The Climate Change - Issues and Challenges

Dr. S. D. Naik

FORUM
OF FREE ENTERPRISE

"Free Enterprise was born with man and shall survive as long as man survives".

- A. D. Shroff
Founder-President
Forum of Free Enterprise

SHAILESH KAPADIA

(24-12-1949 – 19-10-1988)

Late Mr. Shailesh Kapadia, FCA, was a Chartered Accountant by profession and was a partner of M/s G.M. Kapadia & Co. and M/s Kapadia Associates, Chartered Accountants, Mumbai.

Shailesh qualified as a Chartered Accountant in 1974 after completing his Articles with M/s Dalal & Shah and M/s G.M. Kapadia & Co., Chartered Accountants, Mumbai. Shailesh had done his schooling at Scindia School, Gwalior and he graduated in Commerce from the Sydenham College of Commerce & Economics, Mumbai, in 1970.

Shailesh enjoyed the confidence of clients, colleagues and friends. He had a charming personality and was able to achieve almost every task allotted to him. In his short but dynamic professional career, spanning over fourteen years, Shailesh held important positions in various professional and public institutions.

Shailesh's leadership qualities came to the fore when he was the President of the Bombay Chartered Accountants' Society in the year 1982-83. During his tenure he successfully organized the Third Regional Conference at Mumbai.

Shailesh was member, Institute of Fiscal Studies, U.K.; member of the Law Committee and Vice-Chairman of the Direct Taxation Committee, Indian Merchants' Chamber. He was also a Director of several public companies in India and Trustee of various public Charitable Trusts.

He regularly contributed papers on diverse subjects of professional interest at refresher courses, seminars and conferences organised by professional bodies.

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Editorial Introduction

One of the key objectives of the FORUM ever since its inception has been to create awareness and educate the people at large on matters that are contemporary in nature, and those concerning India's national interest, especially in the fields of socio-economic policies and developments.

For the past several decades, thus, the issues of climate change have been widely and intensely debated and discussed at the various national and international forums – the latter predominantly under the auspices of United Nations, World Bank, Food and Agricultural Organization, *et al.*

It has been widely recognized that climate change is no more an environmental concern, but has emerged as the biggest development challenge for the planet. It has multi-dimensional effects across various countries, and across different sectors of the respective economies. Its economic impact, particularly on the poor, makes it a very challenging governance issue as well.

The author of this booklet Dr. S. D. Naik has done well to capture multiple aspects of this fascinating, but complex subject – from its technical basics of what the climate change is all about to its various ramifications by way of impact on global warming

and consequential damages to farming activities and agricultural yields; human life and health; and risks of melting glaciers and rising ocean tides.

The author reflects at considerable length on two major international events, namely, the historic Paris Agreement of December 2015 and Katowice Consensus of 2018, based on UN Climate Conference held in Poland. He also highlights some of the salient features of the World Bank Group initiative, which has announced a major new set of climate targets for 2021-25.

From an Indian perspective, what is significant is his observation that India "with its diverse agro-climatic settings, is one of the most vulnerable countries" and hence, his suggestion that "there is a need to foster the process of climatic adaptation in agriculture, which involves reshaping responses, both micro as well as macro level decision-making culture".

All in all this is a very comprehensive and useful article from the perspective of students and researchers, and would also help our general readers on understanding the intricacies of the subject.

Sunil S. Bhandare
Editor

The Climate Change - Issues and Challenges

Dr. S. D. Naik*

The Nobel Prize for Economics 2018 has been conferred on two American economists, namely, William D. Nordhaus, who has been studying the interactions among society, nature, technology and economy over a period of time; and Paul M. Romer, who endogenised technology into the growth model popularised by Robert Solow, in which technology functioned as an autonomous external factor. Nordhaus is best known outside the arcane universe of professional economists for his work on climate change, producing computable models that facilitate forecasting how different kinds of climate changes will have their effects on the economy. Both these models also permit calibration of policies to produce the desired-for effects on green house gas production.

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Economic growth has often been associated with large environmental damage in the form of pollution and environmental degradation. For a variety of obvious reasons, this becomes unsustainable, including the inevitable social friction triggered by the people protesting the costs they are forced to incur on account of externalities. Romer's work highlighted the power of ideas in achieving growth, while limiting environmental cost. These ideas are essentially driven by improved technology. To illustrate, India's high growth phase in the post-reforms period was accompanied by lower energy per unit of GDP because of access to better technology.

