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Business India

THE MAGAZINE OF THE CORPORATE WORLD

December 11-24, 2023

BUSINESS INDIA • COMMITED TO CLIMATE STEWARDSHIP •

INNOVATION AND INDIA

How to keep climate change within livable temperature bands

PETRONET LNG LIMITED

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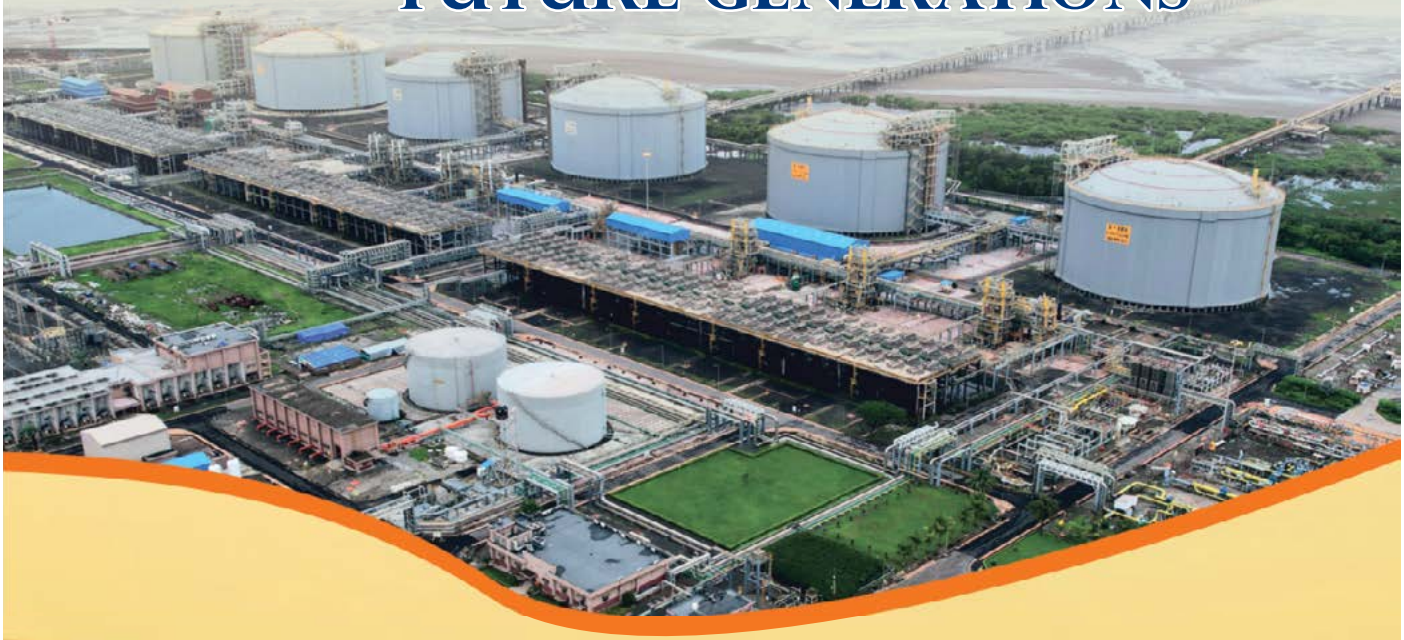

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Business India

This is our third annual issue on Climate Change, to coincide with the annual COP meeting. With COP28 closing this week, the outline of the progress made by all the nations collectively is now fairly clear.

For the first time, the COP (Conference of Parties) meeting was being held in a major oil-producing country. And over the years the momentum has been building for a strong consensus on the phasing out of fossil fuels. While the oil producing countries (and oil majors) have been pushing back on oil production, and instead asking all to focus on the emissions caused by burning fossil fuels.

There have been the usual discussions on the urgency of stepping up production, and the switch to renewable energy. There has been a push to expand the available financial resources to accelerate the adoption. And while the rich countries admit a slippage in their commitments made in Paris on transfer of resources to the poorer countries, and have made promises to step up the transfer, few actual commitments have emerged.

The bigger issue, both from a current and historical perspective of Climate Justice, as always, in spite of some polite acknowledgements, keeps getting pushed to the background. This particularly concerns countries like India, which have contributed little in the past 150 years to carbon emissions, and even today contribute, at 7 per cent, a fraction of what the US does, at 11 per cent or what China (with a much larger population than US) does at 30 per cent.

The government of India has set very ambitious goals for adding renewable energy capacity. It is also at the forefront of encouraging new technologies like for the production of green hydrogen. It is also encouraging the switch to electric mobility – for two- and four-wheelers and even buses. At the same time, it is realistic to recognise that for the next decade at least, new coal-fired plants are necessary to keep up with the growing demands for electricity. And this is necessary if we are to focus on removal of poverty and growth for our people- and to move towards being a developed nation by 2047.

At the same time the government can see that with changing climate patterns, resulting in heat waves, droughts in parts of the country, and floods in other parts, together with the extreme levels of pollution in our cities (and large parts of the countryside too) – the people most affected are the common people in our own country.

It would be fair to say that few countries are as committed to tackling climate change. But of course, with an eye on solutions that are fair and just.

Ashok H. Advani

Hero MotoCorp – Where Sustainability is a Way of Life

Leading the Way in Water Positivity Initiatives

At Hero MotoCorp, the world's largest two-wheeler manufacturer of motorcycles and scooters, sustainability is a way of life. Hero MotoCorp leads the way among automotive OEMs in creating a sustainable and circular economy.

Towards that end, the company is committed to ensuring water positivity across its manufacturing locations. This translates into using water efficiently in the manufacturing processes, recharging and rejuvenating local aquifers, deploying water harvesting methods beyond the fence to build access to water among communities, thus driving the Company's efforts towards water stewardship.

With a water positivity rate of 405%, the Company is saving close to 3.8 million kiloliters of water every year. Most importantly, the Company has adopted industry-best measures - both within the fence and beyond the fence - in order to create a system that sustains the practice of saving and recharging water.

In 2015, Hero MotoCorp's utilization of water resources stood at 0.20 kiloliter/vehicle. Through a series of water conservation approaches, the company significantly reduced its water usage to 0.16 kilo liter/vehicle in the year 2023. The Company remains determined to continue adopting proven techniques of ensuring the source of life on earth remains preserved for our future generations.

With a commitment to achieve a water positivity rate of 500% by 2025, Hero MotoCorp is well on its way to achieving the target and going beyond it.

The Company created artificial recharge shafts - 570 within the fence and 134 beyond the fence - to ensure the groundwater reserves are recharged and potent water sources for local communities.

Among the beyond the fence initiatives, the Company has already created 24 check dams, and farm ponds and are in the process of developing 50 more farm ponds. More than 3.4 million cubic meters of rainwater harvesting measures have been put in place because of these interventions.

"Hero MotoCorp has always been at the forefront of environmental initiatives. We believe that to be a part of the future, we have to guard all our non-renewable resources at the present. The success we have seen at Neemrana, a water-stressed area, has shown us that innovation and intent can go a long way in safeguarding our planet's future."

Niranjan Kumar Gupta
Chief Executive Officer
Hero MotoCorp

With a commitment to achieve a water positivity rate of 500% by 2025, Hero MotoCorp is well on its way to achieving the target and going beyond it.

Reduce
Through adoption of Nano-Pre-treatment, a process that replaces zinc-phosphate treatment with zirconium resulting in the generation of zero hazardous waste and **40%** reduction in water usage, Hero MotoCorp is cutting back on water usage across its manufacturing locations. The Company has moved from water-cooled to air-cooled manufacturing, adopted alternative cooling, drip irrigation, low-flow faucets, and auto TDS controllers to further save water in its manufacturing processes.

Recycle
The Company recycles **60%** of domestic and process water through its Sewage Treatment Plant and Effluent Treatment Plant.

Recover
An essential part of preventing water wastage, this includes recovery from water-cooled processes, boilers, recycling of RO rejects and backwash of filters.

Home to three of its facilities — a manufacturing plant with a total capacity of 0.8 million motorcycles, Global Parts Centre (GPC) that came up in 2014 and a state-of-the art Global Centre of Innovation and Technology in Jaipur — Hero MotoCorp's water conservation initiatives commenced in Rajasthan.

The Company identified three village panchayats comprising seven villages of Dosod, Banthala, Rodwal, Bheempura, Mukunpura, Vijaypura and Pratap Singh Pura where micro watersheds could prevent runoffs and recharge the water basins.

Consequently, Hero MotoCorp constructed 91 recharge shafts in an area of 58 sq. kms with a water harvesting potential of 16,38000 cubic meters/year. A total of 52 recharge shafts were constructed inside the Neemrana plant premises, with a water harvesting potential of 1,05,072 cubic meters/year.

The Neemrana success story has sparked off similar initiatives in Rajasthan's Dausa. By partnering with local communities to construct check dams, ponds and recharge shafts, not only is the Company saving an essential resource for the future generations but also providing livelihood opportunities for the locals.

The Company is pursuing its water positivity goals with a clear vision of making water accessible to communities around their catchment area.

"I was earlier able to sow bajra in only 1.5 bigha out of 5 bighas of land. We were dependent on the seasonal monsoons for irrigation and had to incur losses every year. With a farm pond within my farm now, I can grow groundnuts along with bajra. I have also sown rabi crops for the first time and planning for more crops. Farming has become profitable now."

Bhagwan Sahay Meena
Bagpura village, Dausa, Rajasthan

500%
Water positivity by 2025

704 recharge shafts
Within and beyond the fence

3.4 million cubic metres
of rainwater harvesting measures

50% reduction
From 450 kiloliter/day to 225 kiloliter/day

24 liters
Water conserved for every litre extracted

The impact of artificial groundwater replenishment and better water management in production processes has resulted in 50% reduction of water consumption.

Recharge
The company has been conscious of the ecosystems and local groundwater availability in areas where a bulk of its manufacturing activities are located. It has been conscious in promoting a series of water harvesting techniques that arrest runoffs, recharging the groundwater reserves and ensuring water access to local communities.

Rejuvenate
The company has supported the revival of 12 water bodies (ponds, check dams and rainwater harvesting units) in Neemrana in Rajasthan and 12 in Dharuhera in Haryana, resulting in an enhanced capacity of **89.5 million liters** (approximately 0.9 million kilo liters). The Company plans to take up 15 more water bodies in Dharuhera and Gurugram that will result in the creation of an additional 1.25 million kiloliters of water.

Recognise/Respect
Hero MotoCorp has undertaken company-wide awareness drives on judicious use of water, documenting its best practices at Neemrana and also promoting water harvesting and biodiversity preservation through its CSR initiatives.

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Ashok Chaturvedi
Chairman and Managing Director

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May 15-19, 1995
Davos, Switzerland

on the subject of:

"Recycling of Mixed Plastic Waste Comprising of Laminated Films of Metalized PET / LDPE / BOPP and Printed with Inks"

Mr. Vipin Mital
FLEX INDUSTRIES LTD.
INDIA

has been awarded with the BEST PAPER HONORS in the section on Plastic Films and Source Reduction

For the Organizing Committee:

Mr. Horst Maack, Chairman

Pioneers in Recyling Multi-Layer Mixed Plastic Waste since 1990's

We are driven by our purpose to contribute toward building a circular plastics economy by 'keeping plastic in the economy and out of the environment'.

UFlex is the first company in the world to invest in an advanced Enzymatic Delamination Technology to enable aseptic packaging recycling. Enzymatic delamination utilizes enzymes to break down the bonding between different layers of the packaging materials, separating the individual layers such as paper and polyethylene/foil laminate, which is reused in packaging and the production of new products.

FY23 Sustainability Highlights

35.41%
Increase in recycled/reused raw materials/inputs in our production processes, from the previous year

55.95%
Reduction in Scope 1 emissions from the previous year

14.99%
Reduction in total waste generated from the previous year

Our Sustainability Pillars

Our sustainability strategy focuses on 4 Rs: Reduce, Recycle, Reuse and Return.

REDUCE

Up to 100% **post-consumer recycled content** (PCR) packaging film to reduce the use of virgin plastic at source

RECYCLE

Converting **Multi-Layer Mixed Plastic (MLP) Waste** into granules to make household and industrial products

REUSE

Converting **plastic waste into fuel**

RETURN

100% super earth-friendly **biodegradable packaging** that breaks down under ambient conditions

Mr. Anantshree Chaturvedi, Vice Chairman, Flex Films International; **Mr. Apoorvshree Chaturvedi**, Director – Global Operations, UFlex Group, and **Mr. Jeevaraj Pillai**, Director - Sustainability, UFlex Limited, at the Alliance to End Plastic Waste (AEPW) Board Meeting in New York.

Awards and Accolades

FICCI Chemicals & Petrochemicals Award for Efficiency in Water Use
Outstanding Work in Circularity Award by the Indian Circularity Forum
Silver Award for Technical Innovation by the Flexible Packaging Association, USA
The Economic Times Sustainable Organization 2023

Climate action has reached a stage of maturity compared even to just a few years ago when we started the annual Climate Special Edition.

This year we explore the evolution of climate action and look to the future. Perhaps less optimistic than prior editions, it is more that the complexity and pervasiveness of the challenge has become clearer, as has the necessity for accelerated and coordinated action amid geopolitical strife.

Innovation and India remain torch bearers for a better future.

Innovation, and not just the type done at start-ups, is starting to demonstrate traction. Corporate leaders are both adopting mature climate innovations to secure trade and market benefits and increasingly nurturing start-up innovations. For their part, start-ups have demonstrated more complex technologies as well as an ability to commercialise technologies more rapidly than developed market peers.

India continued its efforts as THE climate leader of the global south. Climate was woven into nearly every other theme discussed in the G20 and India negotiated from strength at COP, agreeing to concessions on coal in exchange for developed markets also agreeing to phase out fossil fuels. Programs across the government continue to balance the huge need for socio-economic development, the economic promise of transitioning to a green economy and the risks posed by not acting fast enough.

Financing of climate innovations is still in the nascent phases, though significantly more advanced than even two years ago. Herein, several leaders discuss how the market is expanding, including initiatives to balance the innovation risk of new technologies with the climate and accelerated replacement risk of standard equipment, new initiatives to increase the flow of capital for agriculture and SMEs, and perspectives on how the market is evolving and what is still needed.

STARLENE SHARMA
an advisor to start-ups and investors. She combines her experience as an investor and entrepreneur to grow a company

As mitigation efforts continue to drive efforts to slow or reduce the impacts of climate change, leadership has emerged to help communities – especially those most likely to be impacted by climate change – to adapt to the new and future realities and participate in the economic boom the green transition will deliver.

The risks and realities of climate change have become more real as extreme heat and extreme storms have inflicted havoc and unseasonal weather damaged crops. Bad actors raise the question of whether we can overcome the challenge ahead of us… but for every story of malfeasance, there are tens of great works that are often missed.

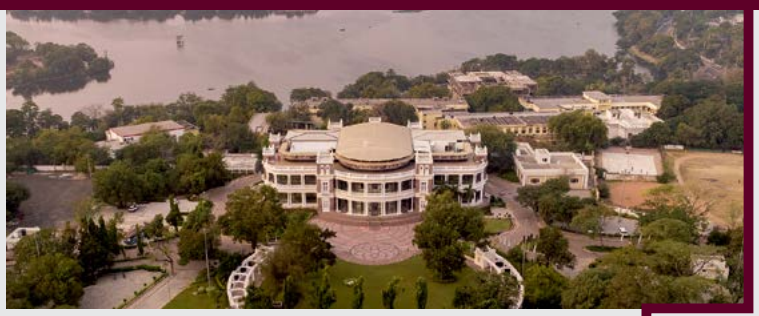
It is with pride that we present this third edition and the emerging climate leadership trends.

Unlock the Infinite Possibilities of MICE in Madhya Pradesh

Where Business Meets Beauty!

Madhya Pradesh, the heartland of India, is rapidly emerging as a premier MICE (Meetings, Incentives, Conferences, and Exhibitions) destination, offering a harmonious blend of modern infrastructure and rich cultural heritage. With world-class convention centres, serene landscapes, mass accommodation capacity, good connectivity and a vibrant cultural tapestry, Madhya Pradesh is the perfect backdrop for your next corporate event. Let's take a closer look at what makes this state a MICE powerhouse.

MP's Convention Centres that Define Excellence



Kushabhau Thakre International Convention Centre, Bhopal

Located in the capital city, Bhopal, this convention centre is a marvel of modern architecture. With over 12,000 square meters of exhibition space, it is a hub for large-scale international events. The city itself is an amalgamation of history, nature, and culture with attractions like heritage sites, lakes, and museums.

Kushabhau Thakre Hall (Minto Hall) being Bhopal's prime identity has now been renovated as an international convention centre without disturbing its originality. The main hall is used as a multipurpose hall for occasions like conferences, banquets, felicitations, etc. The building has a capacity of around 1000 guests alongside 2 meeting rooms, two committee rooms, a boardroom, and a media centre.

Nearby Tourist Attractions

- Heritage Monuments of Bhopal - Moti Mahal, Gauhar Mahal, Taj Mahal and many other (5 Km radius)
- UNESCO World Heritage Sites like Bhimbetka Caves and Sanchi (50 Kms radius)
- Boat rides and water adventure sports at the Boat Club of Bhopal (3 Kms)
- Safari Tour at Van Vihar National Park and Zoo
- Satpura National Park and the Pristine hill station - Pachmarhi (200 Kms)

Maharaja Chhatrasal Convention Centre Khajuraho

Nestled amidst the timeless beauty of Khajuraho, a UNESCO World Heritage Site renowned for its exquisite temples, this convention centre is a tribute to grandeur. The state-of-the-art facilities and impeccable services make it an ideal destination for corporate conferences and cultural events. Delegates can explore the ancient temples nearby, taking a trip through history during their breaks.

The Convention hall facilitates 18000 sq. ft. of meeting space and can host 1500 guests besides a parking space for 350 plus vehicles.

Nearby Tourist Attractions

- Khajuraho Group of Monuments (5 Kms radius)
- Panna Tiger Reserve (27 Kms)
- Madla and Kundalpura Tourism Village (100 Kms)
- Orchha – A UNESCO listed heritage city (170 Kms)

Brilliant Convention Centre, Indore

Situated in the bustling city of Indore, this center stands true to its name. Its cutting-edge facilities are designed to cater to international conferences, exhibitions, and business meetings. Delegates can explore the city's gastronomic delights, shopping hubs, and historical sites during their free time.

The hall can house around 5000 people along with 103 rooms, 15 break out halls, a grand ball room, an exhibition hall and a 1,50,000 square ft meeting space.

Nearby Tourist Attractions

- Street Food at Chappan Dhukan and Sarafa Market (7 Kms)
- Mahakaleshwar in Ujjain (50 Kms) and at Omkareshwar Jyotirlinga (90 Kms radius)
- Scuba Diving at the Sailani Islands (80 Kms)

A Host of Global Events

Madhya Pradesh's growing reputation as a MICE destination is underlined by its successful hosting of prestigious international events, including the G-20 Meetings, UNESCO Gatherings, Pravasi Bhartiya Diwas, and Aviation Summits. These events have been facilitated by the state's commitment to world-class infrastructure and a supportive ecosystem for businesses and event organizers.

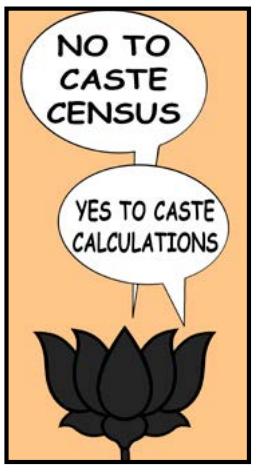
Plan Your MICE Event in Madhya Pradesh

Madhya Pradesh offers a unique blend of business and pleasure, with state-of-the-art convention centres set amidst a backdrop of timeless beauty and cultural richness. Whether you are planning a conference, exhibition, or incentive program, Madhya Pradesh is the destination where your business aspirations can come to life. Explore the enchanting state and experience the magic of MICE in Madhya Pradesh.

Let the heart of India inspire your next corporate event!

Victory and calculations

BJP sets the stage for 2024



The Bharatiya Janata Party's impressive performance in the Hindi heartland states of Madhya Pradesh, Rajasthan and Chhattisgarh has stunned its critics no end. It has even baffled some political observers who had begun seeing a distinct fatigue setting in against the BJP, particularly in Madhya Pradesh. The assembly elections were billed as some sort of a semi-final to the general election due in less than 6 months. In fact, the Congress had more at stake in these elections than the BJP. After all, it was the ruling party in Rajasthan and Chhattisgarh, where freebies showered on the electorate were supposed to fetch the expected political dividends. Congress also claimed it was all set to exploit the fatigue against the Shivraj Singh Chouhan regime in MP. A good performance would have cemented its position in the INDIA alliance.

Yet the BJP led by its spearhead, Prime Minister Narendra Modi, dramatically turned things around, proving many psephologists and political soothsayers wrong. If the polls have yielded an outcome, it is that the BJP will step into the Lok Sabha election with a spring in its step.

It is in the choice of new chief ministers that the BJP has sprung the biggest surprise and demonstrated its plans for the future. The party's troika of Modi-Shah-Nadda has had no compunction in pulling the trigger on stalwarts like Chouhan and Raman Singh, naming relatively unknown figures like Mohan Yadav and Vishnu Mohan Sai in their place. At the time of writing, the fate of Vasundhara Raje also hangs in the balance. It is obvious that all three picks will be a part of the BJP's masterplan to balance caste equations ahead of next year's general election. If the BJP were to sweep these three states, there is realistically little the opposition can do to prevent a third term for Modi.

The stark example is of Chhattisgarh, a state where tribal communities constitute 32 per cent of the population. The BJP has opted for a tribal leader. It could have settled on a Chief Minister from an Other Backward Class (OBC), but a dominant show in tribal-dominated seats made that choice essentially moot. The BJP had won 22 of 26 seats in the state's tribal belt of Surguja and Bastar. Modi's sustained outreach in campaigning, including hailing the state's tribal heritage, declaring himself "born to serve" the community and references to President Droupadi Murmu, significantly contributed to winning those votes. Madhya Pradesh and Jharkhand, two of six states bordering Chhattisgarh, have sizeable tribal populations – nearly 22 and more than 26 per cent, respectively. In Odisha, another border state and the home state of President Murmu, tribal communities account for over 23 per cent of the population.

Over in Madhya Pradesh, the BJP walked a tighter rope, needing to factor in two Deputy Chief Ministers, and the Speaker's chair, to cobble together a leadership structure that (it hopes) will keep various communities, and their political reps, happy and voting saffron through to the 2024 election. The selection of Yadav as the new CM suggests the BJP is setting its sights on the politically crucial states of Uttar Pradesh and Bihar, where the Yadav votes have largely eluded the BJP. A Yadav face as the CM in Madhya Pradesh is a message of empowerment to a community spread across three states that send a combined 149 MPs to Parliament. It has also been seen as a counter to the two Yadavs in the opposition – the Samajwadi Party's Akhilesh Yadav in UP and the Rashtriya Janata Dal's Tejashwi Yadav in Bihar.

