	<ul style="list-style-type: none"> ▪ Sustainable usufruct rights to be given to PRIs and local communities participating in this national endeavour ▪ Suitable areas to be mapped using satellite imagery and cartography ▪ Community / household biogas programme to be parallelly implemented in new and old forest areas on priority basis. ▪ Action may be undertaken under NREGA Programmes ▪ Suitable species for local use to be planted; disincentivize exotic species and industrial feedstocks as these are carbon capture forests. 	<ul style="list-style-type: none"> ▪ Nodal National Authority under MoEF ▪ Available under PRI legislation ▪ Central aid to State Govt. to be linked to performance under this programme. ▪ No diversion of funds by state govt. to be tolerated ▪ NREGA commitment for long-term implementation ▪ Botanical Survey of India and Forest Research Institutes to be incentivized
Protection of existing forest both dense and marginal	Higher priority to conservation than to resource exploitation on carbon intensive projects.	<ul style="list-style-type: none"> ▪ Under Forest Conservation Act ▪ Under Biodiversity Act

Oceans

Strategy	Policy Options	Policy Instruments
Strict control of coastal pollution from municipalities, industries, tourism, shipping and shipbreaking industry	<ul style="list-style-type: none"> ▪ Ban sewage dumping into the sea ▪ No industrial effluents can be released into the sea ▪ Release of wastes from ships to conform to international standards ▪ Strict enforcement of release of hazardous / toxic wastes from shipbreaking 	<ul style="list-style-type: none"> ▪ Instruments under pollution control legislation ▪ Incentivize bio-methanation based generation / fuel from sewage ▪ Introduce inspection standards for ships brought for breaking
Regulate eco-sensitive zones such as mangroves, wetlands, creeks, corals and islands	No construction activity to be permitted in these zones except existing traditional housing of coastal / fishing communities.	Change Coastal Zoning Regulations.
Control overfishing through time and size / technology / flag based controls	<ul style="list-style-type: none"> ▪ Allow stock regeneration through time of year controls ▪ Disincentivize export based mechanised fishing ▪ Control fishing by foreign flag carriers in national waters. 	<ul style="list-style-type: none"> ▪ Encourage states to develop legislation ▪ Delink fisheries from Agriculture Ministry, attach to Ocean Development ▪ Encourage States to cooperate in uniform time of year controls.

Regional Impacts

Region	States	Impacts
Himalayan	Kashmir, Himachal Pradesh, Uttarakhand, Northern West Bengal, Sikkim, Arunachal	Impact on horticultural crops; increased land slides and glacial lake outbursts; reduced snow fall affecting river flow, glacial retreat, greater frequency of flash floods, water stress
Coastal	Gujarat, Maharashtra, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa, West Bengal	Sea-level rise induced out-migration, submergence of cities and damage to infrastructure; increased cyclonic damage on Eastern Coast; reduction in sea-food availability; saline ingress
Arid	Rajasthan and Western Gujarat	Increased desertification; stressed grasslands; damage to animal health; water stress; out-migration
Semi-Arid	Punjab, Haryana, Western/ Central MP, Central/Eastern Mah, Central and Western AP, Western TN, Northern and Central Karnataka	Increased variability of rainfall coupled with increasing trend of rainfall; alternate droughts and floods ; loss of agricultural yield ; direct and in-direct health impacts; increased water stress; in-migration from other regions
Central Forests	Madhya Pradesh, Chattisgarh, Jharkhand, Northern Orissa	Forest drying leading to forest fires indirectly affecting catchment characteristics; massive loss of biodiversity

Regional Impacts

Gangetic Plains	UP, Bihar, West Bengal	Loss of agricultural yield; initial increase in river run-off followed by reduction in perennial river flow; water shortages; heat waves; water borne diseases
North East	Assam/Tripura/Meghalaya/ Manipur/Mizoram, Arunachal/Nagaland	Changes in rainfall pattern; Brahmaputra flows will be affected due to glaciers and snow melt changes; impact on biodiversity
Eastern and Western Ghats	Peninsular States	Forest drying leading to forest fires indirectly affecting catchment characteristics; significant loss of bio-diversity
Islands	Lakshadweep, Andaman and Nicobar	Sea-level rise; cyclones
Generic impacts	All India level	Wide spread malnutrition and water shortages, increases in vector borne and bacterial diseases, increased mortality due to heat waves, increased inland flood damages, increased cyclonic damages, loss of bio-diversity, increased mortality of cattle, wide spread migration, increased damage to infrastructure, saline ingress in coastal aquifers, decline in sea food availability, losses to coastal tourism,

Way Forward:

- Decarbonizing energy flows throughout the economy lie at the core of the transformation that is needed and is emerging across the world. Decarbonizing the atmosphere is even more important from the point of view of the future.
- The sectoral transformations leading to a post-carbon economy will create a completely new structure of the economy, linking energy, materials, transportation, industry, agriculture, forests, cities, oceans and distributions of populations, resources and social opportunities, which will be far more sustainable and efficient.
- The future of continued growth is possible under these scenarios of transformation, wherein security of energy, food, water, forests, strategic materials, housing, health and employment can be assured for the large sections of Indian society.
- These transformations can bring about social stability, removal of poverty and inequality and an inclusive sustainable future. The process must start now.

Way forward

- Policy positions in recent years cannot bring about these transformations. Both the Integrated Energy Policy as well as the current position on climate change (MoEF) which indicates a requirement of US \$ 2.35 trillion for marginal reductions in carbon emissions, may commit us to technological lock-in in major sectors. This pre-emption has to be avoided.
- This framework can be developed fully into a policy road map. Preliminary indications show that internal financial resources, if effectively and efficiently utilized, may be adequate. This will create a transformation without an overhang of future debt, which curbs growth by restricting resources available for development.
- It is necessary to develop a new system of environmental accounting that subtracts environmental, social and climate damages from economic growth as measured in financial terms. This will enable us to accurately determine whether the economic development is sustainable.