What is a climate change?

Climate change is a change in the pattern of weather, and consequential changes in oceans, land surfaces and ice sheets, occurring over time scales of decades or longer. Weather is a state of atmosphere – its temperature, humidity, wind, rainfall and so on. Climate, in its broadest sense, is the statistical description of the state of the climate system.

Rising temperatures increase the concentration of aerosols in the atmosphere that cause air pollution, according to a study which highlights another disturbing effect of climate change.

It is warming the oceans; it is warming land faster, which is bad news for air quality all over the world, according to researchers from the University of California, Riverside in the US. The study published in the journal 'Nature Climate Change' shows that the contrast in warming between continents and sea, called the land-sea warming contrast, drives up the aerosol concentration in the atmosphere. Aerosols are tiny solid particles or liquid droplets suspended in the atmosphere. They can come from natural resources like dust, wild fires, or man-made sources such as vehicle and industrial emissions.

Aerosols affect the climate system, including disturbances to the water cycle, as well as human health. They also cause smog and other kinds of air pollution that can lead to health problems of people, animals and plants. The increase in aridity leads to low cloud cover and less rain, which is the main way that help removal of aerosols from the atmosphere. In the business-as-usual scenario, enhanced land warming leads to increased continental aridity and, subsequently, the concentration aerosols lead to more air pollution.

According to United Nations, climate change is the defining issue of our time and we are at a defining moment. From shifting weather patterns that threaten food production to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change are global in scope and unprecedented in scale. Without drastic action today, adapting to these impacts will be increasingly more difficult and costly in future.

According to new reports, the five years from 2014 to 2018 were the warmest years ever recorded in the last 139 years that the National Oceanic and Atmospheric Administration (NOAA) has tracked global heat. Indeed, 2018 was the hottest year ever recorded. Global air temperatures have varied steadily over the past decades, shifting up and down slightly from year to year depending on natural climate oscillations like El Nino, but following a consistent upward path. Land temperatures were more than 2 degrees warmer than the 20th Century average. Warming climate does not simply heat up summers and keep winters from getting as cold as they used to do: it can change when and where snow falls or lakes freeze. And it may also change the very ways that the oceans circulate.

Surely, ever-increasing heat is a huge challenge for humans and living creatures around the world. Heat waves from Europe to Australia roiled the planet during the past year, breaking temperature records and devastating wildfires. The European heat waves, scientists discovered, were five times more likely to happen because of human-induced climate change. The wild fires that wracked the western US were also intensified by climate change, scientists pointed out, as heat and drought sucked water out of vegetation.

The Climate Crisis

Philippus Wester of the International Centre for Integrated Mountain Development has directed the landmark report – The Hindukush Himalaya Assessment – released this year on the melting glaciers in the Himalayan range. It carries an alarming title "Global warming on track to transform the frigid glacier covered mountain peaks, to bare rocks in a little less than a century".

According to the report, two-thirds of the Himalayan glaciers are at the risk of melting by 2100, if global emissions are not reduced by a sharp margin. Even if emissions are rapidly cut, one-third of the ice fields in Hindukush and Himalayan ranges are sure to melt in the next 80 years. These glaciers are a critical source of water for 250 million people

who live in the region, and would have a bearing on the lives of over 1.5 billion people from India, China and Pakistan who live in the nearby regions. The Hindukush and the Himalayan region runs 3,500 km. long from Afghanistan to Myanmar and is called the 'third pole' because of the quantum of ice it harbours. It is also home to some of the highest peaks in the world such as Mount Averest and K2. The report, which was prepared over a five-year period by more than 200 scientists, revealed that huge masses of ice in the third pole have steadily thinned since 1970s when global warming first set in. Almost 15 per cent ice is believed to have disappeared since.

Another study released by NASA's Jet Propulsion Laboratory in January 2019 discovered that an enormous underwater cavity in the Thwaites Glacier on Antartica's western coast will perhaps speed up the glacier's thinning and decline. The cavity is about two-thirds the area of Manhattan which is nearly 1,000 feet tall, the study noted. The water-filled cavity is formed by warm ocean water melting the ice shelf. As the glacier comes in touch with more warm water currents, the probability of ice melting will be faster. The NASA study, as reported in the New York Times story some time ago, found that the ice shelf in the area melted at

the rate of more than 650 feet per year between 2014 and 2017.