The irony is that while the BJP is opposed to a caste census, it is relying extensively on a caste calculus in the Hindi heartland states. Also the new CMs are expected to be loyal and obedient, with strong roots in the RSS. They can be dismissed at a moment's notice and replaced by someone more effective should the need arise. Also, their caste/class should be a potentially key vote bank to help the BJP corner votes in states to negate the losses elsewhere. As for their administrative experience, or lack of it, it is obvious that a lot of backseat driving will be done from New Delhi. The centralisation of the BJP's power structure will then be complete.

As for the Congress, it has won a consolation prize in Telangana, a spill-over of its recent victory in Karnataka and a consequence of the recent discrediting of the KCR regime. On the other hand, the Telangana outcome has highlighted the limitations of the BJP's appeal. This is a small straw that the Congress can clutch at. ◆

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From phase out to phase down

Coal is poised to be an energy mainstay for India over the next two decades

On the concluding day of the COP 28 climate summit in Dubai, about 200 countries had agreed that fossil fuels will not be phased out, but that their consumption needs to be reduced globally in order to achieve the net zero target by 2050. The resolution calls for "transitioning away from fossil fuels in energy systems, in a just, orderly and equitable manner. The word 'transitioning' has replaced the wording of an earlier draft that had called for the 'phase-out' of all fossil fuels, which India, China and other developing countries objected to as they are primarily dependent on coal.

At the conference, India's prime minister stressed the importance of protecting the rights of all for the global good, and highlighted the imperative of inclusive and equal participation. India will achieve its Nationally Determined Contribution (NDC) towards the Paris Pact. But he also reminded the participants that his government had been clear about the important role of coal in the country's economy. The message here is apparent – India will not buckle under pressure at the cost of the country's development.

Coal is India's primary energy source, crucial for its energy security due to its abundance, availability, and affordability, with approximately 326 billion tonnes in reserves. Debates arise about coal's role in India's energy future despite its meeting over 55 per cent of the country's energy needs. Concerns primarily stem from environmental perspectives as global activism intensifies against fossil fuel usage. The push to remove coal from the global energy mix has become an international priority.

India is actively embracing renewable energy, experiencing year-on-year growth of 15.7 billion units in solar and wind power, contributing 13.36 per cent to the total energy generation of 1045.85 billion units, whereas coal-based plants generate 732.09 billion units.

With a growing population, expanding economy, and pursuit of a better quality of life, India's energy consumption is expected to rise. Due to limited reserves of petroleum, natural gas, hydel project restrictions, and geopolitical perceptions of nuclear power, coal remains central to India's energy scenario.

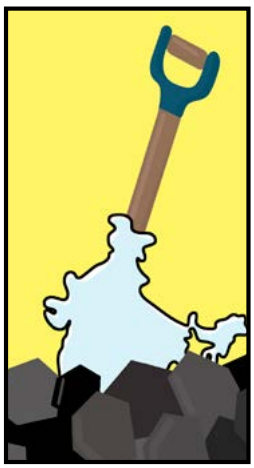
The International Energy Agency projects India to have the world's largest rise in energy demand, with coal generation peaking in 2030. All India coal production reached 893.19 MT in FY23, growing by 14.77 per cent. The Coal Ministry aims to boost production for the fast-growing economy while being committed to meeting NDC obligations. Recognising environmental concerns, the ministry supports underground coal mining, which accounts for only 4 per cent of total production, utilising technology to mitigate carbon emissions

According to Coal India's chairman, underground mining is environmentally cleaner, minimally land invasive, avoids large acquisition of forest and agricultural land, and does not requires mass rehabilitation and resettlement. More importantly, underground coal quality is superior to that from open-cast mines, which could potentially reduce the need for imports of high-grade coal.

India should now focus more on a new generation coal-fired power plant called Ultra Super Critical Plant. This high-efficiency plant results in less coal consumption for generating the same amount of electricity and reduces carbon dioxide emissions by 3.3 per cent. Similarly, India needs to adopt a policy for Carbon Capture units for thermal power plants that support industrial decarbonisation and provide opportunities to join the growing circular economy. It is a capital-intensive initiative. Tata Steel was the first to commission a Carbon Capture unit in its plant in 2021.

Even though India continues to make great strides with renewable deployment and efficiency policies, the sheer scale of its development means that coal will remain the mainstay of energy sources. Opinions about coal, both from proponents and opponents, are aligned against each other across a clear divide, with each side steadfast about their own convictions.

Truly, much logic could be found on both sides. Realism dictates that notwithstanding the role of renewable energy sources, the demand for coal in the country is expected to endure for at least the next two decades. ◆



Silver Linings not Silver Bullets

Innovation across industry, policy, and finance will all be required to meet the risks and opportunities of the climate challenge

The human capacity to innovate is what separates us from apes, but there are clichés about being one's own worst enemy for a reason. Advances dating back to the first industrial revolution have simultaneously improved human quality of life at an aggregate level and increased population through extended lifespan, while slowly and silently putting us out of equilibrium with Mother Earth. And we all know nobody wants an upset mother.

As the economy grew, humanity ignored Newton's laws – every action has an equal and opposite reaction. Scientists started reporting climate changes in the early days of the industrial revolution. Economists warned us about forgetting to account for the tragedy of the commons. Now, as we see more and more climate change-related extreme weather events, our bill for unfettered growth, living beyond the carrying capacity of the planet, has become due.

This year, one of the main objectives of COP is reviewing the Global Stock Take – an exercise to understand exactly what has happened since the Paris Agreement was ratified and set new goals aligned to today's reality. One challenge is that the government data sets that feed analysis are typically dated. However, debating the nuance can seem superfluous considering ground realities.

In 2023, multiple global temperature records were broken, and a great number of fires, floods, droughts, extreme heat waves, and other extreme climate-related events reached unprecedented levels resulting in tens of billions of dollars in damage. The planet will close the year with an average 1.4 ° C warming above pre-industrial levels, recording the hottest year on record according to data from the World Meteorological Organization (WMO).

Against such a background and consensus that climate action has not made nearly enough progress, it is natural to try to look for quick fixes.

Systemic problems require systemic solutions

Despite advances in micro-nuclear, nuclear fusion and the promise of green hydrogen, these 'breakthrough solutions', with an ability to create endless amounts of free or low-cost clean energy, are not silver bullets. One problem alone did not cause climate change, and as much as technologists may wish differently, one solution alone cannot address the scale and scope of the challenge.

This is not to say that we should not invest in these technologies or commercialisation of a myriad other up and coming and/or proven climate technologies. Each of these technologies and many others may play a valuable role in the energy transition, but none is ready for full deployment, none can solve all of our energy needs efficiently, and none is without unintended consequences. *(details in call out box)*

Also, each of these only addresses energy, which is only part of the problem. Climate change is caused by and effects so much more.

The transition to a green economy will be the next industrial revolution. Every part of the global economy must be included.

Like its predecessors, this industrial revolution will necessitate changes in the means and mode of production and it will affect nearly every sector – energy, industry, agriculture, transport, buildings, mining and deforestation to name the big ones. Early participation in the energy transition will set the foundation for the green transition, but this is only the beginning.

Further, like its predecessors, this industrial revolution will lead to the largest transfer of wealth in history. This could be good, creating a more inclusive economy or it can further exacerbate economic disparities. How closely India marries its economic development to the green transition will have as much, if not more impact on socio-economic development as initiatives targeting a just transition.

The Making of the Green Industrial Revolution

Industrial revolutions are borne of rapid adoption of new innovations that fundamentally transform economic development, often paired with new financial instruments to enable rapid dispersion. In this case, the drive for new technologies is in response to the scope and scale of changes required to keep climate change within liveable temperature bands.

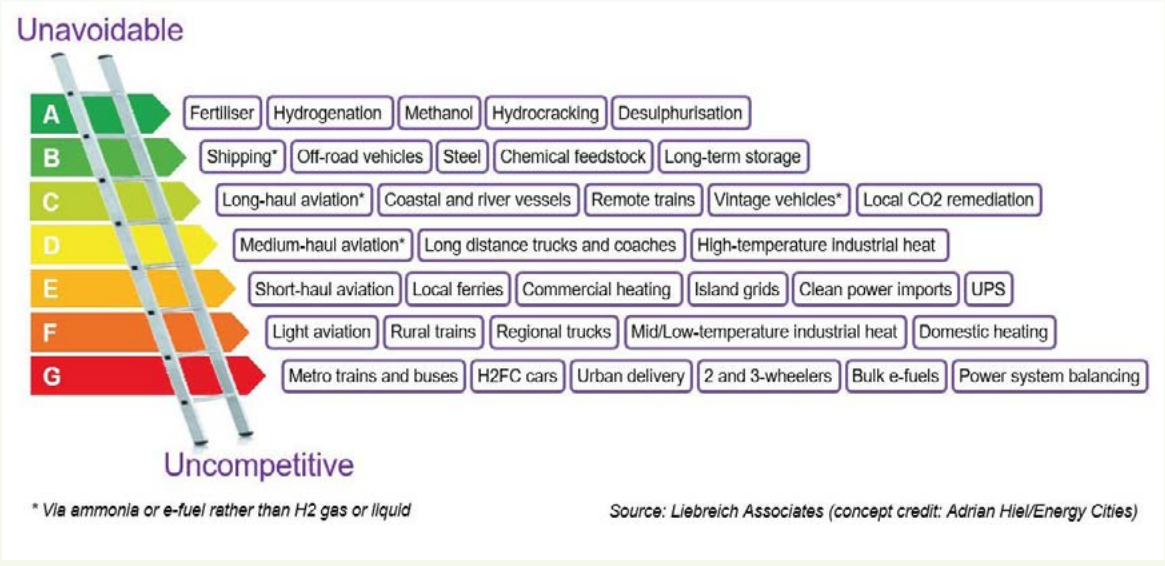
This will require nothing short of replacing the vast majority of chemicals, materials and processes used in the production of goods, food and services associated with a developed middle-class lifestyle. How homes and roads are built must change, as must how factories operate.

For India, the fastest growing major economy, this is especially true. By 2030, manufacturing and energy requirements are projected to double, while consumer spending is expected to reach $6 trillion a year – a full 1.5x the current national GDP.

To achieve the promise of India's economic development will require that new and existing manufacturing decarbonise early, accelerated adoption of innovations with a viable value proposition and dramatically improved capital efficiency.

If India follows China's emissions trajectory as it develops, it will use 70 per cent of the global carbon budget. This means that even if the US, Europe, Russia, China, the Middle East, and other developed nations ALL meet net-zero objectives by 2040, the planet would not be able to stay below 2° C. None of these economies are on target to reach net-zero within this time frame.

If India follows China's emissions trajectory as it develops, it will use 70 per cent of the global carbon budget



** Via ammonia or e-fuel rather than H2 gas or liquid*

Source: Liebreich Associates (concept credit: Adrian Hiel/Energy Cities)

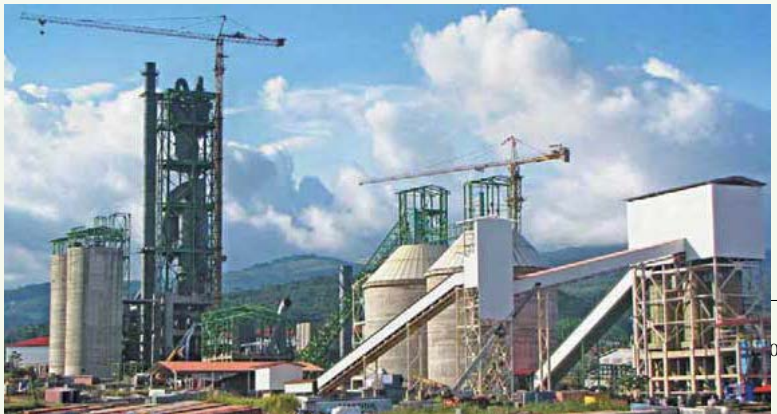
Reality check	
Intervention	
Hydrogen Hydrogen is being touted as a super fuel alternative to replace coal, gas and oil across myriad use cases. Green Hydrogen, the cleanest form is produced through electrolysis to split water into oxygen and H2 atoms. Touted as a clean and low-cost replacement for everything from transport and boilers to fertilisers, hydrogen has many drawbacks.	• Requires an average of 9 litres of water to produce 1 litre of hydrogen • Energy inefficient with 30-40 per cent loss of energy in production and another 30 per cent energy loss in the storage process • It is not a drop-in solution for existing industrial processes. Boilers will require costly retrofits to transition. • Existing gas pipelines are not viable for hydrogen gas. Its smaller molecule size will lead to higher leakage • Transport costs are 2-3x product cost due to low density (requires lots of space) and temperatures requirements (-253° C)
Micro- Nuclear / Small Modular Reactors Small modular reactors are being developed with the intent to modularise and industrialise production of reactors for rapid deployment, particularly in remote or disaster-hit areas or to sit on the footprint of decommissioned coal plants to provide baseload zero-carbon energy. Due to safety and security risks long technology development and approval cycles have prevented commercialisation.	• To date many reactor designs are still reliant on HALEU fuel (enriched uranium), leading to risks of proliferation. Newer models using thorium are safer but still produce an isotope that can be irradiated into uranium for weapons purposes • Several studies indicate the capital cost of SMRs to be equivalent to larger reactors. Security and insurance costs are similarly expected to be on par with traditional nuclear, while power production is lower • A Stanford study indicated that radioactive waste from SMRs will be higher than conventional nuclear reactors • Fuels are not widely available
Fusion In 2023, scientists were able to demonstrate positive energy production from nuclear fusion, touted as the holy grail of free, clean energy. Mimicking the energy production of the sun, fission occurs when two atoms slam together to form a heavier atom, like when two hydrogen atoms fuse to form one helium atom. The energy production of such a reaction is several times greater than traditional nuclear energy without radio-active by-products and only small amounts of helium. While it is yet to be demonstrated at any scale, 1 kg of fusion fuel could provide the same amount of energy as 10 million kilograms of fossil fuel.	• Still limited ability to repeat positive power generation • Requires extreme temperatures (150 to 200 million degrees) and energy to produce • Some scientists suggest Deuterium and tritium reactivity makes fusion possible on earth but releases excessive neutrons that function similarly to radioactive waste • Tritium, one of the most commonly used molecules in testing is rare and requires extreme cooling demands and operating costs to maintain.

Niti Aayog estimates that India needs $160 billion dedicated climate investment per year through 2070 to achieve its net-zero goals

Silver Linings

Indian cement industry has the lowest average carbon footprint amongst major economies

Leaders in Indian industry (like Mahindra, Tata, Dalmia, Jindal to name only a few) have been early adopters of decarbonising technologies like heat pumps and new materials, with Indian cement having the lowest average carbon footprint amongst major economies. Similarly, corporates working with start-ups benefit from better access to technology, faster development time and can offer higher return on investment (*See War against time, P 38*)



Early transition is already reaping economic benefits for these companies through immediate cost benefits, shareholder pricing and competitiveness in international markets.

Drawing lessons from these industrial leaders to green SMEs and industrial production is one step in India keeping its per capita carbon usage in check. Another is to develop pathways for rapid adoption of innovations with cost effective emission reductions.

To accelerate the adoption of such innovations – technologies or processes – often requires mechanisms to achieve techno-commercial validation, aligning business models and capital structures to the reality of the market, and access to appropriate capital.

The planet will close the year with an average 1.4°C warming above pre-industrial levels

To be viable, climate innovations must be price and quality competitive. To build climate viable businesses we cannot fight human nature

To be viable, climate innovations must be price and quality competitive. To build climate viable businesses we cannot fight human nature. Price, aspiration, and convenience are the drivers of consumer decision-making. As climate change has become mainstream and climate-friendly products have become aspirational, market forces have shown consumers will make luxury, identity and low-cost impulse purchases despite price. In the vast majority of instances, however, climate-friendly goods must be better, cheaper and/or significantly more convenient than the status quo to achieve adoption.

This is one of the areas in which India's innovators truly shine

It is only when climate innovations are price and quality viable that funds will flow freely, but more capital or higher capital efficiency will be necessary to achieve climate and economic development goals.

Niti Aayog estimates that India needs $160 billion dedicated climate investment per year through 2070 to achieve its net-zero goals. This does not include economic development, investment or social inclusion requirements. This quantum of capital is not available at present.

Industrial revolutions often require adaptations in the financial markets to achieve rapid adoption and scaling of technology availability. A few financial adaptations that would support the transition include:

• Incorporation of climate risk in loan underwriting to equalise or benefit green financing terms – interest rates should not be dramatically cheaper for new dirty technologies when proven green technologies exist.

• Availability and reliance on equity to adequately reduce technology and business risk to create appropriate pipelines for lenders. Equity is intended to be higher risk capital than loans. In properly functioning markets, equity is intended to de-risk companies. When loans are de-risked, interest rates and NPAs should both reduce.

• Results-based financing can be leveraged to help agrarian communities transition and participate in the economic benefit of the green economy. Registration and certification costs are prohibitive for low-income participants most in need of the economic benefits carbon markets offer. India's farmers are responsible for food security. More than any other group, agrarians will bear the brunt of climate change and need support in the transition.

• Regulations that carbon and similar credits only be used to offset emissions that cannot yet otherwise be mitigated.

Climate change impacts will not be limited to extreme weather, health, and price increases. It impacts larger economic markets through supply chain disruptions and shifting commodities prices. We have only seen the early impacts of climate change. Baked-in emissions and transition timelines assure that impacts will become more intense and extreme.

Innovation across industry, policy, and finance will all be required to meet the risks and opportunities of the climate challenge.

Embracing systemic and coordinated changes based on market viability will be necessary. Silver bullets may be part of the solution but building on its many silver linings will be India's true strength. ◆

STARLENE SHARMA

DCM Shriram AgWater Challenge: A Call to Action

India harbors 18% of the world's population yet possesses only 4% of global water resources, rendering it one of the most water - stressed nations globally. Notably, 78% of the total fresh water resources are utilized by India's agriculture, with 62% of irrigation reliant on groundwater, causing an annual decline of 0.3 meters. Moreover, 80% of water-intensive crops — such as Paddy, sugarcane, wheat, and cotton — are predominantly cultivated in water-stressed regions. The unsustainable use of freshwater, coupled with unsustainable agricultural practices and the impacts of climate change, pose severe threats to India's agricultural sector. India accommodates over 600 million farmers, among whom 85% are smallholders, owning less than 2 hectares of land as their livelihood. At the nexus of their future and livelihood is water stress which is estimated to reduce the income of a smallholder farmer by a whopping 25%. However, amidst these challenges lies an opportunity for change to transform challenges into opportunities for a water-resilient agricultural landscape in India

DCM Shriram Foundation is dedicated to disrupting the status quo of inefficient water usage in agriculture, by promoting practices, innovations, and optimisation for large-scale water conservation. With this objective, DCM Shriram foundation in partnership with The Nudge Prize launched a grand innovation challenge with a prize purse of INR 2.6 cr creating a pipeline of innovative and affordable solutions improving water use efficiency and profitabilty for smallhodler farmers growing rice, wheat, sugarcane and cotton.

The Problem Statement to solve

Inviting leading AgTech innovators & Social Entrepreneurs from across the globe to scale solutions for Indian (SHFs) to solve for

	Water use efficiency Improving cropping water efficiency by at least	Affordability Deliver the tech as per below % of cultivation cost	Profitability	Scalability
RICE OR	60%	20%	improve **smallholder farmer** profitability by at least **40-50%** through better SHF package of practices	demonstrate a verifiable pool of **5,000 SHF (or, 5,000 hectares)** by the end of the challenge
WHEAT OR	40%	15%		
SUGARCANE OR	20%	15%		
COTTON	50%	10%		

134 applications were received and were thoroughly evaluated by top AgWater ecosystem players including esteemed advisors and collaborative assistance of the ecosystem including investors, incubators, CSOs and academic institutions.

We are delighted to introduce the challenge cohort, consisting of 16 distinguished AgTech organisations, that have shown exceptional promise in addressing crucial AgWater challenges. Their work spans across data and intelligence-driven irrigation systems, precision farming, IoT-enabled sensors, and BioAg Inputs.

DCM SHRIRAM FOUNDATION

COHORT DETAILS

AgriRain Agro Industries Private Limited

Data-driven Irrigation as a Service (IaaS) through hose reel rain gun system for small land parcels

Spread across 5+ states in India

Maharashtra, Bihar, Telangana, Madhya Pradesh, Rajasthan, Uttar Pradesh, Andhra Pradesh & Karnataka

ARMS 4 AI

Geo-AI technology based platform for crop/farm diagnosis and provide insights to the farmers

Spread across different districts in Uttar Pradesh

BharatRohan Airborne Innovations Private Limited

Hyperspectral thermal imagery through drone technology to analyse crop health and provide advisory through Whatsapp & SMS

Spread across 5 major Agriculture states

Rajasthan, Uttar Pradesh, Haryana, Maharashtra

Censanext Systems Private Limited

Provide crop recommendations for every 7 days through data analysed and gathered on AI & ML platform

Spread across 3 states in South & West India

Maharashtra, Karnataka, Tamil Nadu

Centre for Environment Concerns

Retrofitted moisture diffuser to crops at root level, improving the soil moisture level and reducing irrigation water

Spread across Peninsular India

CropIn Technology Solutions Pvt Ltd

Offers predictive crop advisory service, data captured and analysed through remote sensors and AI/ML platforms

PAN India

EF Polymer Private Limited

Organic water retension polymer made from fruit peels, capable of holding water 100 times its own weight

Spread across 3 major states

Rajasthan, Uttar Pradesh, Gujarat

CultYvate

IoT enabled Alternate wetting and drying solution to analyse data and provide crop advisory

Spread across 6 Agriculture states

Rajasthan, Uttar Pradesh, Haryana, Maharashtra & Punjab

AutoFarm (Industill Farmtech Pvt Ltd)

Customised IoT based advisory service that manages irrigation and automates fertigation

Spread across different districts in Maharashtra

Intech Harness Pvt Ltd

Jalaprayag is an Autotech pump controller that automates irrigation and can be operated through mobiles, eliminating human intervention

Spread across different districts in Maharashtra

Oorja Development Solutions India Private Limited

Oonnati is a Pay per use irrigation model that provides community irrigation service through solar pumps. Provides services at 3.5 to 4 INR per cubic meter

Spread across different parts of Uttar Pradesh

Oscillo Machines Pvt Ltd

Self-propelled rider type Root Washed Paddy Transplanter and DSR (Direct Seeded Rice) reducing manual labor and improving manual efficiency by 0.5-1 acre per day

Spread across 6 states in South and North India

Karnataka, Telangana, Andhra Pradesh, Tamilnadu, Odisha, Punjab

PhyFarm

Data driven intelligent smart irrigation scheduling, weather monitoring and fertigation system through message alerts

Spread across 7 major states & UTs across North and west India

Maharashtra, Karnataka, Telangana, Haryana, Delhi, Rajasthan, and Madhya Pradesh

Rivulis Irrigation India Pvt Ltd

Manna - an Irrigation Intelligence software that utilizes remote sensing, geo mapping, and satellite imaging to offer real-time irrigation recommendations

PAN India

SICCA (Sense it Out Intelligent Solutions Pvt Ltd)

Sensor based IoT irrigation management system to optimize water usage, promising a guaranteed 2X increase in the yield

Spread across different districts of Maharashtra majorly in Sangli, Solapur, Kolhapur, Pune, Satara

Virentiatech Pvt. Ltd. (Virenxia)

Digitally-enabled Climate Smart Sustainable Agriculture (eCSSA) that provides BioAg inputs and farm advisory services to help farmers shift from the conventional practices

Spread across 5+ states in India

Maharashtra, Uttar Pradesh, Meghalaya, Tamil Nadu

In partnership with
Office of the Principal Scientific Adviser
to the Government of India

GUEST COLUMN

BUSINESS INDIA ◆ THE MAGAZINE OF THE CORPORATE WORLD

Bridging the gap

Harnessing the potential across emerging markets can serve as a game-changer in bridging the financing gap

VIVEK P. ADHIA

The global transition towards 'Net Zero' low carbon economy faces a monumental challenge. The chasm between financing required to combat climate change and resources deployed is vast. This chasm is not just about insufficient funds, but also uneven distribution of investments across a handful of countries and technologies. The key to unlocking full potential, therefore lies in redirecting attention towards emerging markets, with the highest decarbonisation space.

The global climate financing gap: Currently, global efforts to combat climate change are marred by significant shortfalls in financing and investment flows. This inadequacy poses a substantial obstacle towards implementing large scale solutions critical for accelerating the transition towards low carbon pathways. Despite concerted efforts and commitments, the existing financial resources remain disproportionately concentrated in select nations and technologies, creating a skewed landscape. According to the UN, the annual investment required to meet global climate goals stands at approximately $3 trillion, a figure that far exceeds current commitments. Shockingly, a mere 10 countries receive around 75 per cent of the total climate finance, leaving the rest of the world struggling to secure necessary resources. As a matter of fact, India alone, currently faces $100-150 billion financing gap each year to meet its NDC commitments, outlining a clear opportunity for redirecting growth capital.

Empowering emerging market economies: Untapped potential: Emerging market economies possess a unique advantage -- they are positioned as the vanguards of development and growth while boasting a high potential for decarbonization. The International Finance Corporation (IFC) estimates that investments in clean energy and climate-smart technologies in emerging markets could reach $23 trillion by 2030. Harnessing the potential across emerging markets can serve as a game-changer in bridging the financing gap. Their active development and burgeoning growth profiles offer a ripe opportunity to tap into the global financing pool. As an exemplar, while the world looks at tripling its renewable energy capacity addition, India has already doubled its capacity on renewables over the last five years, showcasing a global lighthouse opportunity, for similar impacts in other emerging markets. Further, studies show that every dollar invested in clean energy across emerging markets generates about three times more jobs than in developed economies signalling the potential for just transitions and all-round socio-economic growth.

Outlining appropriate financing models to carve-out unlocks: For technologies and solutions to flourish on a mass scale within emerging markets, the formulation of robust commercial models is imperative. These models need to encompass not only innovative solutions but also sustainable and scalable financial structures. Further, financing models tailored to local context for example, bringing in blended finance opportunities for partially viable projects, demand aggregation or market transformation models (urban and commercial lighting and cooling solutions, motors and thermal decarbonisation solutions for MSMEs), capex into opex models (or energy as a service applied for solar rooftops, electric mobility, solar cold-chains), or be it guarantee-backed instruments for upcoming technologies (for example across compressed biogas, green hydrogen, waste to energy or direct air capture) or topped with pre-financing

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of carbon credits or payment for ecosystem services (for landscape restoration, wetlands, nature-based solutions) or others innovative instruments (like extended moratorium for agro-forestry or long gestation projects) etc. have demonstrated, that if structured well, low carbon and green solutions can be significantly scaled up. India for example, with its energy as a service model, has implemented one of the largest lighting programs globally, also has accelerated energy transition of small and medium enterprises with its National Motor Replacement Program etc. Also, the roll-out of climate friendly financing models and bankability of solutions can be significantly enhanced by tapping into low cost high impact resource raising by way of green bonds, blending with catalytic philanthropic capital etc. India for example, has seen great traction recently on the issuance of green and social bonds, providing viable financing alternatives for climate projects.

Addressing the last mile financing woes: Success of appropriate financing models and structures depends on their implementation, which have a significant dependency on the last mile financing ecosystem. In most emerging markets, the last mile financing system especially for green investments and products is largely fractured. Across the world, there has been a plethora of climate financing commitments, in fact more than $100 billion pledged by 20+ global agencies. However, the biggest challenge faced by most of them, is the lack of credible, agile and effective intermediaries, that can help boost the last mile delivery and financial ecosystem. Credible intermediaries like NABARD, SIDBI, IREDA, PFC, NaBFID or retail banks like Axis, SBI, IndusInd playing that role to further engage with NBFCs like Annapurna, Svakarma, Electronica etc. and rolling out transformative schemes, can significantly help address this challenge. A strong intermediary further brings in a pipeline of investible projects, and unlock anywhere between 4x-10x private sector and commercial investments. It is important to organize projects and schemes well, to address the last mile financing challenge. SIDBI for example, runs amongst the largest credit guarantee schemes globally with CGTSME, enabling large scale financing deployed towards small and medium enterprises.

Seizing opportunities for change: India, amongst other emerging markets has somehow managed to build a momentum on digital and financial inclusion, like never done before. Digital financing platforms led by the roll out of UPI and e-rupee, has significantly addressed the last mile financing gap, increased access to credit, and enhanced bankability. Some of these learnings, especially from successful financial start-ups like PayTM, PhonePe, Uni, Fibe, IndMoney, have made credit accessible at the fingertips. This is a call-out for smart entrepreneurs, businesses and industry leaders – on how green finance unlocks can be a big opportunity for growth over the next decade or so, if we are able to provide platforms that address last mile challenges, be a credible front line to climate financing channelised by intermediaries and are able to deploy smart, innovative solutions that low carbon tech currently requires.

As COP 28 opens up, and call for global finance flow corrections takes centre stage, businesses from emerging markets can be the silver lining – in unlocking investments and in-turn accelerating low carbon people-centric growth that is equitable, sustainable and beneficial in the long run. ◆

Digital financing platforms led by the roll out of UPI and e-rupee, has significantly addressed the last mile financing gap

(Views expressed are author's own, and does not necessarily outline the organisation's formal point of view)

Towards a greener, cleaner future

Shared electric mobility is a crucial step towards India's COP 28 targets

ANMOL SINGH JAGGI

India's journey towards achieving environmental sustainability is a complex and dynamic equation that needs to take into account more than just a few moving parts. The journey towards sustainability has to be transformational, in that it needs to accelerate the changes of decades of existing norms and practices but subtle enough and not disrupt precarious socio-economic balance too much. A little too much focus on either side and the quadruple transition – economic, social, political and environmental – which India is carefully undertaking, can at the least lose its momentum, at the worst lose its way altogether.

It is for this key reason that India's shift to a path of sustainability has to identify and select key sectors, where even small and incremental changes have large impacts. Mobility has been identified as one such sector, where small changes like a shift to less carbon emitting vehicles can have a major impact on not only people's life today, but also on future generations.

In recent years, more incremental changes have been introduced by state and Central governments to shift towards a future of clean-mobility. The most successful application of this change has been in the consensus that electric vehicles can not only hasten the environmental transition, but keep economic and social transitions in tandem as well. Electric vehicles have the ability to be aspirational and thereby socio-economically transformative as well. The added macro-economic benefits of lowered import bills, increased future-ready manufacturing and services jobs for a burgeoning demographic dividend and ultimate energy independence, truly makes even a gradual shift to electric mobility extremely impactful in the overall transformation story.

It is well-known that, in a country like India, vehicle ownership is a sign of prosperity. Ride hailing was able to disrupt this old norm and mentality, giving access to vehicles to almost every income bracket, dismantling the notion that vehicle ownership is mandatory for ease of moving.

With economic activity more reliant on the ability of people to move easily, safely and efficiently, ride-hailing in itself was a good first step, while electric ride-hailing takes this one step further. The latter marries not only the concept that a vehicle as an asset has more use as a shared commodity, but that sustainability and environment consciousness do not need to be exclusively apart from this concept.

The impact of this evolution, which has to be said is just beginning, can't be understated. As is well documented, over the last few years, the worsening air quality in the National Capital has called for a dramatic reduction in the number of vehicles on the roads or a concerted switch to electric vehicles. Electric ride hailing ticks both boxes, encouraging the use of shared assets but shifting to electric mobility altogether. In fact, a recent study showed that, if only EVs were added in India between 2021 and 2022, India would have saved about 9.5 million metric tonnes of CO2 emissions. Add that with the potential reduction of one vehicle owned per passenger who used shared mobility services, the impact on the environment and climate change would be phenomenal.

As being discussed in COP 28 and has been in numerous COPs since the monumental Paris Agreement in 2015, the world is looking for innovative solutions that can rapidly transform the negative effects of climate change. India has announced its target is to reduce emissions intensity by 45 per cent by 2030 at this year's COP 28, while also expressing interest to be the host for COP 33. The global community has been seeking real-world solutions that are not only doable or viable, but globally equitable, such that they can be adopted not just by the richer countries, but developing ones as well. Electric ride hailing can be one major step in that direction, incorporating the unabated access and aspiration to different modes of mobility without further exacerbating the negative impacts of climate change.

Finally, solutions that can intertwine various interventions towards mitigating climate change, are those that will have the greatest impact. Electric mobility and ride hailing, which can be and is increasingly being powered by clean energy, can show that the shift to renewable energy generation does not disrupt or impede daily life. In fact, it has the ability to show that a transition to a cleaner future all around is possible easily and without complications, which developing countries like India, have always feared.

Thus, as a first step towards the globally accepted problem of adverse climate change, electric mobility and its subset of electric ride-hailing is not only a move in the right direction but can have consequential positive effects that can seamlessly help countries and communities transition to a greener, cleaner future. The more this sector is encouraged and invested in, the greater the impact it can have and by doing so, the path towards sustainability is nearly assured. ◆

The author is Co-Founder & CEO, BluSmart

Building financial resilience

Financial resilience is needed to drive funds and investments towards climate adaptation efforts

JAGJEET SAREEN

ANIRUDH KISHORE

United Nations Secretary-General António Guterres's dramatic declaration that we have now entered the era of 'global boiling' is only the latest in a string of warnings about imminent extreme climate events. Yet, we know that some regions are more affected than others. According to an IPCC report from 2021, the Indian Ocean is warming faster than most other global oceans, leading to climate disasters growing more frequent and deadlier. This puts about 2.6 billion people who live in the Indian Ocean Region (IOR) at heightened risk of food shortage, livelihood loss, and displacement.

Globally, there is growing recognition around the need to bridge financing gaps to tackle these threats. Available funds fall short by 5-10 times of what is required, disproportionately affecting Small Island Developing States. A climate-intentional financial sector is required to enable the smooth flow of these funds and drive investments towards climate adaptation efforts, such as restoration of mangroves and promotion of agroforestry.

Carbon-dependent economies, particularly countries in the Indian Ocean region, might find it difficult to build physical resilience without first building financial resilience. Supply chains in the region are dominated by fossil fuels, making them especially susceptible to transition risks, such as lower credit rating for companies, a dip in market valuation, and liabilities in the form of penalties or legal action. According to a working paper by the Asian Development Bank Institute, these countries expected to suffer losses amounting to $1.7 trillion by 2100 due to climate change.

Financial resilience can help incentivise the shift to a decarbonised economy, without adversely impacting existing jobs and revenue streams.

How to build financial resilience

Building financial resilience refers to financial institutes creating mechanisms through which they can combat both, physical and transitional risks posed by climate change. However, currently, companies do not have access to reliable and consistent data to even begin assessing the problem at hand. In India itself, around 70 per cent of banks have not attempted to quantify the amount of their portfolio susceptible to climate risk, according to a study by the Reserve Bank of India. In the absence of information, it becomes difficult to define the problem and identify the parameters to work. Access to data can bridge the gap between intention and action, and provide the initial push to greening the sector.

Once financial institutes establish the source and extent of the risks, they need enabling structures to overcome them. Regulation and guidelines can prove effective. The RBI, for instance, published its climate risk management guidelines in 2022 and a more comprehensive framework in 2023. Clear, actionable guidelines such as these provide financial institutions with a starting point to frame internal policies and sets precedence for best practices. Similarly, policy actions such as mandating ESG norms and disclosures can accelerate the switch to climate-smart practices.

Ultimately, information and infrastructure are not enough. Financial institutes need to more holistically integrate the language and nuances of climate change and risk management into internal processes. To do this, it is integral to have a workforce capable of implementing these changes. Capacity building and training programmes ensure that everyone is equipped with the right skills, such as climate risk assessment or reporting, and help embed individual climate commitment across firmwide operations.

Financial resilience can also aid climate competitiveness

A climate-resilient financial sector also ties into broader attempts to build climate competitiveness among economies in the region. By lowering the transitional costs of becoming climate-smart, economies gain an edge in an increasingly decarbonised global trade order. The European Union's Carbon Border Adjustment Mechanism (CBAM), a 'carbon tax' levied on per-unit emissions on imports, is one such example. High-carbon export economies, such as India, Bangladesh and the Maldives, stand to benefit from climate-smart financial structures which enable the shift to cleaner supply chains and protect against forthcoming sanctions.

As each economy works to strengthen its own financial sector, it can set an example and incentivise neighbouring regions to follow suit. Ultimately, it is important to remember that building financial resilience and climate competitiveness is not a zero-sum game. Rather, it enables the region – and the rest of the world – to work together, in a coordinated manner towards a common future. ◆

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'Just transition'

This method ensures equal sharing of the benefits of low carbon transformation

VIVEK SEN

SAARTHAK KHURANA

As climate change threatens the life and lifestyle of millions across the globe, a rapid cross-sectoral transition away from fossil fuel usage has become urgent in order to mitigate its worst impacts. This poses a grave challenge in terms of overhauling existing physical infrastructure, human capital skill sets, and financial investments. On the other hand, such a transition also presents the opportunity to create a sustainable, equitable and just future for everyone. This is critically important for countries in the global south, which are likely to face disproportionate impacts of climate change and low carbon transition at the same time.

'Just transition' framework would ensure that the benefits of low carbon economic transformation are shared equitably, providing support to those who could lose economically – be they regions, countries, states, industries, businesses, communities, workers or consumers. However, just transition cannot be implemented through a one-size-fits-all approach; rather, it requires context-specific participatory processes in consultation with all stakeholders, including governments, employers, workers, civil society, and affected communities.

Any just transition framework needs to incorporate four basic principles – it needs to recognise that certain segments of society might suffer as a result of energy and environmental decisions, and identify such entities (recognition justice); uphold the right to a fair process for various stakeholders to participate equitably in decision-making processes (procedural justice); look into equitable distribution of burdens and benefits of energy and environmental decisions (distribution justice); and lastly, aim to repair the loss faced by individuals, as a part of climate change and linked transition (restorative justice).

Just Transition frameworks would have to change and adapt across geographies and sectors, focusing particularly on power, mobility, and industry, where significant sectoral transformation is underway, and the need for early development of suitable Just Transition frameworks is high.

The mobility sector is witnessing vast transformation across passenger and goods categories

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Given India's critical importance for the world to meet its climate goals, it is imperative for global institutions to facilitate a just and inclusive transition in the world's most populous nation and other developing countries. In India, 80 per cent of the country's 1.4 billion people live in districts with high climate vulnerabilities. CPI conducted studies reveal that states likely to be most impacted by the transition away from fossil fuels, are also amongst the most economically impoverished ones. For instance, in Jharkhand, the impact of such a transition would be equivalent to ~19 per cent of its GSDP, in the current scenario. The complexity arising from the fact that climate change-affected and transition-affected stakeholders are largely the same, necessitates the development and implementation of a Just Transition framework that does not leave anyone behind.

Equitable distribution of burden and benefits: The power sector globally, has witnessed a rapid decline in the cost of renewables and energy storage technology, thereby offering an increasingly viable round-the-clock alternative to fossil fuel-based power generation. The eventual transition from fossil fuel-based generation to clean energy-based generation would impact existing jobs, requiring significant reskilling and redeployment of human resources. It would not only impact the economy of regions heavily dependent on fossil fuel-based activities but also the continuity of other businesses linked to such activities. However, the transition would open up vast new opportunities in the sphere of manufacturing, deployment, operating and recycling of clean energy generation solutions; energy storage systems; and supporting grid infrastructure. Therefore, the 'just transition' framework for the power sector would need to include relevant policy mechanisms, financial resource planning, innovative financing structures, and capacity development frameworks to help equitably distribute the burden and benefits across all stakeholders.

The mobility sector is witnessing vast transformation across passenger and goods categories. While the shift from fossil fuel to electric has been ongoing in rail transport for some time now, decarbonisation of ground transportation has been increasing with the growth in electric mobility supported by developments in battery technology. The sectoral transition has been rapidly advancing with increasing digital transformation across the value chain. This shift is likely to require extensive reskilling of the workforce that is currently employed in the internal combustion engine vehicle value chain. It would also involve redistribution of supply chains, with the shift in mineral requirement for new-age vehicles, and recycling of end-of-life materials. The just transition framework for this sector would need to factor in not only the natural resource availability, but also the equitable access to technology, gender, and inclusion-related implications, as well as the availability of financial and knowledge resources.

Renewables offer an increasingly viable round-the-clock alternative to fossil fuel-based power generation

The industrial sector faces the highest degree of complexity in its transition, considering the hard-to-abate nature of emissions in key sectors such as steel and cement. This is due to the role of fossil fuels as input feedstock for these industries rather than being the energy source in the production process. Decarbonisation of this sector would require resource efficiency, material circularity, and innovative low-carbon technologies. While solutions do exist, access to technology and low-cost finance to bridge the cost differential remains a barrier. The just transition framework would need to focus on policy measures and partnerships between countries, institutions and enterprises of the global north and the global south, to make available the technology, skillsets, and finance. To address the impact on workers, communities, and local governments dependent on the extraction of mineral resources, the framework would need to incorporate long-term diversification of climate-positive economic activities in these regions.

There is an urgent need to scale up and accelerate the mainstreaming of Just Transition discussions for the formulation of effective implementation frameworks to evaluate the impacts and outcomes. Such a Just Transition framework would require synchronised global efforts to strengthen partnerships and alliances that can support and enable a 'just' transition at all levels.

Just transition is not only a necessity but also an opportunity to transform our economies and societies for a better tomorrow. ◆

The missing part of the jigsaw

With the talent it has, India can demonstrate a new pathway to shared sustainable prosperity

HISHAM MUNDOL

Much has been written and said – justifiably so – about the need for finance and technology to support India's green transition. These are both big imperatives and represent large and growing gaps between what is available and what is needed. There is a third one which is less prominent, but the strategic implications of which are equally consequential. This is the gap on talent.

Climate change is the most complex and serious problem facing humanity. Addressing this scale and complexity is going to require an enormous growth in green talent. India does not have enough of this – either those who work exclusively on sustainability or those who use sustainability skills in their core jobs. The gap is large and growing.

The requirement is huge and can be bridged through three main routes. Firstly, it is to embed sustainability as a core part of executive education and skills development in India. On executive education, most corporates offer programmes on strategy, leadership, team building, communications and company-specific technical skills. While these are all important, few provide specific support on sustainability. In quite a few cases, it appears but as a bolt-on to other themes. It needs to be central and needs to be widely subscribed within any enterprise. It is critical to keep in mind that sustainability skills are required across the board and not just with the corporate sustainability team. The finance and accounting teams need to understand carbon pricing. Manufacturing needs to be up-to-date. with the direction of emerging green technologies. The procurement function needs to be as much of a custodian of a Net Zero commitment as the Chief Sustainability Officer.

Indeed, a catalyst for this spreading of sustainability knowledge will be when every single employee has sustainability on their objectives. That day is not far. Companies that undertake efforts are the ones who will not only survive, but indeed thrive. With regards to skills, as we train electricians, plumbers, carpenters, builders and couriers and delivery drivers among others, they need to learn sustainable practices, as that is where the demand will be from.

The second aspect is to update – and keep constantly updated – the teaching of sustainability and dramatically scale up the student body that chooses to work in this space. Every subject taught on campuses and online should have a clear thread of sustainability running through the teaching plan. So much of the sustainability agenda is nascent and there is so much innovation and action that is happening that a syllabus designed for today will likely be redundant in five years' time. Engineering and skilling syllabuses also need to keep up with the rapidly changing practices in climate action. Familiarity with carbon markets was good-to-know a few years ago but is going to be mission-critical over the next five years. Environmental law and reporting requirements – including global changes in regulations – are going to need to be skillfully navigated by the business sector in India. Business schools need to teach that sustainable shareholder value creation will be created by responsible business. Everyone learning to become an investment banker must learn to be a sustainable financing specialist, or else they will not be successful bankers for long.

The last route is to fuel the funnel of talent. The requirement of sustainability talent is huge and the ecosystem to enable the development of the requisite skillsets is slowly picking up but needs to accelerate.

There is also growing understanding about climate change, but only in young people. School and college students should be encouraged to take this up as it combines purpose with potential. Environmental Defense Fund's Climate Corps programme is a great example of creating change agents. It selects and trains passionate, talented, and ambitious Masters students and matches them for 12-week internships with host companies who are authentic, ambitious, and concerted about sustainability. Climate Corps Fellows then join a thriving community of nearly 3,500 across the globe, who are the sustainability leaders of tomorrow and act as agents. We need programmes like this, and others, to scale up. We need more of India's brightest to join the sustainability brigade.

Going back to the numbers. They do appear daunting, but it is easier to appreciate it when one looks at the size of both the challenge and the opportunity. India has achieved this kind of scale before. We should take inspiration from how corporates, academia and governments collaborated to source and skill the nearly 4 million who are now part of India's outsourcing economy. These should come together because climate change is both the crisis and the economic opportunity of the century.

Finance and technology are necessary but not sufficient. Talent is the missing part of the jigsaw. Without it, India's response will be sub-optimal. With it, we can demonstrate a visionary new Indian pathway to shared sustainable prosperity that will be good for the economy and good for the environment. ◆

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Enabling Net-Zero

Indian energy marketplace needs a digital lens for a Net-Zero future

ANIMESH MISHRA

In the pursuit of sustainable development and heightened energy efficiency, India finds itself at a pivotal crossroads, necessitating a tailor-made solution to grapple with the unique challenges presented by diverse and widely distributed energy efficiency initiatives. EESL, renowned for its pioneering efforts in expanding access to energy-efficient solutions, has assumed a crucial role in meeting these challenges head on.