The direct effect of global warming is seen in the rising sea levels that contribute to increased instances of flooding in the nearby areas. According to the NASA study, the Thwaits Glacier, if melted, may raise the water levels in the world's oceans, by about two feet, threatening the lives of many residing in coastal cities. Even the melting of glaciers in the Himalayan ranges could disrupt the flow of rivers like Ganga, Indus, Yellow and Mekong, which could eventually have a bearing on crops for billions of people residing in the eight neighbouring countries. The melting glaciers will increase rivers flow through 2050 to 2060, after which river flows will start shrinking sharply. The Indus and the Central Asian rivers will be most affected, wrote, 'The Guardian' in a story quoting Westers.

Besides rising levels of ocean waters, melting glaciers would result in worsened air pollution and increased frequency of extreme weather conditions. Most places in the US have reportedly observed extreme winters this time around, while summers don't seem too far along here in India. A study published by the journal 'Nature Climate Change' noted the contrast in warming between continents

and sea resulting in the aerosol concentration in the atmosphere to rise, thus deteriorating air quality. While Delhi has continuously seen a surge in the number of toxic air days, Thailand's capital, Bangkok has also been in the news of late for witnessing unprecedented levels of air pollution. Residents have complained of increased instances of nose bleeding and irritation in the eyes due to toxic air.

Historic Paris Agreement

Incidentally, the 2018 Nobel Prize came after the historic Paris Agreement to combat climate change and unleash actions and investments towards low carbon, resilient and sustainable future which was agreed and signed by 195 nations in Paris in December 2015. This agreement, for the first time, has sought to bring all nations into a common cause based on their historic, current and future responsibilities. This agreement's main aim was to keep the rise in global temperature in this century below 2 degrees centigrade and to drive efforts to limit the temperature increase even further to 1.5 degrees centigrade above the pre-industrial levels. This level is supposed to be a much safer defence against the potential worst ever impacts of climate change.

It was also agreed that to reach these ambitious goals, appropriate financial flows will be put in place, thus making it possible for stronger action by developing countries in line with their own national objectives. The Paris agreement and the outcomes of the UN Climate Conference are expected to cover all the crucial areas identified as essential for a landmark conclusion. The agreement also strengthens support to developing nations.

Unfortunately, the President of the United States of America, Donald Trump has withdrawn from the Paris Agreement saying that it is an "agreement that disadvantages the United States to the exclusive benefits of other countries". This clearly amounts to denying the reality and urgency of the problem. Many experts have rightly pointed out that the US contribution to air pollution is the highest in the world. However, by co-incidence or design, the process of US withdrawal from the agreement cannot begin before the 2020 US presidential election.

The Katowice Consensus & India's Position

Incidentally, the UN Climate Conference held in Katowice in Poland in 2018 has moved ahead with the implementation of the Paris Agreement through a rule book reflecting strong support among citizens of all countries for urgent action to avert dangers

arising out of climate change. Apparently, public pressure has prevailed over scepticism, although the outcome does not adequately reflect the short window available to make deep green house gas emissions cuts.

Yet, the Paris Agreement, endorsed by 195 countries under the UN Framework Convention on climate change has a long road ahead before carbon emissions can be pegged at levels flagged by scientists. Recently, the Inter-governmental panel on climate change, in a special report, issued a stark warning on man-made emissions. It said that to cap the rise in global average temperature over pre-industrial levels at 1.5 degree Centigrade, a 45 per cent reduction in emissions over 2010 levels must be made by 2030.

This is a challenge for all big economies, including India, which is among the top 5 emitters of carbon dioxide. ***In the Indian context,*** it highlights the need for action on several fronts, namely, (a) scaling up solar and wind power in line with the goal of reaching 175 GW by 2022; (b) steadily reducing reliance on coal; (c) shifting substantially to electric mobility; and (d) adopting green industrial processes. It is obvious that taxing luxury emissions and using the dividend to support poor to have an access to energy has to be the one of the key policy goals,

thereby building on international green funding linkages.

At Katowice, Indian negotiators put forth legitimate concerns on the likely social impact of the new rules that will make the Paris Agreement operational in 2020. After all, at an estimated 1.2 tonnes of CO2 per capita, India emits far below the global average of 4.2 tonnes. Yet, cumulative emissions determine the impact on climate. The task now is to achieve a paradigm shift that will slow down the addition of new sources of carbon emissions.