Over the years, EESL has successfully implemented some of the largest energy efficiency projects across India. However, the company is now entering a new phase, marked by the introduction of an innovative one-stop marketplace – a digital platform intricately crafted to offer a comprehensive array of energy-efficient solutions, products, and government schemes.

The complexity inherent in energy efficiency projects, involving various stakeholders spanning over different geographies and technical intricacies, demands a standardised and efficient process. The e-marketplace, as envisioned by EESL, will be a first of its kind, fully integrated with information technology, streamlining mega-scale projects for swift approval and digitalised project deliveries.

To expedite and accelerate the adoption of innovation in energy efficiency products and services, In the e-marketplace, EESL is looking to bring an easy access to financing for MSME and start-up sector which would be looking to adopt energy-efficient technology from the platform. It would also give industry access to empanel and place their products and services for wider outreach on the e-marketplace.

By standardising agreements for both products and services, EESL will create a transparent and consistent framework. This will not only facilitate smoother transactions but also foster trust among industry players, businesses and consumers, thereby catalysing the growth of the energy efficiency market.

The marketplace will incorporate an automated process through SAP, ensuring seamless integration of vendor payments, finance and the entire product or service delivery supply chain. This digital transformation is poised to simplify acquisition and payment processes for businesses and individuals alike.

The digital integration of the e-marketplace takes efficiency a step further by expediting project approvals and deliveries. Leveraging information technology, the platform accelerates appraisal processes, including entity evaluations based on goods and services tax performance, application programming interface-based integration, and self-appraisals. This digitalisation enhances efficiency and supports the scalability of energy efficiency interventions, addressing the challenges posed by the disaggregated nature of such projects.

EESL's pursuit of innovation extends beyond the marketplace, as the organisation actively explores new frontiers such as super-efficient air-conditioning, induction cook-stoves and energy-efficient fans. This underscores EESL's commitment to staying at the forefront of advancements in energy efficiency and sustainability.

In line with these initiatives, EESL is implementing its 2030 strategy, which is rooted in the principle of 'enabling Net-Zero'. This comprehensive approach focusses on integrated solutions across diverse sectors, prioritizing public sectors, utilities, MSMEs, rural areas, agriculture and affordable housing. The strategy encompasses a wide range of innovative and affordable energy solutions, including super-efficient appliances, energy-efficient buildings, e-mobility, and more.

EESL's pursuit of innovation extends beyond the marketplace, as the organisation actively explores new frontiers such as super-efficient air-conditioning, induction cook-stoves and energy-efficient fans

EESL's forward-looking vision is evident in the launch of new programmes, such as the National Efficient Cooking Programme (NECP), Energy Efficient Fan Programme (EEFP) and the launch of energy efficient LED inverter bulbs. Additionally, EESL is positioned as the nodal agency for guiding public sector entities towards Net-Zero. The organisation is also venturing into e-mobility, smart and efficient distribution utilities, Net-Zero cities and villages, Net-Zero cold chains, Net-Zero industries, and international collaborations with entities like USAID SAREP. This holistic vision underscores EESL's commitment to driving a comprehensive transition towards carbon neutrality and sustainability across various sectors in India.

The organisation has been known for playing a central role in propelling India towards Net Zero emissions by championing advancements in energy efficiency through its initiatives like Unnat Jyoti by Affordable LEDs for ALL (UJALA) and Street Lighting National Programme (SLNP). ◆

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Starting and ending with controversy

COP 28, the international climate change conference just concluded

Before the annual conference was even underway, tensions rose around accusations that host country, the UAE, and its appointee as president COP 28, Sultan Ahmed Al Jaber, were accused of leveraging COP planning meetings to pedal oil. Of note is that Al Jaber is also the head of the Abu Dhabi National Oil Co.

Al Jaber responded to the controversy noting that he did not need climate meetings to sell oil. While many world leaders were ready to move ahead, it raised the question amongst many attendees about the role of an oil economy leading climate negotiations, with memes about it being akin to a cigarette company leading the World Health Organization.

As the conference actually got started, the UAE aimed to put the drama behind it, with an announcement to operationalise the Loss and Damage Fund, the crown achievement of COP 27, with a $100 million contribution.

In the early days of the conference, India again assumed its role as a leader for the global south through participation in the Presidency's Session on 'Transforming Climate Finance'. As in past years, India advocated adherence to the Common but Differentiated Responsibilities doctrine, encouraging replenishment of the Green Climate Fund as well as affordable transition financing for developing nations, while simultaneously urging that to achieve equity, developed nations accelerate the rate of their own transition.

This set the stage for ongoing discussions on the need for supportive climate finance mechanisms and support for stressed renewables investments. With changing interest rates driven by developed markets, the procurement of new and servicing of debt on existing renewables is precarious.

India also launched the Green Credits Programme as an international initiative to incentivise voluntary pro-planet actions. Much like the Green Credit programme being developed by the Ministry of Environment Forestry and Climate Change (MoEFCC) the model proposes to issue credits for land rejuvenation activities.

Al Jaber: climate meetings to pedal oil?

The 'Global Tipping Points' report was a significant report released early in the COP 28 agenda. Supported by more than 200 scientists, the report identifies 26 critical tipping points, "which pose threats of a magnitude that has never been faced before by humanity," said Tim Lenon, professor, lead author & chair, Climate Change and Earth System Science, University of Exeter, UK. Five are dangerously close to breach and scientists fear that breaching one or more tipping points may have a cascading or domino effect.

In the two weeks following, many Indian corporates, think tanks, start-ups, NGOs, investors and industry bodies hosted or participated in sessions, workshops and activities to share best practices and advance India's leadership role in shaping global climate action.

In the concluding days of COP, negotiators reached the UAE consensus – a landmark agreement to expedite the reduction of unabated coal power usage. Historically, India and China have opposed the measure, especially in light of developed markets not making similar concessions on other fossil fuels. The same day, it was agreed to also phase down use of fossil fuels. In response to the agreement, India noted the importance of justice and equity as core principles of the both this and the Paris Agreement.

Both India and the UAE saw the inclusion of phasing down fossil fuels as a win, but for different reasons. For India, the win was in holding developed nations to equitable energy transition terms. For the UAE and OPEC, the win was in the terms not requiring 'Phase Out" of fossil fuels, despite more than 100 countries preferred phase out over phase down.

The primary objective of COP28 was finalisation of the 'Global Stock Take' (GST) – a progress report agreed to in the Paris Agreement, to assess progress, gaps and updated required action before nations recalibrate Nationally Determined Contributions (NDC). Conceptually, the report represents an important accountability tool and to set forward set priorities.

Governments, inter-governmental organisation and global think tanks have prepared guidance on achievements, challenges, shortfalls, suggestions and proposed language for the last year. Herein lies the second controversy. Negotiations went into overtime to close the agreed terms of the Global Stock Take. There were disagreements about the language on the 'phase down' or 'phase out' fossil fuels, including unabated coal. Though many countries believed the phase down language to be too vague to be enforceable a deal that left everyone a little happy and wanting more, is likely the sign of a good negotiation. Choosing how the report card reads and deleting full clauses in the GST alleviate sensitivities is the bigger issue.

India closed COP 28 with a statement that it had met its NDCs well ahead of schedule – reducing emissions intensity of its GDP by 33 per cent and achievement of 40 per cent new electric installed capacity from renewable sources. It further announced it is revising its ambitions upward and encouraged other countries to do the same. ◆

Weathering storms

Global brands have made meaningful progress towards reducing carbon emissions

This might be the year that climate action came of age. After years of limited action followed by everyone doing something all at once, climate has not only become the standard for concerted amounts of government, corporate and investment action, it has now started weathering storms.

No longer a niche topic or a "special interest of 'first movers', global brands have not only made net-zero pledges but also meaningful progress towards reducing carbon emissions. Financial firms representing over $80 trillion assets under management and $70 trillion banking financial assets have similarly made pledges on greening investments. There are more than a few climate unicorn start-ups and large Wall Street firms are setting up entire departments for carbon markets.

As with any maturation, these events have not been entirely seamless. In the last year, brands have been accused of hiding behind credits to green wash operations, changing interest rates have rendered a number of green infrastructure investments unviable, while early upheaval in the venture markets challenged start-up valuations.

The carbon markets were rocked by exposés zeroing in on the types and quality of credit certification. This resulted in both in a tightening of standards but also raising the question of just how much firms were actually doing to improve operations and when or if credits are appropriate for offsetting business emissions when other solutions are available, though perhaps at higher price.

Better performance

On the national stage, India ranked seventh globally in the 2023 Climate Change Performance Index. The government held the G20 presidency, convening hundreds across different climate and environment themes (energy transition, industrial decarbonisation, finance, start-ups, land use, water and more) and integrating it across traditional business themes under its 'One Earth, One Family, One Future'.

Global geopolitics continued to cause upheaval in established trade and energy systems resulting in continued 'backsliding' in developed countries, even as Europe implemented the Carbon Boarder Adjustment Mechanism (CBAM) requiring developing countries to fund carbon consumption in the EU rather than investing in the sustainable development and climate transition at home.

Companies that have taken early leadership in greening heavy industries like steel and cement, praise CBAM and encourage India to establish similar regulation, claiming it is the metaphorical carrot or stick needed to push mainstream industry to adopt measures. Meanwhile, industry bodies encourage that India look into a mechanism to collect and distribute the CBAM tax in India and use the funds to support SME decarbonisation.

In the US, well it's the US, there is always argument on climate. Even as some Republicans continue to condemn climate change as a Chinese conspiracy theory, the other half of the party has started developing a business first approach to climate, with states competing for EV and battery manufacturing. Climate initiatives established under Biden, have been slow to bear fruit, but many are expected to establish the foundations for longer-term energy sufficiency and green manufacturing.

COP also enjoyed scandals this year, as the first year an oil country led the global climate conference. Accusations of the host using COP preparations to sell oil, were an early challenge. The frequency and damage of climate change events might lead one question if the real scandal, however, is hosting a conference for +100,000 attendees to travel across the globe to negotiate the Global Stock Take. Some might question the need for such a report, given that climate action has obviously not been enough to head off extreme weather, while others question the veracity of a report in which key clauses or recommendations can be negotiated out, in lieu of national interests or consensus. ◆

Catalyst initiatives

It is time to elevate subnational solutions for effective climate action

SARANSH BAJPAI

The Global Stocktake synthesis report released by the United Nations Framework Convention on Climate Change ahead of COP 28 paints a worrisome picture of the world's progress towards Paris Agreement targets. While there is a limited window of time to course correct, the report echoes previous warnings that global efforts are falling short. There is need for transformative changes by governments, businesses and civil society across sectors at a pace that is much faster than recent trends to limit global warming.

While countries have initiated the process by submitting their nationally determined contributions, the success of climate action hinges on the actions taken at subnational levels, encompassing states, districts, cities and villages. Countries such as India are paving the way for climate action at the subnational and local levels.

For instance, Bihar has become one of the first Indian states to prepare a net-zero strategy that aligns with India's 2070 target – a feat highlighted at the India Pavilion of COP 27 at Sharm El Sheikh, Egypt. Bihar has already positioned itself as a pioneer state committed to building a sustainable future and is poised to make a significant contribution to the national climate agenda. It has promoted noteworthy initiatives, such as didi ki nursery – local women-managed nurseries that are empowering rural women and leading to enhanced sources of income. J-WIRES, a women's collective involved in producing energy-efficient products through decentralised renewable energy is another initiative by Bihar that not only strengthens climate action in the state but also improves livelihood opportunities for marginalized communities.

Tamil Nadu is another state leading subnational climate efforts through a dedicated district-level Climate Change Mission. The mission aims to develop grass-root initiatives to address climate-related challenges at the local level and is empowering local communities to lead adaptation and mitigation. Moreover, the state has set up the Tamil Nadu Green Climate Company (TNGCC), which is its first ever special purpose vehicle entrusted to resolve the climate crisis in the state. Its novelty lies in its formation and legal structure, which provides flexibility to collaborate and build partnerships with other institutions to drive climate action in the state. Furthermore, the district-level climate fellows' program has also created robust institutional arrangements for improving participative governance. Tamil Nadu's approach serves as a model for regions worldwide, emphasising the power of local action in building resilience.

In the heart of India, Madhya Pradesh is swiftly embracing clean energy initiatives. Recently, the state's chief minister declared Sanchi as India's first solar city. The city serves as a testament to Madhya Pradesh's commitment to renewable energy adoption, demonstrating how urban centres can transition towards sustainability. Sanchi has constructed dedicated solar parks to meet its agricultural and urban electricity needs. Additionally, it has installed vertical axis wind turbines and plans to have piezo-electric floors to generate electricity from footfalls in tourist sites. It has conducted energy audits of all government buildings and replaced conventional energy equipment by energy-efficient alternatives. This macro-scale adoption of renewable energy technologies and energy efficiency measures will enable the state to decarbonise its grid-mix and reduce its energy intensity. Additionally, it will also pave the way for a cleaner, greener future in alignment with India's ambitious target of achieving 50 per cent non-fossil energy by 2030. This also aligns with the G20 goal of tripling 2030 RE targets, which may get endorsed at COP 28. Adapting energy systems, transportation networks, buildings, public spaces and landscapes to accommodate solar technologies is a complex task in Indian cities. Widespread adoption of rooftop solar PV in cities may be affected by high density residential areas, shared and rented apartments with poor access to rooftops, and regulatory development norms. This working model of Sanchi demonstrates how Indian cities can leapfrog towards a carbon-neutral future.

Uttar Pradesh, India's most populous state, is developing an action plan for over 58,000 gram panchayats to enhance localised climate actions in the state. The plan aims to mainstream and integrate climate change adaptation and resilience in the local planning process through Gram Panchayat Development Plans (GPDPs). To support this, a capacity-building package is being rolled out through a network of 17 regional-level and 31 district-level rural development institutions.

India's megacities such as Mumbai and Bengaluru have made significant strides towards achieving future net-zero status through comprehensive planning. Recognising the urgency of addressing climate change for the environment and the well-being of people, these cities have enacted impactful measures. Initiatives, such as green building

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programs, public transportation enhancements and carbon offset projects underscore Mumbai and Bengaluru's aim to become carbon-neutral, while enhancing the resilience of their people and infrastructure. Bengaluru's climate action plan, for instance, will help the city adapt and improve its resilience against climate-induced hazards. Furthermore, it will outline clear actions across sectors, such as stationary energy and buildings, transportation, solid waste management, air quality, water, urban planning, greening and biodiversity. This framework is crucial for developing a robust governance mechanism to strengthen stakeholder collaboration as well as implement, monitor and evaluate suggested actions.

The cities of Burhanpur and Indore in Madhya Pradesh have implemented projects aimed at enhancing the water resilience of the cities to future climate stress by restoring and conserving traditional water storage structures. These projects facilitate the diversification of water supply sources for the cities. Consequently, they decrease dependence on scarce groundwater resources, while also reducing emissions and curbing costs linked to the extraction of water from distant surface water sources.

The need for enhanced mobilisation of finances and efficient use of existing resources is widely recognised as an essential enabler for driving climate actions. Odisha has become the first state in India to introduce a climate budget, where the state's annual budget tracks and enhances budgetary allocation specifically for climate-relevant activities. This integration of a climate perspective into the state's fiscal planning serves as a model for other states to adopt climate-budget tagging. Bihar has also been developing its green budget on similar lines, further exemplifying the growing trend towards integrating climate considerations into fiscal policies across states.

Indore is capitalising on innovative mechanisms to finance its climate actions. The city is generating an annual loyalty of almost $0.3 million from the 550 tonnes per day bio-methanation plant, operated through a public-private partnership. Furthermore, Indore has earned over $1 million in revenue from carbon credits and raised $86.5 million in green bonds to build the largest solar plant in the city for pumping and supplying water from Narmada.

The strides made by various Indian states and cities in addressing climate change highlight the transformative power of subnational climate action. Through collaborative efforts involving businesses, governmental bodies and civil society organisations, these initiatives exemplify the potential of public-private partnerships in advancing climate solutions. Such localised endeavours serve as compelling models, not only motivating national counterparts but also encouraging global partners to unite in the fight against climate change.

At COP 28, India can proudly showcase the community-driven climate solutions in its states and cities. These initiatives are catalysts for a worldwide movement, engaging every state, city and individual in constructing a more resilient, sustainable, and environmentally conscious society. Through innovation, fostering collaboration, and prioritising sustainability, these actions can pave the way towards a more sustainable future for all. ◆

The cities of Burhanpur and Indore in Madhya Pradesh have implemented projects aimed at enhancing the water resilience of the cities to future climate stress by restoring and conserving traditional water storage structures

Transformative transition

Transition finance can help standardise emission measurement

NEHA KHANNA

DHRUBA PURKAYASTHA

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To achieve the goals of the Paris Agreement, countries need to accelerate economy-wide decarbonisation. This transformative transition would require financing for mitigation at an unprecedented scale. It is estimated that India needs about $2.5 trillion till 2030 for Nationally Determined Contributions or NDCs (MoEFCC, 2015). While this low carbon transition would need to be led by the real economy sectors, complementary support of the financial sector is critical. For increasing green finance, it is imperative that emissions reduction activities be considered for directing financing as 'Transition Finance' (financing activities, which reduce emission but are not 'green' or zero emission).

Climate Policy Initiative tracked finance flows towards climate action that fall short significantly. The tracked green finance flows represent only a quarter of the needs, with a majority of these flows going to renewable energy and cleaner transport (CPI, 2022) and a small share allocated to emissions reduction in 'hard of abate' sectors such as steel, cement, chemicals etc. To increase green finance flows to these sectors, it is important to focus on transition finance. Bridging this financing gap would require structural and institutional changes in both the banking and capital markets to direct financial intermediation towards emissions reduction, which may not necessarily be green as defined. The current 'green' assessment and evaluation processes used both by capital markets and the banking sector do not adequately account for reduction of carbon emissions in many real economy sectors.

Further, the risk assessment approaches in banking and financial markets rely heavily on conventional credit rating systems, even for financing hard-to-abate sectors which are eligible for transition finance. The current credit rating models are short-sighted and might not be forward looking enough to provide an early warning signal ahead of a climate crisis (as stated in IEEFA, 2023) and also do not tilt the playing field for lending/investment towards emissions efficiency. Excessive reliance of the financial sector on conventional credit ratings, which do not incorporate positive green externalities, could discourage capital investment in climate-positive economic activities, businesses, and projects because credit ratings largely disregard green positive externality as a factor in credit assessment, thereby favouring well-established, profitable but carbon-intensive businesses. Climate-positive enterprises, often based on newly evolved low-carbon technologies are assessed by traditional credit rating agencies as high-risk and, consequently, find it challenging to attract capital, especially debt financing.

To enable transition finance, a different paradigm for lending and investment decisions is required, which reflects emissions-per-unit finance. While some such ratings exist globally, there are no standard ratings in India. An analysis of the current carbon-specific rating offerings shows that there are two categories of products – one, climate/ESG risk products that measure risk to a company's profits; and, two, alignment products that measure alignment to international goals such as the Paris Agreement.

Climate/ESG risk products look at the impact on a company, while alignment products usually assume all companies will act in unison proportionate to their share in 1.5/2°C goals, which is highly unlikely and an irrational assumption. As a result, neither of them might accurately capture the impact on the environment, and therefore, the benefits of transition to a low carbon economy.

Given that India will need to transition, the SEBI, has introduced 'Parivartan Score' or 'Transition Score' in their amendment to credit rating agencies regulations (SEBI, 2023). The circular states: 'This transition score could track changes in quantitative metrics in trend-lines or change in revenues from environmental/social services and products, or any quantitative assessments, which would be as per the given models of the ESG rating providers.'

The construct of such a score may be anchored in three main objectives (as per a BIS paper published in *BIS Quarterly Review*, September 2020): one, it should provide additional incentives for the rated companies/debt instruments and loans to contribute to the attainment of climate goals such as those of the Paris Accord and country level Net Zero commitments; two, it should help investors in the decision-making process; and three, the system should allow investors and other stakeholders (such as auditors, regulators and policymakers) to check a firm's improvement and verify that the desired climate mitigation effects are achieved. The 'Parivartan Score' could be developed and mandated for financial instruments (bonds and loans above a certain value, in case the money is being raised for a green project) and should, ideally, assess carbon emission per unit of capital or output.

The use of such a score for transition by the financial sector would not only assist in meeting India's NDC commitments but would also help in mobilising capital to sectors, which may otherwise not be eligible for funding or may get finance which is priced much higher. A standardised score, in our view, would help in enabling transition finance. ◆

From challenges to prosperity

Through the creation of a robust recycling infrastructure, EPR reduces landfill disposal and promotes sustainable resource utilisation

JACOB DUER

CEO & President, Alliance to End Plastic Waste (AEPW)

The world today is evolving into a more robust and urbanised ecosystem. With this growth comes a significant challenge in the management of plastic waste and pollution issues resulting from inappropriate disposal. India faces the additional challenges posed by a burgeoning population and rapid industrialisation.

By 2030, it is projected that India's urban population will increase from nearly 48 crore to 60 crore. This will result in a threefold increase in waste, from 62 million to 165 million tonnes. Due to plastic's durability and low cost, plastic consumption is rising, leading to an increase in plastic waste and plastic waste pollution. For India to secure a better environmental outcome, it is crucial for plastic waste management systems to improve and recycling levels to increase.

The challenges in India include littering, lack of segregation at source, and inadequate infrastructure. The nation's diverse landscape and socio-economic factors make behaviour change difficult. Encouraging habit shifts, especially in plastic waste handling, can be challenging.

However, this scenario also offers enormous potential for livelihood creation, technology transfer and the development of a booming waste management industry.

The Indian government recognises the urgency and need to implement strategies to address the issue of plastic waste management. But despite India's commitment to mitigating plastic pollution, the nation still generates 26,000 tonnes of plastic waste per day, with a substantial portion ending up in landfills, rivers, and oceans, making it imperative to find sustainable solutions.

Cohesive ecosystem: One of the key steps to combat this critical issue is to develop inclusive and cohesive value chains. Involving stakeholders – from policymakers and plastic manufacturers to informal waste processors and waste pickers – is crucial to addressing the social, economic, and environmental concerns associated with plastic waste.

The task of ending plastic waste in the environment is a collective effort, making it essential to find solution models that benefit both the environment and the community and are economically viable. Such models can inspire both the private and public sectors and facilitate the creation of a collaborative ecosystem to move towards the vision of a circular economy.