As a party to the global climate impact, India has to systematically assess its emissions and measure mitigation actions to UNFCCC at stock-taking meetings. This is an opportunity to bring major sectors such as energy production, construction, agriculture and transport on board, and make changes to regulations that favour environment friendly alternatives. China has taken the lead in advancing electric mobility. A "clean up" India will help meet emission commitments and remove the blanket of air pollution that is suffocating major cities.

According to some experts, Katowice agreement delivered precious little beyond the rulebook. There was no global climate action vision forthcoming. How desperately one is needed is evident from

the latest special report of the United Nations Inter-governmental Panel on Climate Change which rightly exhorts action on the part of nations to limit global warming to a maximum of 1.5 degrees C above the pre-industrial levels or suffer unprecedented damage to the goals of poverty eradication and sustainability.

Global warming threatens the entire world – all the continents, countries or their substantive portions, various sectors, and lives and livelihoods of billions of people. For example, polluted air and water disproportionately affects India's poorest, increasing the risk of infections, diseases, reducing standard of living, and lowering the chance of escaping the poverty trap. Unfortunately, the US, Russia, Saudi Arabia and Kuwait – all oil-rich nations – successfully stalled the formal adoption of the pathway suggested by IPCC report for meeting the desired target for limiting the warming of 1.5 degrees C below pre-industrial levels as suggested in the formal agreement.

The work of another famous Nobel laureate, Ronald Coase, had many years ago argued that so long as property rights are clearly established, externalities will not pose a problem. The presence of very high transaction costs prevent that from happening frequently enough, obliging the governments to

intervene to correct the market failures. Firms are also reluctant to invest in the clean-up cost of environmental damage unless forced to do so. Consequently, in the case of "bad" externalities, such as harmful emissions, the market will continue to produce too much of them.

The Heat is on...Implications for India

As Sagnic Dey, Associate Professor at the Centre for Atmospheric Sciences, IIT Delhi, reminds us: "The impact of climate change can be seen on all spheres of lives, including impact on health, food security, water resources, natural resources, extreme events, and so on. The direct impact on health can be seen through changes in ecological niches for spreading vector borne diseases like malaria, dengue and air pollution.

A World Bank report titled "South Asia's Hotspots: Impacts of Temperature and Precipitation Changes on Living Standards" warns that changes in average temperature and precipitation will not just make survival difficult, but also severely impact the living standards of 600 million Indians living in vulnerable areas. It further adds that ***rising temperatures and erratic rainfall patterns could cost India around 2.8 per cent of its GDP.***

In the coming decades, the changes in average weather will have a clearly negative impact on living standards in Bangladesh, India, Pakistan and Sri Lanka. In India and Pakistan, water stressed areas will be more adversely affected compared with the national average, the report noted. Incidentally, the word of caution was not without reason. We are already seeing the ill effects of an erratic monsoon pattern across the country. Parts of Maharashtra, Karnataka, Rajasthan and Odisha continue to witness a worst form of drought year after year, while Kerala suffered the wrath of floods in August 2018, worst since 1924.

According to a report released by the Intergovernmental Panel on Climate Change in October 2018, if global warming continues to increase at the current rate, temperatures are likely to increase by 1.5 degrees anytime between 2030 onwards. That will mean we will be grappling with severe bouts of heat waves in a little over 10 years from now. The repercussions of extended summers are everywhere – an irrational monsoon pattern, aggravated levels of pollution, an alarming increase in the death of new born babies due to infections, looming threats of floods in coastal cities, and even loss of business.

"India has a tropical climate and it contributes to the largest number of new-born deaths in the world – approximately 27 per cent. Of this 27 per cent, almost 35 per cent or one-third of new born babies die due to infections, which is a pretty large number," says Vikas Datta, Director-Professor at the Department of Neonatology, Lady Hardinge Medical College, New Delhi.

As per the report of the World Health Organisation (WHO), over 88 per cent of the existing diseases among children below the age of five years are supposed to be due to climate change. If the direct relation between erratic climate patterns and the burden of diseases is not enough to understand the gravity of the issue, Samanta Ahdoot, lead author of a policy statement in the American Academy of Padiatrics, says, children are also most vulnerable to secondary impact of global warming.

Drop in Produce

India's Economic Survey for 2017-18, had estimated that extreme temperature shocks had resulted in 4 per cent decline in agricultural yields during the Kharif season (July-October) and 4.7 per cent decline in yields during the Rabi season (October-March). Similarly, extreme rainfall shocks – when it rains significantly less than usual, also impact the yields adversely. Kharif yields had dropped by

almost 12.8 per cent, while Rabi yields dropped by around 7 to 8 per cent.

Since the drop in yields has a direct bearing on agricultural incomes, the Economic Survey noted that climate change could reduce annual agricultural incomes by 8 per cent on an average and between 20 to 25 per cent particularly in the case of unirrigated areas. Data shows that minimum temperatures have been rising at a relatively faster rate than the maximum temperatures. This has adverse impact on yields along with impact due to the increase in pollution.

Further, as per the World Bank report mentioned earlier, temperatures in Bangladesh, India, Pakistan and Sri Lanka are already above the optimal values. Besides causing discomfort to people and altering their lifestyles, changing temperatures and seasonal precipitation patterns have already altered the farming seasons in these countries. Also, as per the World Bank's calculations, healthcare fees and productivity losses from pollution, cost India as much as 8.5 per cent of its GDP.

Focus on Renewable Energy

As a relatively poor country, India will be among those most adversely affected by climate change if warming exceeds I.5 degree C. Hence among

other things, it will have to speed up renewable energy generation. "The window of opportunity for action is much smaller", said Priyadarshan Shukla, Chair of Global Centre for Environment and Energy, Ahmedabad University. In its report, Global Warming at 1.5 d C, released on October 15, 2018, the UN-backed Intergovernmental Panel on Climate Change (IPCC) said time is running out to avert the more disastrous impacts of climate change. The global average temperature is already 1 d. C above pre-industrial times and at the current rate of emissions, the earth is warming up 0.2 d C every decade. "Every half a degree warming matters" said Hoesung Lee, the chair of IPCC.

India has already experienced weather changes in Uttarakhand, Chennai, Srinagar, and more recently, in Kerala. The heat waves of the past summer and uneven rainfall, with floods affecting some regions and very severe drought conditions in others, herald a huge and expanding danger. "We have a generation or less to make some dramatic changes in the way that economies run, the way we govern our systems" said Aromar Revi, co-ordinating author of the 2018 IPCC special report. Changes will be required across energy, transportation, urban and agriculture systems.

However, like other experts, Revi stressed that this is also a moment of opportunity for India. He argued that at the per capita level, because of our large population, India is not a significant emitter. This gives India a chance to rework her entire energy system and the way agriculture, water and cities are managed. He further observes that "it is a moment to do the things we haven't been forced to do before". Like-wise, Arnubha Ghosh, CEO of the Council on Energy, Environment and Water states that "India has an ambitious programme focussed on renewable energy generation capacity, but the pace needs to "maintain the momentum, thereby ensuring that targets are met and raised, that contracts are honoured, transmission losses are reduced and attention is paid to technology development and manufacturing".

Moreover, several experts point out that the key is also in grid stabilisation, which will need to be addressed in a systematic way, given the question of balancing renewable power in the grid in the context of increasing dependence of the power system on variable renewable sources. Thomas Spencer, research fellow at the Energy and Resources Institute in New Delhi, observes that "what is ultimately required is a paradigm shift in financial and operational systems".

Further, Arnubha Ghosh highlighted the importance of energy efficiency as an important segment to drive radical transformation. "The early gains on energy efficiency in large industries should be supplemented with better enforcement of industrial emission standards," Ghosh said. While independent assessments show India is on a path that is in keeping with 2 d C rise, experts say that going by the current trends in renewable energy development, it is likely that India will surpass its 2022 goals. It will not only meet the 2 d C goal, but is likely to do more than that. Evidently, the solutions required to limit warming to 1.5 d C are available. What is required is to speed up and scale up implementation. "The Governments have to review targets with 1.5 d C in mind rather than 2 d C" said Mr. Shukla of Ahmedabad University, who also chairs IPCC Working Group III on mitigation. Unfortunately, implementation is often "fragmented," according to Minal Phatak, a professor at the University's Global Centre for Environment and Energy.