India already has several projects that prove strengthening the informal sector and bridging the divide between the formal and informal sectors can result in significant improvements. Let's Transform is one such example, illustrating the potential to make an impact in the plastic waste challenge. This social inclusion project was developed by SAAHAS Zero Waste, a Bengaluru-based environmental and social enterprise, and IKEA Social Entrepreneurship (ISE). It aims to tap into the entrepreneurial qualities of waste workers in the informal sector and convert them into sustainable business leaders. The project supports these entrepreneurs-in-the-making by providing training, technical and financial support to strengthen and sustain their livelihoods.

EPR – A powerful instrument: In a move to strengthen India's circular economy, the government has issued guidelines on Extended Producers Responsibility (EPR) on plastic packaging under the Plastic Waste Management Rules, 2016.

EPR is a powerful instrument for assigning responsibility and accountability for plastic waste, transferring end-of-life product management costs from local governments to producers, alleviating the financial burden on the public sector. By setting targets for reuse, recycling, and the use of recycled content, EPR compels producers, importers, and brand owners to reduce waste mismanagement. This also encourages the recovery and recycling of waste into secondary raw materials and diminishes the need for virgin resource extraction.

A wide range of mechanical and chemical recycling technologies are available today and can work in tandem to keep materials in circulation with the highest quality, economical, and environmental value as long as possible. Through the creation of a robust recycling infrastructure, EPR reduces landfill disposal and promotes sustainable resource utilisation.

Additionally, EPR offers environmental solutions and serves as a robust job generator, benefitting all strata of the workforce, including those in basic vocations. Currently, the informal waste sector faces challenges ranging from occupational hazards and lack of storage of collected waste, to various social and operational issues. In this regard, EPR is useful in ensuring that waste collection across all levels is streamlined and inclusive, without leaving the informal sector behind.

This symbiotic relationship between EPR implementation, job creation and supporting livelihoods underscores the potential to not only address environmental challenges but also stimulate economic prosperity. ◆

Role of partnerships

To realise the decarbonisation journey, fostering public-private partnership models between the government and industry is imperative

SUBRAMANIAN CHIDAMBARAN

Today, amidst the global conversation surrounding decarbonisation goals, it's encouraging to witness the commitment of nations and organisations towards addressing and mitigating the impact of climate change on people, societies, and the planet. However, if we dig deeper beyond the announcements and aspirations, there are some fundamental challenges on our road to zero emissions. Often, the discourse lacks a granular examination of how these goals will be achieved or the practicality of the execution roadmap.

One critical aspect frequently underestimated is the specialised and complex nature of decarbonisation and energy transition. The fact is that it requires individuals with deep specialisation in this domain and passionately dedicated to making substantive progress. However, many organisations view it purely as a competitive advantage and opt for a solitary path towards decarbonisation.

It is with this context that this article aims to emphasise a pivotal point: Progress requires partnership and decarbonisation demands a collective endeavour.

Stages of the decarbonisation journey

Before advancing on the decarbonisation journey, it is essential to define what is meant by decarbonisation. This definition is not the theoretical explanation of decarbonisation but what it means for a particular country, industry sector, or organisation. For example, decarbonisation for an engine manufacturer involves a reduction of carbon footprint across the entire production value chain, including suppliers, as well as in the end-use application of engines. On the other hand, for a steel manufacturer, it is about reducing the carbon footprint in mining, steel manufacturing processes, etc including their suppliers. Even though these interventions fall under categories of Scope 1, 2, and 3 greenhouse gas emissions from an environmental impact perspective, the actions and goals vary significantly across industries. Therefore, defining and understanding what decarbonisation means for a particular nation, industry sector, or organisation is a key imperative.

Convert definition into metrics: The subsequent step involves translating this 'definition' into measurable metrics. These metrics encompass both input and output parameters. For instance, a steel manufacturer might have input metrics like 'utilisation of electric arc furnaces' or 'percentage share of green hydrogen in iron-ore reduction', alongside output metrics such as 'total CO2 emissions (in tonnes)'. This process aids in developing what can be termed as the 'Decarbonisation Scorecard'.

The decarbonisation curve: A combination of steps 1 & 2 helps in designing the 'decarbonisation curve' for a particular industry or country which is nothing but a maturity progression curve starting from the least decarbonised scenario and advancing toward the aspirational 100 per cent decarbonised scenario. At each stage along this trajectory, distinct metrics and actions should be plotted which are needed to move from one stage to the next.

Baseline: Once the decarbonisation curve is defined, we then need to 'baseline' the specific country or organisation on this curve. This entails assessing the current position of the country or the organisation on the defined decarbonisation curve.

Target setting and action plan: Subsequently, we should focus on target setting and defining the action plan aimed at achieving the desired levels on the decarbonisation curve with clearly articulated timelines and responsibilities.

Fostering a robust partnership ecosystem: Having a robust ecosystem of partners is a critical need to advance on the decarbonisation journey. It is unrealistic to expect that an organisation can independently undertake the aforementioned steps. Given the evolving nature of this space, there is a wealth of knowledge and experience to be gained from global developments in the area of decarbonisation.

In the backdrop of the stages of the decarbonisation journey as detailed above, below is an illustration of the six key roles that are integral to advancing the decarbonisation agenda:

Although many organisations think of managing these roles by themselves, doing so may result in sub-optimal outcomes from a quality and investment of time and effort perspective. It

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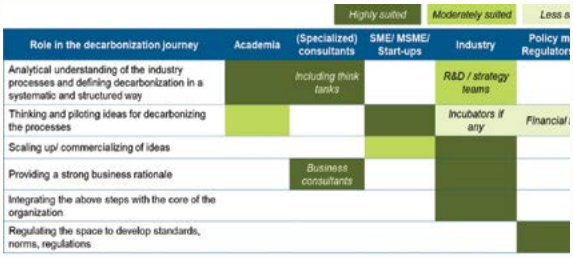
is important to acknowledge that certain stakeholders/partners are better suited to assume these specialised roles more effectively and efficiently. The following summary outlines the thoughts that advocate for a collaborative and co-creative approach in this direction.



Now, what makes these partners better positioned and suited for certain roles over others?

Academia: Academic institutions such as the IITs, IISc, etc are naturally endowed with an ecosystem that is bustling with both analytical and creative thinking. With extensive academic connections worldwide, these institutions possess a unique ability to effortlessly translate groundbreaking research breakthroughs across borders. Serving as think tanks for governments and numerous organisations on diverse topics, these institutions leverage the curiosity and intellectual vigour of students, complemented by the experienced and systematic approach of faculties.

This synergy makes academic institutions an ideal partner for shaping and structuring the decarbonisation journey. Interestingly, many of these institutions have moved away from an 'only teaching & research' place to a 'teaching, research and entrepreneurial' abode. There have been many successful start-ups that have emerged from the premises of these institutions carving their unique path.

Specialised consultants are advisory/consulting firms that specialise in specific areas of decarbonisation and can bring in a wealth of analytical rigour in the form of well-tested models, surveys, etc thereby enhancing the credibility and validation of defining the decarbonisation curve, metrics, and baselining the organisation.

While academia and specialised consultants excel in contributing to the 'what' of decarbonisation, the 'how' requires the involvement of players such as SMEs/MSMEs/start-ups. These players possess the ability to translate ideas into minimum viable products that can be commercialised, thereby helping the organisation achieve the decarbonisation metrics. Moreover, the industry's engagement becomes crucial at this stage to guide the SMEs/ MSMEs/start-ups to make the right choices and deliver the expected products/ services effectively.

Policymakers, regulators, and the government need to define the ecosystem for decarbonisation in collaboration with other stakeholders like academia, industry, etc to set comprehensive standards, processes, and regulations creating an equitable and conducive environment for all entities. This would also help promote India as a preferred destination for global firms aspiring to meet their decarbonisation goals.

Though this is an ideal scenario, multiple challenges call for an understanding and resolution before this ecosystem can operate seamlessly.

The sentiment 'As an organisation, we can do everything' is often echoed in many companies reluctant to engage in partnerships or collaborations. With limited resources, the crucial question arises: where should an organisation invest these resources to maximise their utility? This decision revolves around identifying core competencies. Industries need to decide which tasks they wish to undertake themselves and which they prefer to delegate to partners. The era of handling everything independently is no longer feasible.

'Industries need to do all the funding' – this is a common expectation we hear being voiced in various forums, particularly from academia and government. It is essential to recognise that all entities operate within constraints – be it manpower, assets, or capital. There are multiple priorities that organisations need to address. While the expectation of funding from industries is fair, they cannot be expected to allocate all the funding to completely exploratory areas. Further, it is unrealistic to expect newer areas of research to satisfy the RoI needs of the industry. Hence, efforts must be made by stakeholders to address the concerns and expectations (to the extent possible) of the industries in this regard.

The expectation that the 'government must incentivise/subsidise everything' is often voiced, particularly from the industry. It's important to acknowledge that governments, especially in a country like India, have a multitude of priorities within their budget. These encompass critical areas such as poverty alleviation, ensuring essential amenities like food, healthcare, and education, alongside broader growth objectives. Hence, expecting the government to fund all the decarbonisation needs is an unrealistic ask that may not align with the broader scope of their budgetary commitments.

To realise the decarbonisation journey in India, fostering public-private partnership models between the government and industry is imperative. This collaboration should prioritise assigning lead roles to partners like academia, consultants, start-ups, and others based on their specialised competencies and credentials, as highlighted earlier. Embracing these partnerships can nurture a robust ecosystem propelling India towards its decarbonisation goals and actualizing the vision of a sustainable, low-carbon future. ◆

Interestingly, many of these institutions have moved away from an 'only teaching & research' place to a 'teaching, research and entrepreneurial' abode

War against time

Startups and corporates can leverage the climate emergency to accelerate and embrace innovation at warp speed

Wars, times when human race faces its worst crisis, are also when strategies for resource usage are at its sharpest. To take a leaf out of maritime strategies in such times, large battleships work in tandem with nimble footed destroyers to manoeuvre complex and uncertain geographies.

The climate challenge is a war against time – one that humanity cannot afford to lose.

As large industries look to transition to a green economy and innovators build the transformative technologies, there are lessons from rules of the water that can guide corporates and start-ups in building symbiotic relationships that can accelerate the transition.

Brisil's green or Bio-Silica helps brands better service customer demands with lower carbon emissions

Let's sample some facts

Typical transitions that happen at a global scale – like adoption of fossil fuels over mechanical energy (1 AD to 1900 AD), even adoption of hydrocarbon over coal (1800s to 2000s) – happen over many decades, if not hundreds of years. That too when the new technology is more efficient and cost effective than the incumbent.

The current transition can afford no such luxury. For mitigation alone, India needs over $2 trillion in new investments in low carbon technologies to meet its NDC targets, with comparable investments in adaptation and resilience. Important to note is that such investments are required in technologies that aren't fully proven, in markets that are untested, and at costs that, in some cases, are today prohibitive.

This change has to be led by governments and large corporations who, to a cynic, are the antithesis of speed and innovation.

While speed and agility are often not in the DNA of large corporates, necessity is the mother of invention. A generation of entrepreneurs is taking up the challenge, but this is only a partial solution. Climate technologies, even once technically proven have historically had long commercialization cycles.

The role of large established companies in driving the green transition and the accelerating adoption and dispersion of the clean technologies is undeniable. This is especially important in the current context, where the primary customers are not the masses, but the corporates themselves.

The technologies that will drive the transition include capital equipment, new materials, production

system retrofits, hard infrastructure, and other products that impact business viability (think large scale electrolysers producing hydrogen or new materials like green silica making everyday products cleaner and healthier). Asset light digital ventures (apps like Uber), may deliver incremental climate benefit and software might eat the world… but it can't eat carbon).

As we look towards achieving the green transition and India's economic promise, the secret sauce may well lie in the symbiotic relationships between climate startups and corporations. Hence the need for corporations to embrace startups and deploy innovative models while retaining the scale of impact.

The managing director of a multinational's corporate venture capital practice recently explained that its investments are meant to dramatically accelerate the company's internal innovation cycles, noting "startups do in six months what can take us five years due to internal processes and approvals" and even the ones that do not become suitable acquisitions, "better help us service our customer demands."

As large industry looks to transition to a green economy and innovators think to build the technologies that can transform, there is a clear and present argument to be made for large corporations to adopt start-ups like never before. Corporates looking to leverage startups to strengthen business operations can accelerate the rate innovations become viable through:
Product Adoption or Distribution
Demonstration or Co-development
Investment

Product adoption or distribution
Corporates have the benefit of size, scale and well established supply and distribution channels. As consumer and business demand increasingly requires access to green products, adoption and distribution of green technologies can keep corporates aligned with customer and shareholder requirements.

EESL has been an early leader in evaluating and adopting climate technologies to be distributed through its various energy efficiency schemes. Startups have benefited from EESL partnership in areas including street lights and smart meters. Under its leadership the company is poised to launch a platform to screen and support distribution of a much wider selection of energy efficient technologies. One exciting feature of the platform is a partnership with SIDBI to facilitate lending for capital intensive purchases. In 2024, EESL will launch a new innovation challenge to source a first group of startups to include on the platform.

Laurus Lead Acid batteries made with Cancrie Carbon: improving the efficacy of batteries

Producers of consumer goods, have increased requirements to meet net-zero targets while maintaining product quality and safety. Chemicals can be particularly difficult to replace for greener alternatives, especially since brands often do not produce the chemicals used in their products and replacement often leads to long product redevelopment cycles and safety testing. Recognized by Loreal, Proctor & Gamble and Decathlon, Brisil is a startup that produces green or Bio-Silica. It leveraged early adoption by mid-sized companies to scale its sales to several global FMCGs, apparel and sporting goods brands. The true test of such innovation is to be able to seamlessly integrate into existing processes and products, helping brands better service customer demands with dramatically lower carbon emissions.

Access to corporate labs and/or a sandbox for Techno Commercial Validation
Part of the long commercialisation process for new low carbon technologies is the ability to demonstrate techno-commercial viability of first of a kind technologies. The benefit to corporates can include early access to cutting edge technologies that solve real business concerns, joint development of industry specific IP (competitive advantage over competition), investment preference and as technologies are proved, preferred market financing terms.

To capitalize on such opportunities, the Indian Oil Corporation runs an annual innovation challenge for identifying and supporting startups working towards a Net Zero future. In one such instance, IOCL has partnered with Greengine Environmental Technologies Private Limited, a Kanpur-based startup that captures carbon dioxide from industrial flue gases using their unique microalgae-based technology and converts it into biomaterials. Their first carbon capture plant is announced to come up at IOCL's Mathura refinery and is expected to go live by February 2024.

Such corporate associations lead to similar opportunities for the startup to partner with other industries. Greengine, for instance, is set to achieve its yearly target of minimum 1 million tonnes of CO2 in next three years. As part of its innovation drive, IOCL has expanded its pool of investment across multiple technology types like Hybrid energy (H2E power systems), Agri waste based fuel (Amol Carbons), Bio Inspired air purifier (GermSafe) and many others.

Other examples include Laurus, a leading battery manufacturer, and Cancrie, an early stage start up,

Brisil silica: global brands vouch for it

collaborating to show how new technologies developed by startups can dramatically improve product quality and the co-development processes for new material integration. Cancrie, a startup developing specialized and advanced carbons to dramatically improve the efficacy of batteries and energy storage devices – increasing storage capacity, charge duration and battery life – provided lab results and material samples to Laurus. Following commercial testing and validation, Laurus and the startup then worked together to optimize integration of Cancrie Carbons in a line of Laurus batteries that offers better margins to the manufacturer, a better product for customers and reduces corporate reliance on materials from sometimes unreliable global supply chains. Laurus has indicated interest in working with the startup to accelerate advanced batteries and co-develop other green materials for battery manufacturing.

Cancrie carbon Lead Acid battery

Investment

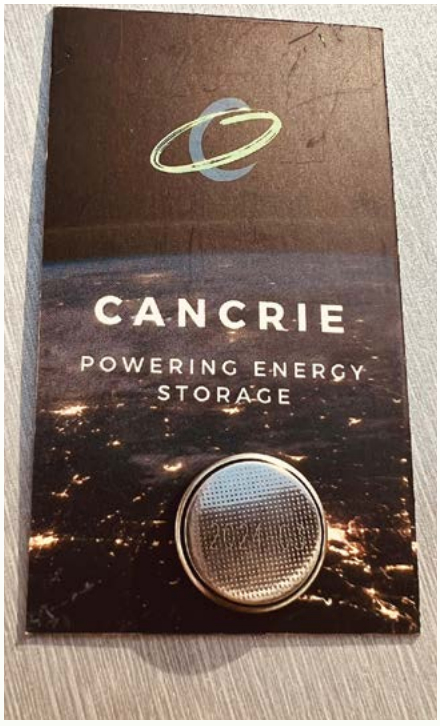
Companies in the US and Europe frequently invest – sometimes directly, sometimes through aligned specialist funds – in technologies that directly integrate into company operations or product offerings and other times in adjacent offerings to add to customer value proposition.

Companies including ABB, BP and Shell have established dedicated VC teams in India to invest in leading climate technologies, while companies like Bosch, Cummins, and Engie are early entrants evaluating India's climate startups.

A look at the investment portfolio of Shell alone shows the depth and breadth of technologies across innovation in storage (Aquion Energy), solar steam generators (Glasspoint Solar), data repositories (TIBCO), Utility analytics solutions (Sense Labs), Bio Plastics (Avantium) and many others. Such interplay across technologies not only allows for integration opportunities for the investor, but also provides significant access to scale to innovators.

Firms that invest through funds are able to benefit from the market insights of sector specialists. Such arrangements can be through a company specific portfolio in which the corporate retains investment approval or through participation in a fund to diversify risk, but with co-investment or follow-on investment rights.

Assessments put cumulative investment in nascent and new technology ventures by large energy companies across robotics, clean energy, alternative fuels and battery storage to



Li-ion cell made from Cancrie carbon

exceed $15 billion in 2021. The scale is expected to only increase, and create a need to act for others.

There are a lot of reasons corporates may fear working with startups – work with startups can be risky, early work may be more costly, startups work differently, and sometimes they just seem like they're from a different planet. Similarly, many startups fear corporate partners may steal IP, force unviable pricing or just be too slow.

These fears are not entirely unfounded but can be navigated. For corporates to achieve maximum benefit from working with or investing in startups, the ground work on strategy, governance, internal capabilities, resource allocation needs to be thought through carefully.

Wars have brought innovation and industry together in accelerated commercialisation of technologies like the radar and jet engines. Startups and corporates can leverage the climate emergency to accelerate and embrace innovation at warp speed. The climate change is a clarion call for the Goliaths to, for once, embrace the Davids, for the survival of the planet.

STARLENE SHARMA and
ANIRBAN MUKHERJEE OF BCG
(Views expressed are personal)

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Therefore, community empowerment and environment protection have been amongst our topmost priorities since inception. Over the years, we have invested more than ₹820 Crore in ESG and today, our holistic CSR programmes benefit over 8.5 Lakh people. We have created a forest cover of 875 Acres by planting over 20 Lakh trees and specific emissions from our mining operations are on a downward trajectory.

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Accelerating green finance

NABARD is poised to be a catalyst in the fight against climate change and effect climate resilience in rural India

SHAJI K.V.

India grapples with a pressing climate dichotomy – more than two-thirds of its districts will face substantial climate risks by 2030, imperilling over 30 per cent of the country's GDP, based on various estimates by India Climate Collaborative, Council on Energy, Environment and Water (CEEW), World Resources Institute (WRI) and the Boston Consulting Group. Simultaneously, for achieving India's Nationally Determined Contributions (NDCs), As outlined by the Climate Policy Institute, India requires an additional $100-150 billion in annual funding, hindering the scaling up of low carbon and climate positive interventions. Several efforts are in place; however, they are predominantly targeted towards the mitigation of greenhouse gases within sectors like power, industry, mobility and infrastructure. There is an urgent need to build the right bankable solutions to drive greater adaptation and resilience.

Rural India stands at the frontline of climate change, bearing the brunt of its adverse effects and missing out on critical financing support. India has to navigate financing hurdles within the agriculture and rural sectors, to provide for an inclusive and sustainable growth pathway and support the fulfilment of the country's NDCs. The current landscape therefore demands a paradigm shift towards green finance – an approach that structures the right financing mechanisms, supports bankability of key solutions, empowers last mile institutions to deploy this money and builds capabilities of rural communities, farmer producer organisations (FPOs), cooperatives and federations towards greater resilience.

At NABARD, India's foremost development finance institution, we acknowledge our pivotal role in addressing the structural challenges that exist. NABARD is the key institution engaged in financing and enabling the rural ecosystem – through its work with the rural financial institutions, self-help groups (SHGs), FPOs and governments. NABARD is further committed to unlock green financing, which advances inclusive environmental and social progress and is actively recalibrating strategies to propel climate-related solutions in rural areas. The opportunities for climate-resilient practices within agriculture and allied sectors are vast. From leveraging renewable energy sources to promoting water conservation and sustainable agricultural practices, forest conservation and restoration, agro-forestry, wetland restoration or dairy – each avenue presents a pathway towards a more resilient future.

Across the country, over many years, NABARD has spearheaded initiatives showcasing successful financing models that marry climate adaptation with economic viability. These models span from promoting community-based watershed management programmes for enabling environmentally-sustainable livelihoods to tribals and indigenous people to facilitating the adoption of climate-resilient crop varieties. As the Direct Access Entity/ National Implementing Entity for dedicated Climate Funds such as Green Climate Fund (GCF), Adaptation Fund and National Adaptation Fund for Climate Change, NABARD has already supported about 40 projects across India in diverse sectors. These endeavours have not only mitigated the impacts of climate change but also augmented the resilience of rural communities.

As India enters the transformative *amrit kaal,* NABARD is poised to be a catalyst in the fight against climate change. Our unwavering commitment to financing sustainable projects aligns with our aspiration to leave a profound legacy – a healthier, more prosperous and more sustainable India. By nurturing resilient rural communities today, we sow the seeds for a brighter and more equitable tomorrow. We have set ourselves up in these changing times, with a specialised Department of Climate Action and Sustainability. Looking ahead, our vision is resolute. NABARD aims to deepen its engagement by focussing on:

- providing for, the foundational ecosystem and enabling elements around green taxonomy, climate data availability, project information and impacts, etc;
- designing the right instruments, basis on our deep understanding of rural and agro sectors; and
- enabling mechanisms for the last mile financing system to absorb this financing via green literacy, capability build, carbon markets framework support, etc.

Each of our focus areas helps address on ground structural challenges.

Green taxonomy: We are looking forward to forging strategic alliances building-up on our positioning as a credible, efficient and robust financial intermediary. NABARD aims to plug the significant rural and adaptation financing gap, by engaging with critical players and expanding the foundational ecosystem. We have embarked upon a journey to create a first ever green taxonomy that is holistic, that covers both adaptation and mitigation elements, highlights green tagging

The author is chairman, NABARD

Our unwavering commitment to financing sustainable projects aligns with our aspiration to leave a profound legacy – a healthier, more prosperous and more sustainable India

opportunities in the agriculture and rural segments, etc. The green taxonomy of NABARD builds up from India's ongoing plan, globally relevant and recognised taxonomies across EU, ASEAN, etc, and also from a retail markets perspective covering CBI and ICMA.