World Bank Group Initiative

The World Bank Group has announced a major new set of climate targets for 2021-25, doubling its current 5-year investments to $200 billion in support for countries to undertake ambitious

climate action. The new plan significantly boosts support for adaptation and resilience, recognising the mounting climate change impacts on lives and livelihoods, especially in the world's poorest countries. The plan also represents significantly ramped up ambition from the World Bank Group, sending an important signal to the wider global community to do the same.

The $200 billion support across the Group is made up of approximately $100 billion in the direct finance from the World Bank (IBRD/IDA), and approximately $100 billion of combined direct finance from the International Finance Corporation (IFC) and the Multilateral Investment Guarantee (MIGA) and private capital mobilised by the World Bank Group. A key priority here is boosting support for climate adaptation, recognising that millions of people across the world are already facing severe consequences of more extreme weather events. By ramping up direct adaptation finance to reach around $50 billion over FY 2021-25, the World Bank will, for the first time, give its equal emphasis alongside investments that will help reduce emissions.

World Bank Chief Executive Officer, Kristaline Georgivia observes that "people are losing their lives and livelihoods because of disastrous effects

of climate change. We must fight the causes and also adapt to the consequences that are often more dramatic to the world's poorest people". He further said that "this is why we at the World Bank commit to step up climate finance to $100 billion, half of which will go to build better adapted homes, schools and infrastructure, sustainable water management and responsive social safety nets".

The new financing will ensure that adaptation is undertaken in a systematic fashion, and the World Bank will develop a new rating system to track and incentivise global progress. Actions will include supporting higher quality forecasts, early warning systems and climate information services to better prepare 250 million people in 30 developing countries for climate risks. In addition, the expected investment will build more climate responsive social systems in 40 countries, and "climate smart" agriculture investments in 20 countries.

There are literally trillions of dollars of opportunities for the private sector to invest in projects that will help save the planet, said IFC CEO Phillipe Le Houreou. "Our job is to go out and proactively find those opportunities, use our de-risking tools and encourage private sector investments. We will do much more in helping finance renewable energy, green buildings, climate-smart agri-business,

urban transportation, water and urban water management", he said.

The new targets build on the World Bank Group's 2016 Climate Change Action Plan. In 2018, the World Bank provided a record-breaking $20.5 billion to finance climate action, doubling delivery from the year before the Paris Agreement, and meeting its 2020 target two years ahead of schedule. The World Bank Group will continue to integrate climate considerations into its work, including screening projects for climate risks and building appropriate risk mitigation measures, disclosing both gross and net greenhouse gas emissions, and applying a shadow carbon price for all material investments.

Helping Poorest Countries

How would the poorest countries deal with the challenges of climate change? Globally, the last three years were the hottest on record. Emissions of carbon dioxide from fossil fuels and industry started rising in 2017 after a brief levelling off. Many regions experienced more severe and frequent storms, flooding and droughts. According to the latest inter-governmental panel on climate change report, the climate consequences of a 2 degree C are now far greater than for a rise of 1.5 degree C, and we are not even on track for either.

Given the urgency and enormous demands for financing, an estimated $1 trillion will be needed in the poorest countries to meet climate commitments by 2030. Evidently International Development Association (IDA) will need to play a bigger role to deal with the situation. With the strong support of donor partners, the IDA has been helping integrate climate into policy reforms and development planning so that countries can reduce their climate emissions and become more resilient and climate smart. For example, forest policy notes are shaping dialogue among countries, governments and development partners. They are also identifying new engagements and project designs in the Democratic Republic of Congo, Ethiopia, Liberia, Mozambique and Nepal. In Bangladesh, a Climate Smart Agriculture Investment Plan is helping ensure high level of co-ordination among government ministries.

On the ground, IDA projects are helping people to become climate smart in their agriculture and land use. In Burundi, Landscape Restoration and Resilience Project is enabling farmer groups to protect top soil, recover soil fertility and begin year-round production of nutrient-rich foods. The farmers are now able to access seeds and fertilisers for a wider range of food and fodder crops, as well as trees and soil stabilising grasses to protect

their land. In Ethiopia's Oromia region, Biocarban Fund Initiative for sustainable Forest Landscape is helping more women register land and become coffee farmers while also introducing climate smart practices to boost productivity.

IDA 18 is helping expand renewable energy across client countries, both to combat climate change and to improve energy access for poor countries. Between July 2017 and September 2018, IDA helped client countries mobilise financing for 6.0 GW of renewable energy generation, exceeding the target of 5 GW. IDA's support will also be critical in helping countries meet their objectives under the Paris Climate agreement as well as the climate-related Sustainable Development Goals.

Transport and Climate

Transport bears a huge responsibility in the current situation since the sector contributes to nearly a quarter of global energy-related green house gas emissions and 18 per cent of all man-made emissions in the global economy. Under a business-as usual scenario, this figure will continue rising to reach one third of all emissions by 2040. Hence, cutting emissions from transport must be central to solving the climate equation.

Now is the good time to identify the most effective solutions for lowering the carbon footprint of transport. By 2050, road transport is projected to see its GHG emissions rise by more than half, international aviation by 300% to 700% and estimates for international maritime transport range between 50-250 per cent. A reduction in transport-related GHG emissions will only be made possible by reducing transport's dependency on fossil fuels and relying more on alternative energy technologies. With as much as 96 per cent of global transport's energy mix currently dependent on fossil fuels, this is more easily said than done.

Farming in a Warming World

The pervasiveness of climatic aberrations and associated socio-economic vulnerability are now widely recognised and experienced across the globe. The Sixth Assessment Report by the IPCC on Global Warming distinctly propagates the need to strengthen and enhance existing coping capacity and to remain committed to the objectives of the Agreement. The report has already established that the world has become 1 degree C hotter because of human activities, causing greater frequency of extremes and obstruction to the normal functioning of ecosystems. Climate-induced risks are, thus, projected to be higher for global warming. More

importantly, for such change in global warming, indigenous populations and local communities dependent on agriculture or coastal livelihoods are very vulnerable to climate impacts.

India, for instance, with its diverse agro-climatic settings, is one of the most vulnerable countries. Its agriculture ecosystem distinguished by high monsoon dependence and with 85 per cent small and marginal landholdings, is highly sensitive to weather abnormalities. There was less than normal rainfall over the last four years, with 2014 and 2015 declared as drought years. Research has also confirmed that an escalation of heat waves, is adversely affecting crops, aquatic systems and livestock.

Steps Needed

According to Food & Agriculture Organisation (FAO) Climate change threatens our ability to ensure global food security, eradicate poverty, and achieve sustainable development. Greenhouse gas (GHG) emissions from human activity and livestock are a significant driver of climate change, trapping heat in earth's atmosphere and triggering global warming.

Climate change has both direct and indirect effects on agricultural productivity including changing

rainfall patterns, drought, flooding and geographical redistribution of pests and diseases. The vast amount of CO2 absorbed by oceans causes acidification, influencing the health of oceans and those whose livelihoods and nutrition depend on them. FAO is supporting countries to both mitigate and adapt to the effects of climate change through a wide range of research-based and practical programmes and projects, as an integral part of its 2030 agenda and the Sustainable Development Goals.

There is a need to foster the process of climatic adaptation in agriculture, which involves reshaping responses across both at micro as well as macro level decision making culture. Climate exposure can be reduced through agronomic management practices such as inter and multiple cropping and crop-rotation; shift to some non-farming activities; going for crop-insurance covers, up-scaling techniques such as solar-pumps, drip-irrigation and sprinklers.

Climate adaptation actions in agriculture are closely inter-twined with rural development interventions, calling for a holistic paradigm. At the macro level, climate adaptations are to be mainstreamed in the current developmental framework which is still

at a nascent stage, as acknowledged by India's Economic Survey 2017-18.

In summing up, mainstreaming adaptation into the policy apparatus has the potential to improve the resilience of several development outcomes. Key interventions needed are expansion of extension facilities, improving irrigation efficiency, promotion of satellite-enabled agriculture risk management, creating micro-level agro-advisories, providing customised real-time data, and capacity building of stakeholders towards building greater resilience in agriculture.

"People must come to accept private enterprise not as a necessary evil, but as an affirmative good".

- Eugene Black
Former President,
World Bank

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The Forum of Free Enterprise is a non-political and non-partisan organisation started in 1956, to educate public opinion in India on free enterprise and its close relationship with the democratic way of life. The Forum seeks to stimulate public thinking on vital economic problems through booklets, meetings, and other means as befit a democratic society.

In recent years the Forum has also been focusing on the youth with a view to developing good and well-informed citizenship. A number of youth activities including elocution contests and leadership training camps are organised every year towards this goal.

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