Further, we are focussing on areas like greening the dairy and poultry value chains, climate smart approaches for crops including rice, wheat, cotton, sugarcane, etc, productive use of solar applications in combating food loss and waste, solar rooftops and cold chains, advancing electric mobility in rural and underserviced areas, to design the right kind of financing instruments that incorporate demand aggregation and market transformation approaches, extend capital to convert upfront capex into opex for farm beneficiaries exploring pre-financing of carbon credits for projects within the agro-forestry and ecosystem restoration spaces. We are additionally priming ourselves to support the implementation and roll-out of key government programmes like National Mission on Sustainable Agriculture, Soil Health, Food-basket transition to include millets, PM *kusum,* etc, to empower renewable solutions like solar pumps etc. for farm energy and water management, regenerative agricultural practices and solutions, etc. Additionally, we are closely engaging with the Ministry of Agriculture and Farmers' Welfare on national framework on voluntary carbon markets, to drive innovative financing across the board. Concurrently, we are also developing a scorecard to objectively measure the impact of these interventions and thereby ensure that the outcomes achieved are in sync with what was ideally desired.

Further, we are looking at strategic collaborations with diverse stakeholders, including government bodies, NGOs, and private entities, to amplify our collective impact and build capabilities in creating a climate-resilient rural India. As our first step in this regard, we are looking at rolling out a climate data warehouse that helps bringing multiple data stacks of impact, solutions, technologies, commercial viability, bankability and financing structures, climate finance possibilities and other aspects. This builds upon our DiCRA (Data in Climate Resilient Agriculture) initiative, partnering with United Nations Development Programme (UNDP) to democratise climate risk data and information, providing open and ready access of critical geospatial data to rural communities. This will further flow into and be the basis of a planned green literacy roll-out that we intend to offer and augment the last mile financing system including Regional Rural Banks, Co-operative banks, NBFCs and so on.

In conclusion, NABARD stands firm in its mission to accelerate green finance and drive climate resilience in rural India. Together, we can forge a path towards a future where sustainability and prosperity intertwine, ensuring a legacy of abundance and resilience for generations to come. Yes, we in NABARD, have always dared to dream, backed by the fervent desire to deliver. As NABARD embraces its revamped climate-oriented strategy, we invite all to partner with us, and build climate resilience for our rural community from the frontlines and contribute to nation-building, while also moving that bit closer to ushering rural prosperity. ◆

The SIDBI way

Empowering SMEs for a sustainable future is the imperative of climate-smart interventions

SIVASUBRAMANIAN RAMANN

SUDATTA MANDAL

Small & Medium Enterprises (SMEs) in India stand as pivotal actors in the nation's trajectory towards a low-carbon economy. The sector constitutes over 40 per cent of the country's industrial output and a significant share of GDP. These agile enterprises are also instrumental in fostering innovation, and growth in manufacturing capabilities, accounting for nearly 60 per cent of industrial energy consumption in India. With about 30 per cent of India's total CO_2 emissions attributed to industries and SMEs being an integral part of the value chain – their role in adopting energy efficient technologies, embracing renewable energy solutions and implementing eco-friendly practices become paramount. Their adaptability and potential for scalable adoption of green technologies position SMEs as key players in steering India's transition towards a more sustainable and economically conscious landscape.

Despite their integral role, SMEs encounter significant hurdles in accessing climate finance and embracing low carbon approaches. Higher cost of borrowing, tighter cash flows, limited collateral options, restricted access to capital and often longer payback period on capex for green transition stand as primary challenges. Last mile financing institutions and NBFCs are therefore hesitant to extend credit, due to lack of awareness, perceived higher risks and performance concerns associated with green investments. Often project developers struggle to navigate complex application processes for climate finance, compounded by a dearth of specialised support and guidance. Addressing these challenges and enabling SMEs to lead India's low carbon transitions – calls out for targeted financial instruments, capacity building initiatives, simplified credit access procedures and tailored technical assistance.

Numerous success stories and lighthouse exemplars have emerged, when strategic financial structuring and a loan ++ approach has propelled SMEs towards sustainable practices. SIDBI's initiatives stand as a testament – our provision of financial aid, technical expertise, and guidance has empowered SMEs to navigate and implement sustainable initiatives effectively. We have been fortunate to be able to work extensively with the ecosystem, government, multilateral bodies and other key stakeholders to go out there, in a bold and disruptive manner, to experiment and test out newer innovative mechanisms. SIDBI has been a first-mover enabling climate finance in India, pioneering energy efficiency initiatives with innovative financing instruments like partial risk sharing facilities with the likes of World Bank, GEF, etc. SIDBI's Partial Risk Sharing Facility (PRSF) has effectively mitigated apprehensions regarding higher risks associated with green lending, while the provision of credit enhancement mechanism has bolstered last mile lenders' confidence and unlocked access to affordable finance. Since 2020, we have focussed on a broader climate mandate having established a $400 million plus green loan portfolio with innovative products across solar rooftops, EVs, solid waste management, circularity, CBG, etc.

'Green banking' model: Looking ahead, SIDBI envisions a future, where SMEs stand at the vanguard of sustainability. Our commitment involves reinforcing support mechanisms, augmenting capacity building programs, and fostering partnerships to bolster SMEs' journey towards sustainability. We are looking forward to taking this commitment ahead, and tackling current day challenges, by both looking inward and externally. Our strategic pivot towards a 'green banking' model signifies a crucial shift towards intentionally prioritising green and climate-friendly investments. As a result, we are looking at a strategy hinged on four key pillars – green resource mobilisation, deployment of innovative green products and schemes, internal green transformation and, lastly, enabling a broader market ecosystem.

As India's principal financing institution, with our core goal towards enhancing credit availability to the underserved MSME segment, we are looking forward to working with our ecosystem partners and leverage our learnings, explore and test out innovative financing options that address key and inherent structural challenges as follows (but not limited to):

Enhancing bankability: Where upfront capital expenses are a huge hindrance for MSMEs to adopt green technologies, energy-as-a-service or ESCO model comes across as a proven solution across sectors and priority areas. In fact, the current ESCO market is just about 10 per cent of an estimated ₹1.5 lakh crore energy efficiency segment in the country, having enough room for growth and expansion;

Loan ++ approach: SIDBI typically bundles energy audits and other technical assistance programs, to further underscore market opportunities within specific SME clusters and technology types. We are exploring early-stage solutions to

Ramann is chairman & managing director; Mandal is deputy managing director, SIDBI

purpose-bound value added credit via e-rupee or other advanced digital solutions, besides exploring opex model of financing in addition to the standard capex models;

Investment playbooks for new-tech solutions: As a key development financing institution, we are looking forward to going bold on newer solutions like CBG or Green Hydrogen, where financing or investment precedence is yet to be established;

Risk management: SIDBI has been the leading DFI in the region, when it comes to deploying guarantee products and solutions, in fact operating one of the largest guarantee programmes in the form of the ~₹3 lakh crore Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTSME). Besides, SIDBI is also working towards greening the Indian financial system by including impact of climate change in its credit risk assessment process.

Preferred financial intermediary: SIDBI's accreditation with the Green Climate Fund, allows it to be the nodal institution, to aggregate green financing pipelines and projects, enable smaller businesses and regional, sub-national financing institutions to access international climate finance, in a streamlined manner;

Blended finance: Partnering with catalytic philanthropic institutions enable us to design and roll out products with reduced cost of borrowing for partially viable projects, multi-level risk sharing/ guarantee models, flexible repayment periods or extended moratorium for projects with high gestation periods, cashflow based financing, or pre-financing via carbon credits to enhance cashflows.

We are looking at a strategy hinged on four key pillars – green resource mobilisation, deployment of innovative green products and schemes, internal green transformation and, lastly, enabling a broader market ecosystem

In conclusion, the imperative of integrating climate-smart interventions within SMEs cannot be overstated. By empowering SMEs to adopt sustainable practices, we can carve a path towards sustainable future, where these enterprises thrive as engines of economic growth and become an integral part of global value chains, while simultaneously championing environmental responsibility. SIDBI remains resolute in its dedication to nurturing and empowering SMEs, heralding a paradigm shift towards a more sustainable and prosperous future. In line with the key unlocks, we believe that structuring the right financing solutions and commercial models can help significantly enhance action on ground. Accordingly, we look forward to engaging with the ecosystem, partnering with key stakeholders and leveraging our learnings so far. ◆

Strong and secure

Coal remains the unsung hero among the diversified energy sources

P.M. PRASAD

Called a major polluter, it is coal that steps in to shoulder the requirement burden when the energy becomes scarce. It is affordable, available in abundance, quick to extract and easy to transport.

Assurance of energy at affordable price is a key driver for economic growth of any nation. In India, coal fulfils this goal responsibly, sitting at the top of the energy pyramid. The world over, coal generates about 37 per cent of the electricity while, in India, it is almost twice of that at 70 per cent.

Primarily, the argument against coal is that it pollutes nature. Environment safeguard and ecological stability, without a shred of doubt, are two important climate measures. However, energy security of the nation is equally important. India's green energy transition through renewable energy (RE) sources has already begun. But this shift is not yet at the pace or quantity that can replace coal's pivotal role. RE cannot substitute coal's role, for now at least. Till that happens, which may be two decades or more down the road, coal remains as strong as ever in India.

To give a perspective, though India's electricity generation from RE grew by 15.7 billion units (BU) to 139.76 BU till October of current financial year, on a year-on-year comparison, this represented only 13.4 per cent of the country's total generation of 1,045.85 BU. It was also 5.2 times lower than the coal-based generation of 732.09 BU. Effectively, RE has a long way to travel before it can catch up with and overtake coal, though it is bound to happen at some point of time in future.

The 2023 UN Climate Change Conference, the 28th meeting of Conference of Parties (CoP 28), is currently underway in Dubai. One of the important considerations of the meeting is fast-tracking energy transition and slashing emissions before 2030.

On this front, India's 'nationally determined contribution' (NDC) commitments underline reducing emissions intensity of GDP by 45 per cent by 2030, from the 2005 level and achieving 50 per cent of the cumulative electric power installed capacity through non-fossil fuel sources. To realise this, either coal's usage has to step down drastically or coal mining has to done in a manner that lowers the emission-intensity. It is amply clear that the former is not feasible.

Though Coal India Limited (CIL) is a fossil fuel producer, aligning with national commitments, the company is bound to the Net Zero aspirations. Spearheading India's coal sector, CIL accounts for about 82 per cent of the entire coal produced in the country. With more than 80 per cent of CIL's total supplies fuelling coal-fired plants, the company virtually empowers the power sector. Having produced 703 million tonnes (mt) of coal in 2022-23, breaching the 700 mt mark for the first time, CIL is on its way to catch up with the current financial year's target of 780 mt.

To reduce carbon emission intensity in coal mining areas CIL is accelerating eco-friendly mechanised coal transportation through 61 first mile connectivity projects that reduces load on road movement of coal and, as a result, dust pollution. Pilot studies conducted through NEERI in two large OC mines on benefits of this initiative reflected encouraging results in savings on diesel costs and significant reduction in gaseous emissions and particulate matter. CIL is also betting big on renewable energy and has rolled out plans to set up 3,000 MW capacity solar power by 2026-27. The company is also increasing OC production through surface miners which entail blast free selective mining with minimal impact on the environment. Till October 2023-24, production through surface miners was 221.3 mt – about 58.4 per cent of the entire OC output of the period. This is 28.5 mt (15 per cent) higher than the corresponding period of the previous fiscal. Plans are in motion to further increase the surface miners' fleet. Crushers already operational to help reduce the movement of dumpers, minimising diesel exhaust and lessening air pollution.

CIL's energy efficiency measures, introduced in 2020-21 through the use of LED electrical equipment, has resulted in Co2 emission reduction of 90,235 tonnes till October 2023. CIL's plants have exceeded the targets much ahead of the fiscal's closure in October itself for two consecutive years.

CIL also has drawn aspirational plans to ramp up eco and society friendly underground production to 100 mt by 2029-30 from 25.5 mt when the energy becomes scarce, as of 2022-23. UG mining avoids acquiring large tracts of land and resultant R&R issues. India has huge untapped potential for UG mining with extractable reserves beyond 300 metres depth and 70 per cent of the reserves are amenable for mining through this method.

As coal's journey is not going to end anytime soon CIL remains strong and secure with increased mechanisation, improved eco-friendly mining methods, modernized mining fleet, robust financial base, talented pool of multi-disciplinary professionals, skilled manpower, and decades of core experience. ◆

The author is chairman, Coal India Limited

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We aim to support small holder farmers to develop sustainable practices that conserve water, optimize resource utilization, and enhance agricultural productivity specifically in the geographies of Hardoi and Lakhimpur Kheri in Uttar Pradesh, Kota in Rajasthan, and Bharuch in Gujarat.

Together, let us build a world where agriculture and water coexist harmoniously, supporting thriving ecosystems, nourishing communities, and fostering sustainable development. Discover the power of collective action with DCM Shriram Foundation.

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Moving the needle

Specialised climate finance is what is needed to get climate innovations to the market

The India Climate Finance Report by the Climate Capital Network (CCN) is an annual landscaping of the opportunities and white spaces in Climate Finance in India, specifically focussed on the most critical trends and insights in climate finance in India, gathered through surveys, interviews, and in-depth articles from members of the Climate Capital Network.

The Climate Capital Network, India's first network of capital allocators across capital instruments (grant, equity, debt), has been created for capital allocators across the climate ecosystem in India to connect, exchange ideas, discover areas of mandate alignment, share pipeline, and build the continuum of capital.

The focus of the 2023 report, 'The Age of Adoption', is on what it will take to accelerate the adoption of critical climate technologies in India, and the vital role played by climate finance in this process. Released in the last week of November 2023, the report is summarised below, to highlight some of the key insights.

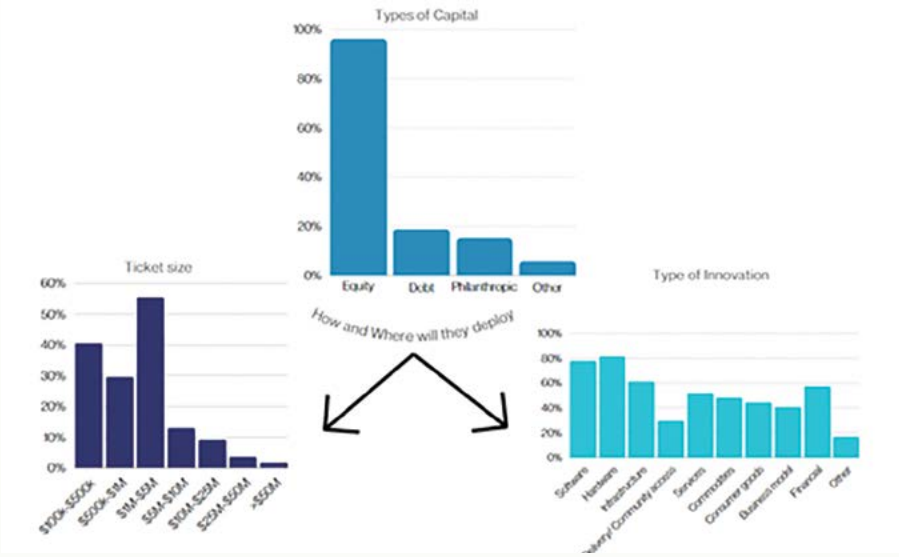
From the age of innovation to the age of adoption

There are many ways to describe what must happen – mainstreaming, institutionalisation, normalisation of innovation, scaling and, of course, adoption. As we hurtle towards 2030 and experience all varieties of climate impact and volatility, one thing is crystal clear to everyone – we must move from 'the age of innovation' to 'the age of adoption'. While many disparate pieces need to be aligned, climate finance and the capital allocators can play a particularly pivotal role in facilitating this adoption – through the capital deployed, as well as the capital instruments deployed to make this capital accessible, available, and affordable.

Where and how funding will flow in 2024

The year 2022 was a clear indicator

that climate was a rising focal point for investors in India, with one-third of all equity impact deals involved a climate-tech start-up, while one-fifth of the entire impact capital invested was in climate. This year it was found that 47 per cent of investors identify climate as an important and existing part of their funding mandate, as against 33 per cent last year. Climate is presenting front and centre of investor mandates. However, equity capital continues to dominate the climate finance stack at 94 per cent of those surveyed. Debt at 18 per cent and philanthropic investors at 14 per cent remain a comparatively small constituent. The need for more sources of non-dilutive funding is loud and clear. *(see chart)*



The majority of funders – irrespective of debt, equity, or philanthropy – are concentrated around the Pre-Seed to Series A stage of funding. While there is a gradual move towards bigger check sizes within this early stage, there still is a dearth of funding for Series A/B onwards. In other words, no significant shifts from last year, and still a clear continuum of capital gap.

This year it was found that 47 per cent of investors identify climate as an important and existing part of their funding mandate, as against 33 per cent last year

What gets and doesn't get funded

Hardware-based, infrastructure and commodities-based innovations are experiencing a jump in investor interest. Similarly, the heavy industry sectors of metal and mining, point-of-source capture, alternate industrial materials, and waste management have seen a significant uptake in investor interest. These are reflective of several market factors – the maturation of domestic manufacturing capabilities, geopolitical instabilities, and a need to be resource self-sufficient, India emerging as the manufacturing base of choice for many countries, a maturing deep-tech ecosystem, and evolving business models that enable organisational scale. At the same time, funders identified a few common areas/sub sectors with increasing investor interest, but an inflection point still has to be reached.

A repeated theme with the underfunded sectors is the fact they are generally IP-led, asset-heavy technologies, and often creating/integrating with core infrastructure. Integral to these businesses are plant and equipment, machinery, hardware, infrastructure and capex. Their growth trajectories, timelines, funding needs, and return profiles are quite distinct from software-led business models, and the opportunity will be unlocked when more funders have the ability to unpack the business models, levers for growth, build new risk-reward frameworks, and align funding.

Capital instruments/innovations needed. Conversations with funders highlighted several interesting and emerging approaches, currently being deployed in other markets or geographies, but all relevant to India.

Public capital

Green debt swaps/debt-for-nature swaps enable developing countries with high levels of debt to reprioritise investments in climate and significantly cut countries' debt in exchange for commitments towards climate action.

Match funding facility – as a collaborative public-private funding instrument de-risks investment in nascent technologies; these are not only attractive to start-ups, which gain multiple types of investors but also to funding parties by diversifying the risks.

Private equity/venture capital

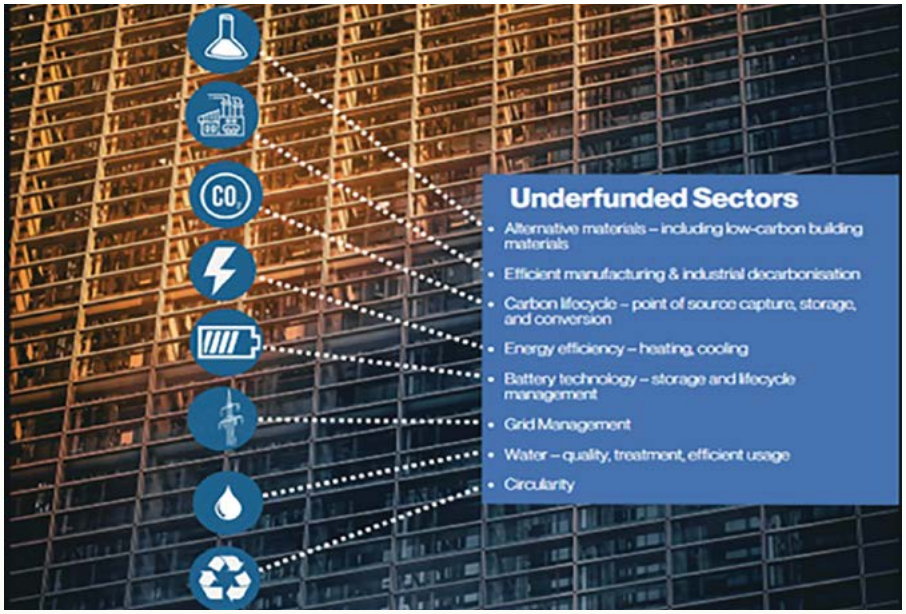
SAFER Notes enable investors to buy equity and startups to have the option to repurchase a part of that equity based on a percentage of future revenues; investors are able to access early-stage companies, get compensated for taking larger risks, participate in the upside while having clear exit opportunities.

Distressed venture capital acquires a majority stake and takes startups out of the venture lane into a private equity path. While restructuring and cost-cutting remain the focus, they still aim for growth and profitability at a steady scale.

Private debt capital

Servitisation, which enabled widespread adaptation of solar, is now being adopted across various climate sub-sectors with high set-up costs and performance risks amongst others, including the cooling sector. Royalty-linked financing, employed widely in other industries like music and mining, is becoming a common instrument for the climate sector and can offer significant opportunities to support the longer gestation periods and development cycles of deep tech innovations.

Project-based debt – Pooling and securitisation are well-accepted tools



in mainstream finance that can have contextual and positive applications for climate tech.

Philanthropic & catalytic capital: First-of-a-Kind (FoaK) Funding – Philanthropic funding for first-of-a-kind funding innovations and products is untapped at this point but offers tremendous potential.

Repayable/recoverable grants: These grants are ideal for climate tech start-ups with unforeseen expenses or to build up their manufacturing capacity in the early days. The structuring and regulations for this form of financing remain to be developed though.

Milestone-based grants: Offering grant investments in a milestone-based structure can be beneficial to start-ups as they graduate through various stages of growth.

Risk backstop. Philanthropic support in the form of a risk backstop can provide a safety net, as startups begin or advance their nascent innovations that typically cannot be supported by other capital providers.

It is clear that climate innovation will need a variety of 'different dollars' to scale and thrive. Several of the solutions described straddle different capital instruments and pools of funding, requiring funders to have a more creative and constructive approach to climate finance.

The role of blended finance and philanthropy: Some of the more commonly called out use cases of catalytic funding for later-stage innovations are: access to low-rate wholesale financing, with guarantee mechanisms/backing from philanthropy; technical assistance and handholding, supported by philanthropic funding; and high-risk, philanthropic funding to support climate innovations progressing through the TRLs. Blended Finance in particular, has emerged as potentially powerful instrument for climate innovation funding, with two clear use cases emerging.

Commercialisation and technology adoption: Providing different types of capital to narrow the Valley of Death for startups, including hardware risk underwriting, commercialisation and achieving product market fit, providing a risk absorption layer and financing for longer gestation tech development and GTM iterations.

Catalysing impact: Filling the funding gap where the monetary value to impact has yet not been assigned or is currently accounted as cost. An example would be Viability Gap Funding (VGF) for trash collected and provided to industrial plants, or mobilising finance towards smallholder farms in India and other developing regions.

At the same time, some funders recommended important course corrections in how Blended Finance is deployed. There was an expressed need to direct equal amounts of funding to 'risky and hard technologies' or 'innovations not projects'.

There were also some concerns about the likelihood of success of this model, given the fact that funding organisations and capital instruments generally work independently and in silos. There are significant complexities and nuances in aligning multiple instruments (and organisations) in a cohesive manner, but blended finance remains a powerful tool of innovation support.

Key levers beyond finance

Beyond finance, the key to taking climate innovations to market lies in synergies with two major stakeholders: the government and corporates.

Government supports in the form of policy pushes such as mandates and standards, emission reduction targets, subsidies, tax incentives, etc. to incentivise stakeholders like the general public, and corporates to adopt new innovations faster. Beyond policy, government support could include establishing R&D facilities, growing a talent pool and providing access to low-cost capital by mandating banks to issue low-interest loans in the sector.

Corporates can play a multitude of roles in engaging climate innovations, including providing them with paid pilot opportunities, corporate sandboxes for techno-commercial testing, decarbonising their own processes and supply chains through startups, providing strategic corporate capital without additional obligations, and partnering with IP-led solutions to give them distribution heft. If developed thoughtfully, these Industry-Innovation partnerships have tremendous power to move the needle.

In short, there are large gaping holes in the climate capital stack, but also several fit-for-purpose financial innovations possible. Many of these climate finance innovations straddle multiple stakeholders and capital instruments, often combining grant, equity, and debt; ultimately specialised climate finance is what is needed to get climate innovations to the market. ◆

MAYA CHANDRASEKARAN and MAANYA RAO

Giving back to the planet

Sustainability in agriculture means while we produce more, we restore even more

RACHNA PANDA

The prevailing geopolitical tensions around the world underline the importance of food security. Food and nutritional security are especially important for developing countries like India that are working towards their socio-economic development goals. On the one hand, agriculture must meet the increasing food requirements of a steadily growing population and on the other hand, climate change and unabated consumption of natural resources are adversely impacting both agriculture and farmers. There is a need to make agricultural practices more sustainable and resilient to improve farmer livelihoods. The need of the hour is to give more than we take; to produce more, but also restore more.

Regenerative agriculture: A paradigm shift: Regenerative agriculture can help India address the challenges of land degradation, water scarcity, climate change, and food security. By integrating regenerative approaches like Direct-Seeded Rice (DSR) and Smart Corn Systems, we can transform the global agricultural system amid the challenges of climate change and food security. DSR is a modern alternative to traditional methods with an opportunity to reduce water usage by up to 40 per cent, lessen farmers' dependence on scarce manual labour by up to 50 per cent, and slash greenhouse gas emissions by up to 45 per cent.

The Smart Corn System harnesses the benefits of Short Stature Corn (SSC). SSC hybrids, which grow 30-40 per cent shorter than conventional corn provide several potential sustainable benefits for battling extreme weather, including the ability to grow more from the same land area, minimising land use, and allowing more precise application of crop protection products.

Building a gender-smart ecosystem: While regenerative agriculture benefits both farmers and the planet, sustainability in agriculture must go beyond and provide an equitable playing field for women. Gender-smart, inclusive farming practices can have a huge positive impact on the livelihood, empowerment, and health of women engaged in agriculture. This is hugely significant because women account for almost half of all smallholder farmers. As India transitions to agriculture 4.0, we can help more women become a part of this transformation by adopting inclusive, gender-smart solutions. Towards this end, Better Life Farming (BLF) – a global, multi-stakeholder alliance – is partnering with organisations and entrepreneurs across the agri-value chain to provide flexible, accessible, and equitable solutions for farmers.

At the core of the program are Better Life Farming centres, which serve as a one-stop shop for farm inputs and crop advisories as well as knowledge and training on sustainable farming practices, social impact monitoring, finance and literacy solutions, and market linkages. On an average, a single BLF centre can serve 500 farmers from its nearby villages. By encouraging women in rural areas to turn agri-entrepreneurs and run these centres we can not only ensure their financial security but also empower them to transform the lives of smallholders. Owing to the female representation at these centres, the BLF programme has succeeded in securing the participation of more women farmers.

The role of supply chains: An important part of developing modern food value chains is to strengthen their capacity and improve their sustainability. Agricultural products and services are linked to emissions, both before and after an organisation's activities, and throughout the supply chain.

The supply chain starts with seeds. What if we could make them more resilient? What if we could digitalise agriculture to help farmers reimagine the way our food system works? The use of sustainable, data-driven solutions for optimal utilisation of resources is on the rise in agriculture. Automation is reconfiguring the entire food system. As supply chains expand to meet the growing demand for food, it is essential to restore sustainability to the supply chain at every step, from farm to household.

Addressing nutritional security: Sustainability encompasses many different but closely interlinked aspects – it isn't only about the environment or about natural resources; it is equally about people. A sustainable agricultural system should ensure food security and nutrition for all.

Through intervention, education and advocacy, we can begin to reverse the cycle of malnutrition among the underserved communities. When individuals understand the role of vitamins and minerals in a healthy diet, as well as the risk of deficiencies, they are empowered to transform their family's (as well as their own) health.

Sustainable development truly has meaning when it is inclusive and equitable. And it can only be so when we give back to the planet and the people at least as much as we take. ◆

The author is VP & Country Group Head - Sustainability, Bayer South Asia

The journey is a long one...

... but green hydrogen is a major milestone in the right direction

BRAGADESH DAMODARAN

Today, the world is pressed with a dilemma – to constantly meet the growing energy demand while minimising the climate impact. This calls for a global effort of transitioning to a clean, sustainable and low-carbon energy system. Businesses across industries as well as major stakeholders have started recognising green hydrogen as a potential new fuel that can replace oil and gas.

Green hydrogen is believed to be the fuel of the future but how does one start today and turn this belief into a reality tomorrow? It begins with a supply chain leading to an efficient and economically-sustainable ecosystem. And to build a resilient and reliable supply chain, challenges of production, deterioration, durability, density, and electrical power capacity must be overcome.

A sustainable energy carrier: Green hydrogen is certainly more efficient and sustainable than other fuel sources available today. However, its adoption and scalability depend on significant infrastructure investment, including digital and advanced engineering capabilities. In India, the public and private sectors have started taking steps to assess, maintain, and maximize the said efficiency. State-owned National Thermal Power Corporation and Gas Authority of India have announced various infrastructure-related projects contributing to the supply chain and ecosystem of green hydrogen. Private organisations in the energy space too have pledged to ramp up their efforts of green hydrogen production. Reliance Industries has laid a roadmap to reduce the cost of the fuel to $1 per kg in the country.

Technology companies will also play a strategic and crucial role in optimising the green/low-carbon hydrogen supply chain. Innovative ideas and best practices discovered by others must be comprehensively applied to strengthen the resilience and dependability of the hydrogen value chain.

Addressing the engineering challenges – plant design, fuel storage, transportation and distribution, development of smart grid and low-cost and sustainable fuel cells – is a precursor to large-scale commercialisation and deployment of green hydrogen. Digital engineering can help solve these problems.

Innovation enabling transition: The development of green hydrogen and its supply chains banks on how well technology will be leveraged and incorporated in the existing processes. When it comes to production, innovations in electrolysis technology will expedite the use of renewable energy sources (solar, wind, and hydro), improve efficiency and reduce costs. Advanced catalysts lowering the required energy-input, large-scale projects making hydrogen economically viable and integrated value chains will greatly aid the production of green hydrogen. Digitalisation using the digital twin technology and software automation can help optimise the operation of electrolysis systems and shrink maintenance costs.

Mass production of green hydrogen mandates rapid scaling of electrolyser manufacturing. Artificial intelligence (AI) algorithms and data intelligence can optimise the complex production process by predicting and controlling parameters. This will also increase efficiency, safety and quality, while reducing capital expenditure and accelerating the time to market. AI-enabled power and process simulation also provide insights for decision-making around investment, source of renewable energy, plant capacity and carbon footprint.

The journey to net zero: The future of green hydrogen holds significant promise for the global transition to a low-carbon economy. It will allow decarbonisation of major industries that have often been challenging to electrify directly and depend on the use of fossil fuels, including heavy industry, aviation, shipping, petrochemicals and certain forms of transportation. With the use of hydrogen combustion engines and hydrogen fuel vehicles, sustainable mobility can also be achieved.

Technology and innovation alone cannot enable the commercialisation of green hydrogen. Policy support and incentives such as financial aid, regulatory frameworks and targets for renewable hydrogen production are a requisite for stimulating investments and market growth. With the aim to become energy-independent by 2047 and hit its net-zero goal by 2070, the government has been encouraging the production of green hydrogen. And to make it a nationwide practice, it has announced the National Green Hydrogen Mission to produce 5 million tonnes of the sustainable fuel annually and make the country a global green hydrogen hub.

As part of their corporate commitment to sustainability, many organisations have been working on decarbonising their operations. Green hydrogen is a key element in their sustainability strategies, thus increasing the demand for the fuel and boosting investments in relevant projects. The journey to the net-zero destination is a long one but green hydrogen is a major milestone in the right direction. ◆

The author is vice-president & industry platform leader for energy transition & utilities, India, Capgemini

Business India CLIMATE CHANGE SPECIAL

Let us not lose sight

Our objective is not merely to recycle plastic waste, but to redefine our relationship with this material

APOORVSHREE CHATURVEDI

Waste generation in India continues to grow at a rapid rate primarily due to urbanisation. India's cities are witnessing a steady rise in population and as a result, also in waste generation. According to a report by TER I (The Energy and Resources Institute), India generates over 62 million tonnes of waste annually; 43 million tonnes gets collected, and only 12 million tonnes gets treated. The remaining 31 million tonnes is dumped.

According to projections, Municipal Solid Waste(MSW) is slated to reach 165 million tonnes by 2030. However, waste collection remains mired in a quagmire with cities lacking adequate garbage collection infrastructure. Due to a lack of source segregation practices, organic and recyclables (plastic, paper, metal) are mixed in MSW and only 30 per cent of collected waste is sorted correctly. If this practice goes unabated, by 2047, our country will need 3,40,000 cubic meters of landfill space every day (1,240 hectares per year).

The ground reality: Waste collection and recycling in India face formidable challenges, on one hand, it is marked by the stark reality of poor or absent waste collection infrastructure in many parts of the country, and on the other hand, 72-78 per cent of the municipal solid waste generated is indiscriminately dumped or subjected to unregulated disposal. One of the critical shortcomings lies in the absence of a widespread practice of sorting at source due to which a significant portion of the recyclable waste ends up in ill-equipped landfills, causing environmental degradation and health hazards.

It is critical to recognize that it is not the process of recycling that presents the most significant hurdle in addressing plastic pollution. Rather, it is the efficient and holistic collection and management of plastic waste that emerges as the cornerstone of our battle.

Harnessing technology for a viable ecosystem: In a country like India, in the absence of the practice of source segregation as a habit and culture, the segregation of plastic waste at the destination is the only path forward. The present way of using waste workers and the use of informal sectors for segregation will certainly fall short of our endeavor to eliminate plastic waste from the environment.

Technology can play a pivotal role in optimizing recycling by integrating volumetric and weight-based sorting with optical differentiators, artificial intelligence, and the use of robotics to enhance waste recycling efficiency by automating precise material categorization based on size, weight, and visual characteristics. AI algorithms control robotic arms, optimizing the process, and adapting to diverse waste items through Machine Learning to facilitate this advanced sorting.

A sustainable and accountable waste management system reduces contamination, improves recycled material quality, establishes a traceable supply chain, and most importantly, helps extract the maximum value out of waste, which today is one of the biggest challenges.

In a country like India, in the absence of the practice of source segregation as a habit and culture, the segregation of plastic waste at the destination is the only path forward

Sustainability in packaging: The flexible packaging industry has been at the forefront of innovation, creating not just increasingly sustainable materials, but also researching effective mechanisms for recycling various plastic and plastic-based materials like multi-layered plastics and aseptic liquid packaging.

Over the last three decades, UFlex has dedicated substantial investments to industrial and MLP recycling facilities worldwide and was credited as the first company in the world to be recognised by the 'Davos Recycling Forum' in 1995, for recycling mixed plastic waste.

The country consumes approximately 2,00,000 MT of flexible packaging material a month. To recycle these quantities, we would need at least 2,000 to 2,500 mechanical recycling plants. Though, not difficult to achieve a policy to encourage entrepreneurs to set up recycling facilities will go a long way in managing waste.

Building the future: A collective endeavour: As we navigate the complexities of plastic waste recycling, let us not lose sight of the overarching goal. Our objective is not merely to recycle plastic waste, but to redefine our relationship with this material. By acknowledging its inherent value while mitigating its negative impacts, we can pave the way for a circular economy that fosters both sustainability and innovation.

As we stand at the precipice of transformation, let us wield the power of collective action to reshape our trajectory. ◆

The author is Director – Global Operations, UFlex Group

Greening of the grid

Thanks to the rapid growth of renewables in power generation, a majority of the new power generation coming on to the grid is from wind and solar sources

SHARAN BANSAL

Electricity grids are often called the world's largest machines – spreading over thousands of kilometres, working in perfect synchronisation to deliver power. However, contrary to conventional machines, these machines actually help kill carbon. Globally, electricity makes up just about 20 per cent of the total energy consumption and more than 60 per cent of the electricity is still generated by burning some form of fossil fuels. However, thanks to the rapid growth of renewables in power generation, we are seeing a welcome trend of 'greening of the grid' where a majority of the new power generation coming on to the grid is coming from wind and solar sources. If the world is truly serious about reducing carbon footprint then electricity needs to become 4x of the present installed capacity by 2050 and this power has to be delivered efficiently to every corner of the world. India has a unique advantage in this regard because our per capita electricity consumption of 800 is still very low compared to developed countries' per capita consumption of 9,000 w. Hence, all we have to do is add majority of the new generating capacity through renewables but for developed countries, adopting renewables means that they actually have to decommission a lot of existing fossil fuel based capacity.

Renewable power, which is typically generated far away from the demand centres need longer transmission lines and greater grid investments. Central Electric Authority (CEA), India, has drawn up an ambitious plan of investment of ₹2.4 lakh crore into the Indian Transmission sector to integrate 500 GW of renewable power into the grid by 2030. Even today, there are a lot of clean renewable power plants awaiting connection into the grid and several others, which are waiting in the pipeline for clarity on power evacuation. This trend is visible not just in India but globally as well. However, investments into the grid still continue to be lag behind requirement.

At Skipper, we are taking several initiatives to help speed up this process of grid construction globally. With presence in over 65 countries, Skipper is one of the world's largest makers of power T&D structures. The company designs and manufactures T&D structures those are not only robust but also adaptable to diverse terrains. One of the major ways how we are helping global transmission utilities and large EPCs build transmission lines faster is by reducing the cost and faster availability of the towers and poles. We achieve this through our strong backward integration and large economies of scale, making us one of the low-cost producers for T&D structures globally. Our large production capacity has the capability to produce as per any global standard and material grades. Our in-house engineering, load testing and R&D centre help us design and test new innovative engineering solutions such as Narrow-based towers and Monopoles. These products help reduce the ground footprint in areas with right of way constraints and even reduce the requirement of trees to be cut when the transmission line is passing through a forest area, all very effective solutions to obtain faster regulatory approvals and even speed up construction.

Offshoring and 'Friendshoring': Our active participation in several cross-border transmission line projects has helped supply clean renewable power generated in India to our neighbouring countries, such as Nepal and Bangladesh. We are committed to the Prime Minister's vision of global integration of power grids around the world to achieve the goal of 'One Sun One World One Grid' where we will see actual 'Offshoring' and 'Friendshoring' of electricity. As the COP 28 identifies the solutions for limiting global temperature rise to 1.5 degrees, and ultimately achieve the delivery of the Paris Agreement goals, we strongly stand by our country's long-term goal of reaching net-zero by 2070.

To kick-start our own internal journey towards renewable energy adoption, Skipper is proud to announce the installation of 1.50 MW rooftop solar panels across three of our plants located in Howrah, West Bengal. This ambitious initiative is expected to generate clean energy, while reducing the carbon footprint induced by our operations. By harnessing the power of the sun, we are not only reducing our reliance on traditional energy sources but also setting an example for other industries to follow. We have also implemented a water conservation initiative by utilising Reverse Osmosis (RO) water from Sewage Treatment Plant (STP) treated water. This initiative supports our galvanised iron (GI) operations. This innovative water conservation approach not only minimises our water consumption but also reduces the energy required for water treatment.

At Skipper, we understand that sustainability is a continuous journey that requires collaborative effort from all stakeholders. Our vision for Skipper's future is to emerge as the largest and most reliable manufacturer for T&D structures globally, helping our customers deliver large transmission projects with reduced cost, faster execution and with the lowest possible environment footprint. We aim to play our part in making India the preferred sourcing hub for all global infrastructure requirements.`

The author is director, Skipper Limited

Making India carbon neutral

Carbon markets are catalysts for decarbonising India's agricultural sector

SUHAS BAXI

Climate change is a growing concern and its damaging effects are already being witnessed across the planet today. Countries across the globe are taking strong measures to arrest this problem, and India is no different in this regard.

Greenhouse gases (GHG) like carbon dioxide have widely been accepted as one of the prime contributors to climate change, and decarbonisation on a colossal scale is the only remedy to end this issue. India has made strong commitments towards emerging as a carbon-neutral country by 2070 and has announced its strategic plan to accomplish this at the COP27 conclave held in Egypt last year.

Transitioning from highly polluting fossil fuels to cleaner, renewable sources of energy is a move that is expected to have a lasting effect on slowing climate change. India, however, produces roughly 60 per cent of its total energy requirements from coal and gas fired power plants, while the rest is met through renewable capacity. Although the green power infrastructure continues to grow in the country, for India to meet its aspiration of achieving half of its energy consumption from non-fossil fuel sources by 2030, these efforts need to be accelerated.

Introduction of policies to decarbonise India. To give a boost to India's decarbonisation efforts towards a sustainable future, the government introduced the Energy Conservation (Amendment) Bill 2022 earlier this year that has laid the foundation for the Carbon Credit Trading Scheme (CCTS) in the country. This landmark amendment has empowered the Ministry of Power to identify sectors that consume high volumes of energy (like steel refineries and power plants) and affix stipulated carbon emission targets for each of these industries. When these entities reduce their carbon emissions, they are granted carbon credits, while those that fail to meet their targets are required to purchase certificates that are commensurate with their emissions or pay additional charges for their pollution.

The CCTS has formulated guidelines for a market that will permit the buying and selling of these carbon credits, which is expected to act as a catalyst for India's decarbonisation efforts. By incentivising investors and players to invest in green infrastructure and carbon capture initiatives through the creation of tradable carbon credits, and disincentivising polluting industries for their excessive carbon emissions through mandatory purchasing of these certificates, the country's decarbonisation trajectory is expected to be on track to achieve its goal of achieving carbon neutrality by 2070.

Carbon credits and the biomass sector: Despite the rapid rise of urbanisation and industrialisation across the country, agriculture and its allied sectors continue to be a sizeable contributor to India's GVA, accounting for a wholesome 18.3 per cent and employing about 62 per cent of the nation's population.

Unfortunately, the agricultural sector also contributes nearly 14.37 per cent of India's total yearly GHG emissions, with one of the most significant reasons being the mismanagement of agricultural waste. Due to lack of awareness and better alternatives, farmers in India tend to burn agricultural waste, or dump it into landfills. If this waste can be collected efficiently and transported to biofuel production facilities, this can be transformed into briquettes and pellets which can be blended with coal to produce electricity. This creates a new carbon cycle, which can be used to generate carbon credits.

Local participation plays a pivotal role: One of the main challenges for biofuel creation is the logistics involved in collecting the biomass from its source. Raw agricultural waste is extremely voluminous, and with the scattered nature of farms in India, transportation can become a choke point for the entire value chain.

In countries like France, local municipalities have partnered with farmers to collect their waste directly from their fields and transport it to the biofuel processing centre. Closer to home, in an effort to reduce its carbon footprint, the administration in Indore has begun collecting organic waste from across the city and has been trucking it back to a central processing plant where it is converted into energy. Similarly, across rural India, Gram panchayats and local farmer co-operatives can team up to aggregate organic farm waste and transport it efficiently to the biofuel facility.

Way forward: Through grassroot involvement in setting up the biofuel value chain, right from aggregating the feedstock from the fields to transporting it to the processing centres, significant decarbonisation of the agricultural sector will occur.

Besides creating wealth from waste, the advent of the trade in carbon credits on a dynamic carbon market will facilitate further revenue generation from the creation and subsequent sale of these certificates which will percolate down to the farmers themselves. Furthermore, CCTS will attract investments that are crucial for growing the renewable infrastructure in the country. ◆

The author is co-founder & CEO, BioFuelCircle

GUEST COLUMN

Powerhouse for the future

Green energy sustainability hinges on embracing the private sector in a shifting market condition

HITESH DOSHI

Even as the COP 28 Summit on climate control brought many global climate custodians into Dubai, the earlier COP 27 held in Egypt last year had already firmed up the commitment to triple renewable-energy capacity. While discussions continue, renewable energy companies are getting into a centre-stage role now to reform and redesign power markets. Indeed, close on the heels of the recent geopolitical crises, climate change is undoubtedly a major pre-occupation of governments in most countries.

The concern about climate change is a manifestation of a broader social concern about 'sustainable' development. The Brundtland Commission, set up by the UN in 1987, had defined sustainable development as development that "meets the needs of the present, without compromising the ability of future generations to meet their own needs". Indeed, it captures the fundamental inter-temporal aspect of human impacts on the natural environment.

While all global bodies have been strongly recommending the need for co-ordinated global action in managing climate change, the debate about how much global abatement should be done, how it should be shared among rich and poor countries and what abatement instruments should be used, seems to be perennial and endless.

The central issue in dealing with climate change is choosing the optimal degree of emission norms, which requires an assessment of costs and benefits over a very long period of time. Every country has its own population-based 'fair share' of emissions it can produce before the world hits unsafe levels of global warming. In this formulation, the US and the European countries have already far exceeded their limits; India, on the other hand, has contributed only 4 per cent of the global emissions since 1850, according to a 2019 UN report.

This is why India's efforts to transition into renewable energy – solar, wind and hydro – have gained such prominence in recent times the world over. India is a prominent player in the global solar revolution, ranking fourth globally in solar power capacity. In the last five years, the country's solar installed capacity has experienced a monumental transformation, increasing from 21,651 MW to 70,096 MW in 2023. The IEA projects that solar power will make up about 30 per cent of India's electricity generation by 2040. As per estimates, this substantial growth in wind and solar power effectively prevented the release of 11 million tonnes of carbon di-oxide!

Recently, the Indian solar manufacturing sector achieved a historic milestone of 60 GW installed module manufacturing capacity. A favourable policy environment, including impactful measures such as the Production Linked Incentive (PLI) scheme, has played a significant role in this phenomenal growth of the sector.

PLI has ensured that the country will add an additional 40 GW of module manufacturing capacity by the end of 2024-25. This expansion is strategically focussed on promoting backward integration, enhancing energy security, and establishing a dependable supply chain to support domestic solar installations, which are anticipated to reach over 30 GW annually. The growing realisation across nations of the pressing need to diversify supply chains and reduce dependency on China, provides a further competitive advantage to Indian manufacturers.

Moreover, interventions to curb the high levels of imports of solar modules and cells by implementation of the ALMM (Approved List of Modules and Manufacturers) policy, will provide additional impetus to indigenous production and empower Indian manufacturers to make a substantial contribution to the global clean energy transition. It is estimated that, by 2026, Indian industry will be able to make solar modules worth 100 gigawatts (GW) annually and help the country be a net exporter of solar power.

Green energy sustainability to ward off climate change hinges on embracing the private sector in a shifting market condition. "There's going to be a paradigm shift," says Sultan Al Jaber, the economist & president of the UN climate conference (COP 28) held in Dubai in December. "The political process needs to be well complemented with private capital and a business mindset."

This is where the private sector in India has excelled. Waaree Energies has taken the lead in driving the energy transition, offering innovative and reliable renewable energy solutions. It empowers businesses and individuals to make the shift towards sustainable energy sources, reducing carbon footprints for a greener world. We believe sustainability should be accessible to all. With a proven track record, Waaree Energies has demonstrated execution capabilities in delivering successful and affordable renewable energy projects.

India is well on its path to satisfy the aspiration for higher living standards, while pursuing a sustainable energy strategy, the likes of which the world hasn't yet witnessed. Of course, we as a country are determined to pursue clean energy while seeking a balance between energy access and affordability, energy security, and environmental considerations. Therein lies the powerhouse for our future generations. ◆

The author is chairman & managing director, Waaree group

Sustainable farming

Adopting climate-smart practices in agriculture is the need of the hour

ASHISH DOBHAL

Farming, even in the best of times, is besieged with challenges. Fear, uncertainty, and anxiety are emotions that farmers grapple with season after season. However, the burden of feeding a hungry world has never been heavier than it is today.

Climate change has intensified life's difficulties for farmers. Extreme weather events such as heat stress, droughts, floods, and unpredictable weather patterns like unseasonal rainfall and temperatures are increasingly disrupting agriculture. Simultaneously, resources like water are also under greater stress.

We are witnessing the combined impact of these factors on yields and farm incomes. India, for instance, is poised for its first drop in rice output in eight years due to an erratic monsoon. The area under wheat cultivation is also set to decrease as a lack of moisture in the soil compels farmers to switch to alternative crops. This situation has prompted the government to curb or ban exports of wheat, sugar, rice, and onions, raising concerns that India may have to import some crops.

In short, growing food today is more challenging than ever, ironically at a time when farmers are being called upon to produce more food than ever before. Therefore, now farmers need to adopt climate-smart practices to not only reduce the sector's impact on the environment but also to ensure that the growing global population remains fed by making farming smart, sustainable, and, most crucially, resilient.

Collaborative approach: Climate-smart practices encompass aspects like product usage, spraying techniques, tilling practices, and harvesting methods. For them to be most effective, a collaborative approach involving farmers, the government, and the private sector is needed. While the government's role will be to create an enabling policy environment, the private sector will lead the way in devising innovative solutions.

This innovation will manifest on several fronts. Some companies will engage in mechanisation, others in enabling the digitisation of agriculture, and still others in developing a portfolio of products that will lay the groundwork for farmers to transition to climate-smart agricultural practices.

Take, for instance, UPL. The company, whose India division is now officially called UPL Sustainable Agro Solutions, falls into the latter category. UPL has developed a vast range of climate-smart products covering everything from crop protection and soil health to plant stimulation and post-harvest solutions.

Recently, UPL has been ranked as the industry leader in the Dow Jones Sustainability Index, achieving a score of 76, outperforming the industry average of 24. In the past, the company has also been ranked #1 by Sustainalytics among its peers. This achievement demonstrates UPL's continued commitment to sustainability and harnessing the decarbonisation potential of the agricultural industry.

One of the company's biggest success stories has been its Zeba technology. Zeba is a naturally derived, starch-based, super-absorbent tech. Intended for in-furrow application, Zeba increases the water-holding capacity of the soil, improves nutrient use efficiency in the crop's root zone, and has a positive effect on the soil microbiome, thereby maintaining soil health. It can absorb 400 times its own weight in water and release it as per the crop's need. It is effective for six months in the soil and is completely biodegradable, decomposing naturally and harmlessly into the soil.

Zeba was used across 200,000 acres of farmland in 2021 by 135,000 farmers across India and saved 58 billion litres of water in just one year. Moreover, the use of Zeba led to a 25 per cent reduction in fertiliser use, while delivering savings of ₹1,500 per acre on electricity and ₹ 1,000 per acre on labour. In total, Zeba has earned the average farmer an additional income of ₹22,000+ per hectare on an additional spend of less than ₹5,000.

The company's ProNutiva programme has scripted a similar success story. ProNutiva integrates natural bio-solutions (bio-protection, bio-stimulants and bio-nutrition) with conventional crop protection products improving crop health, resilience, while also boosting yields. The package helped farmers in Gujarat increase the yields of their groundnut crops by over a third. Replicated on a larger scale, the package has the potential to slash India's dependence on edible oil imports, one of the few areas in which we haven't yet achieved self-sufficiency.

Beyond its products, UPL also provides integrated agricultural services giving farmers access to IPL kits, soil testing, weather, crop advisory, and mechanisation services, empowering them to practice sustainable precision farming. At the same time, the company has also enabled access to finance for farmers, which is key to the deployment of climate-smart practices.

By pushing the boundaries of innovation, UPL is helping farmers produce more food, more sustainably, with less. That is the sort of visionary leadership that's needed to put agriculture on a sustainable footing. Our farmlands are desperately in need of another green revolution. To make farming sustainable – that is the only solution. ◆

The author is CEO, UPL Sustainable Agri Solutions

Scaling livelihoods with clean energy

Rural communities find new livelihood opportunities through decentralised renewable energy

Somnath Kharade, a farmer in Maharashtra's Ahilyanagar district, has moved up the lemon value chain. Earlier, he was content with growing lemons from the one-acre plot behind his house and selling them to middlemen, who would then take them and sell them for a profit at the mandi. But now he is a wholesale trader of lemons. He buys lemons from nearby farmers, clubs them with his own crop and then waits for the right time to sell. Lemon prices fluctuate through the year and, Somnath, like most seasoned farmers, knows the trends. When the November harvest comes in, he holds the stock but doesn't sell. He waits nearly 45 days, till Sankranti (mid-January) time, when lemon prices go through the roof and then sells his stock for a huge profit.

Somnath's ability to procure and store large quantities of lemons and to confidently time the market, comes from his newest acquisition – a 20-tonne cold room that stands in his backyard. It is powered by biomass – straw, fallen branches and briquettes – from and around his farm. The cooling system is developed by New Leaf Dynamics, a social enterprise based in Delhi. It uses ammonia as the coolant, which has no adverse climate effects whatsoever. The biomass is burnt in a clean and pollution-free manner, generating enough energy to run the cooling cycles.

The cold room has other functions too. Somnath jokingly refers to it as his ATM. Whenever he needs quick cash, he converts a portion of the cold room into a ripening chamber and places a few kilograms of lemons here. When the green lemons turn yellow, he sells them in the local vegetable market at a premium of Rs20 per kg. At the end of the season, when all the high-grade produce has been sold, he flips a switch on the cooling engine to reverse its cycle, converting the cold room into a drying chamber. The low-grade lemons, not pretty to look at but rich in flavour, are dried and sold to the food processing industry.

Clean energy, new livelihoods

Like Somnath, other people from rural communities across India are finding new livelihood opportunities opening up for them, thanks to decentralised renewable energy (DRE). Technology-driven products like irrigation pump sets, cold rooms, ice boxes, food processors and fodder growing stations, all powered by DRE, are now mature and reliable. They work in off-grid and weak-grid areas, completely eliminating the uncertainty that plagues rural power availability. Moreover, bigger DRE-powered installations like Somnath's cold room don't need a three-phase electricity connection, which is expensive and hard to get in rural areas.

A new generation of social entrepreneurs are building these DRE products. Rather than retro-fitting existing products into DRE power sources, this generation is actually custom-building products from scratch that are perfectly fit for purpose. The entrepreneurs understand the value chains they work in very well, and many of their innovations come from the insights they gather on the field. Akash Agarwal, who runs New Leaf, put in the cycle-flipping switch after he realised that the cold room was lying idle for some parts of the year, when it could well be used for drying left-over produce. Another entrepreneur, Vasanth

Raheja Solar Food Processing
Founded by Varun Raheja

The affordable solar dryers are designed to enhance farmer profits. The enterprise offers training, and buyback support enabling farmers to supply high-quality dried products to conscious consumer brands.

Dharambir Food Processing Private Ltd
Founded by Kissan Dharambir

A compact, portable solar powered food processor to process fruits, herbs, medicinal plants, and seeds. Neetu Tandon, Entrepreneur & PL Demo Champion for Kissan Dharambir's multi-purpose food processing machine. She runs a successful Fast-moving consumer goods (FMCG) micro-enterprise using the food processor. As a demo champion, she hosts two to three such localised demos in her community every month, generating four to five potential sales leads for the enterprise.

Kamath, whose company Hydrogreens makes solar-powered fodder-growing units, noticed that his product was mostly operated by women. He then reduced the height of the unit to bring the upper trays of fodder within their reach.

There is a large potential market for DRE livelihood appliances. A report released by CEEW (Council on Energy, Environment and Water) and Villgro Innovations Foundation in May 2023 estimates that India has a $50 billion market for clean technologies, which can impact 37 million livelihoods. This market continues to grow even as the quality of the power grid in the country improves. The demand for DRE products, driven initially by the need for reliable electricity, is today increasingly fuelled by aspiration and entrepreneurial spirit. In many cases, the cost over their lifetime of DRE powered livelihood appliances beats that of their grid powered counterparts. The customer base is expanding too. Since DRE products are decentralised by design, they are much more gender inclusive. Installations are close to homes or farms, so women micro-entrepreneurs can use them while balancing their domestic responsibilities.

Devidayal Solar Solutions
Tushar Devidayal, Founder

Devidayal Solar, at a Trade Activation event organised in Jaipur in 2022. Devidayal Solar Solutions provides affordable cold storage solutions that operate on distributed renewable energy.

Women-end users at the Trade Activation event

The Powering Livelihoods initiative helped women purchase DRE powered appliances using a 50 per cent subsidy and 50 per cent credit support from Rajasthan Grameen Aajeevika Vikas Parishad (Rajeevika) that provides end-user financing support in Rajasthan.

Powering livelihoods

The challenge for the DRE Livelihoods sector is to convert the latent demand into actual on-ground sales and installations. Back in 2020, the Powering Livelihoods programme was kicked off, jointly designed and executed by Villgro and CEEW to address exactly this challenge. The programme adopted a holistic approach to scaling the sector. On the supply side, Powering Livelihoods worked with 14 innovative social enterprises, helping them to scale their operations and fine-tune their business models. On the demand side, the programme created digital awareness campaigns, user experience centres and 'demo champions', who were active users willing to explain a DRE product to other people. The programme also actively engaged with the ecosystem around DRE Livelihoods – from the ministries responsible for framing policies related to DRE, to financiers who would provide loans to users interested in buying the products.

The programme has had several notable successes. Until May 2023, Powering Livelihoods had enabled over 11,000 installations of DRE Livelihoods appliances, which in turn enhanced the livelihoods of over

Hydrogreens

Founded by Vasanth Kamath

Hydrogreens offers affordable technologies for small dairy farmers. Hydrogreens cultivates fodder in a low-cost, micro climate-controlled grow house that functions in temperatures of 40-50 degrees Celsius using only half a bucket of water.

New Leaf Dynamic Technologies Founded by Akash Agarwal

A patented refrigeration technology, called GreenCHILL, this 5-30 MT cold storage utilizes farm waste such as biogas, biomass pellets, waste wood, husk, hay, and bamboo waste. The biomass is carbon-neutral, posing no environmental harm.

17,500 users. Almost all of these installations happened through commercially viable business models, which means the enterprises making them also grew in revenue – on an average, by 2.3 times over three years (including through the difficult Covid period). The data from these 11,000 installations was meticulously documented and shared with the Ministry for New and Renewable Energy (MNRE). This and other inputs formed the basis for the world's first ever formal policy framework for DRE Livelihoods, released by MNRE in 2022. R.K. Singh, Union minister for power, new & renewable energy, announced at the National Summit on Powering Sustainable Livelihoods in May 2023 that the government had plans to create a large programme for DRE Livelihoods.

Yet, there remains a lot of work to be done in the sector. Enterprises struggle to take their DRE products deep into rural areas. As young companies, they lack the staff strength to set up sales and service networks on their own. One of Powering Livelihoods' major thrust areas going forward, is to set up strong networks of go-to-market (GTM) partners. Rural distribution is a space that has seen a lot of innovation lately, and the program has partnered with companies like Essmart and Dharmalife who are adopting digital platforms and payment systems to rapidly expand their coverage area for DRE Livelihoods products.

Affordability is another major concern. Most prospective customers are convinced of the earning potential of DRE products, but lack the capital to purchase them. It is essential that these products are bundled with financing schemes – loans that allow users to pay in instalments. Powering Livelihoods has already established several 'lighthouse' projects that showcase how DRE Livelihoods and financing can go together. For example, over 200 units of solar powered refrigerators manufactured by Mumbai-based Devidayal Solar, have been sold via a loan scheme offered by a prominent non-banking finance corporation (NBFC). Schemes like this often need added risk coverage when they start off – first loss default guarantees or FLDGs in bankers' parlance – but once borrowers start paying their instalments regularly, the financiers do away with such requirements. The programme aims to bring many more end-user financing organisations into the sector, to catalyse faster uptake of DRE Livelihoods products.

Over the next two years, Powering Livelihoods aims to build a mature ecosystem for DRE livelihood technologies, where stakeholders have sufficient data and case studies to be convinced of the commercial viability of DRE Livelihood solutions as well as the impact they create. The aim is to have at least 40,000 more livelihoods enhanced by these solutions, with at least 25 innovative and profitable enterprises building products to suit their needs. The programme aims to catalyse many more go-to-market players and financiers to operate in the sector. The programme also hopes to inspire convergence of government policy across ministries when it comes to schemes – with not just MNRE but others like the ministries of agriculture, food processing industries and textiles, among others, considering DRE as an integral part of their schemes.

Most importantly, Powering Livelihoods aspires to enable tens of thousands of people like Somnath Kharade to adopt decentralised renewable energy for their livelihoods. They will form the core of India's army of climate warriors, who clean up the environment even as they earn their living.

ANANTH ARAVAMUDAN

The author is chief, strategy & sector lead, climate action, Villgro, India' foremost impact-first incubator

Harnessing the Sun

To become a global clean energy powerhouse, one has to overcome policy and infrastructure challenges

SRIVATSAN IYER

India's solar energy sector has seen a substantial increase in capacity, tripling from 22.34 gigawatts (GW) in March 2018 to an estimated 72 GW by October 2023, reflecting the global transition to sustainable energy and signalling a clear shift away from traditional sources. This reflects a concerted effort by the Indian government and private stakeholders to embrace renewable energy and reduce their carbon footprint, supported by policies and initiatives that have facilitated investment and driven down financing costs.

This expansion in renewable power generation is also significant in the context of India's energy needs and its commitments under international climate change agreements. The solar sector's growth has generated employment across the manufacturing, installation, and maintenance segments as well as contributed to economic development and social welfare by providing power to remote areas. The rate of adoption of solar power has also accelerated in recent years, thanks to the declining costs across the value chain that have rendered it competitive, and in many cases cheaper than traditional energy sources. Continued investments in capacity expansion as well as technology enhancements across the value chain are likely to ensure that costs will remain low for the foreseeable future. The complementary aspect of battery storage has also seen significant drops in cost, further enhancing the adoption of solar power. Notably, India has been moving towards renewable energy bids that require providers to supply round-the-clock, peak and load-following power, which take advantage of storage systems to address the reliability aspect of renewable energy supply.

While the environment for the growth of solar power in India appears very positive, there are some aspects that, if unaddressed, could potentially derail the efforts towards reaching the aspirational targets that have been set. Most significant among these are the barriers that have been set up to protect the domestic manufacturing industry in the form of the BCD (Basic Customs Duty) and the ALMM (Approved List of Models and Manufacturers) listing requirement.

The BCD is intended as a tariff barrier to prevent or reduce the import of solar modules and cells from China, the largest PV equipment manufacturing hub in the world. While the intent to support and foster domestic capabilities for the future is a positive one, the lack of sufficient number of seasoned domestic manufacturers with large enough capacities upstream of the value chain (cells, wafers, ingots, etc), will lead to an increase in the cost of developing solar projects and consequentially, solar power. The requirement of using only modules listed in the ALMM, which are effectively only domestic OEMs, amplifies the issue and will hold back the actual potential for installations and growth in the solar sector. On the ground, this is reflected in the slowdown in capacity addition figures for recent years and threatens to limit India's capacity for growth at a very crucial time, unless tackled immediately.

In addition, the development of solar power plants involves navigating complex administrative processes. The procurement of land is fraught with legal and regulatory challenges, often leading to delays. The solar industry also grapples with the slow pace of receiving approvals from various government entities, which can stall projects. The national grid infrastructure is another critical concern. As solar power generation increases, the grid must be capable of managing the variable nature of renewable power. Investments and upgrades to the grid system are essential to accommodate the growing proportion of solar-generated electricity. These upgrades need to be planned and executed swiftly to prevent bottlenecks in the transmission and distribution of solar power. While significant progress has been made in these areas compared to the early years of India's journey, there are still obstacles that need to be overcome before we can expect to hit the target of 280 GW of installed solar power capacity by 2030.

As the country marches towards its solar goals, the implications for India are profound. The transition to solar energy is likely to redefine India's energy landscape, making it cleaner, greener, sustainable and more self-reliant. The country's push for solar energy also reflects a larger trend in Asia, with countries like China, Japan, and South Korea investing in renewable energy sources.

In short, India's solar sector has achieved notable growth, but realising the ambition of becoming a global clean energy powerhouse requires overcoming policy and infrastructure challenges. Balancing the objectives of fostering domestic manufacturing and maintaining the growth momentum of the solar sector will be critical. Streamlining administrative processes and upgrading the grid infrastructure are vital for sustaining the growth of solar power and achieving the targets set for 2030. ◆

The author is global CEO, Hero Future Energies

Business India CLIMATE CHANGE SPECIAL

Rising to the challenge

Indian financial institutions take on climate change

CLINTON ABBOTT

Sustainability practices have become prevalent worldwide to align with global climate objectives. As evidence of this shift, India too plans to reduce the emissions' intensity of its GDP by 45 per cent by 2030 from 2005 levels. With government backing, every industry is pushing the boundaries to achieve environmentally sustainable goals. While the financial sector has embraced this change too, a recent climate report by the Reserve Bank of India (RBI) reveals that a collective and concerted effort from banks is still required in the areas of climate risk and sustainable finance, demanding further action in this domain.

Devising a green blueprint: According to the RBI climate report, India's financial institutions are increasing their environmentally friendly offerings, such as Sustainability Linked Loans/Bonds (SLL/SLB), and ESG Mutual Funds. This positions Indian banks as catalysts for a ground-breaking era of sustainability and environmental advancement.

Therefore, as an important step to truly tackle climate risk and foster sustainability, banks must establish a robust mechanism, dedicated to overseeing and elevating relevant initiatives. It is imperative to integrate key performance indicators (KPIs) focussed on climate risk, sustainability and environmental, social and governance (ESG) into the performance evaluation criteria.

Encourage green transaction tech: Banks must invest in innovative technological solutions that help companies in setting and meeting their ESG targets. By adopting a modern deposit and billing platform, banks can offer corporate customers unique carbon offset solutions that combine access to the carbon credit market and their treasury products. Such an innovation will not only help reduce overall carbon output but also encourage increased deposits with the bank.

Provide differential pricing and benefits based on ESG scores: Specialised technology providers are collaborating with ESG rating agencies to help rate corporate customers and reward customers with higher sustainability scores with a better discount or preferential interest rate or price. Banks can use sustainability ratings generated as additional criteria to determine preferential pricing and benefits for various banking products and services. With such monetary incentives at play, more corporate customers will be encouraged to effectively invest in ESG initiatives and earn special perks based on their ratings across ESG-related parameters.

Regional focus with preferential benefits: Financial institutions must establish investment frameworks that prioritise ESG practices, tailored to the specific needs and characteristics of the regions they serve. A prime example is the Indian economy that is heavily reliant on agriculture. In this context, there is a growing trend of waste-to-energy projects that convert agricultural and forestry waste, as well as municipal solid waste, into usable energy. Moreover, agri companies are actively promoting sustainable agriculture practices. To foster the advancement of such initiatives, financial institutions could offer infrastructure loans with preferential pricing and implement other supportive monetary measures.

Government push: The RBI has proposed several monetary initiatives to assist companies in adopting environmentally friendly strategies and financing green projects. One such measure includes mandating commercial banks to invest 40 per cent of their adjusted net bank credit in priority sectors, which include renewable energy.

Additionally, the government is considering the establishment of a carbon trading market, based on the principle that trading carbon credits will lead to the most efficient approach to reducing emissions. If effectively implemented, the Indian carbon market could achieve climate goals, while also driving innovation and technological advancements. However, financial institutions must have the right technology in place to participate in and be eligible to receive the incentives.

Clean economy: Financial organisations possess the power to wield their resources and champion sustainability, becoming pivotal players in the fight against climate change. To further bolster their green offerings, banks must embrace cutting-edge technology. By doing so, they will not only attract more business and revenues but also assist customers in accelerating their sustainability agenda.

The idea behind advocating ESG must not just be perceived as a corporate mission statement; it is an extraordinary opportunity to actively contribute to creating a greener, inclusive, and responsible world for all. With adequate policy measures, strategic tie-ups, and impactful blueprints for green services, financial institutions can be the guardians of sustainability. ◆

The author is senior vice-president & head, product management, SunTec Business Solutions

Beyond plastic waste

India holds promise in addressing gaps within its waste management ecosystem to shape a sustainable future

SURANJANA GHOSH

India is facing a serious environmental problem, with over 3.4 million tonnes of plastic waste produced annually. Unfortunately, only 30-40 per cent of this waste is recycled, resulting in a huge 60-70 per cent ending up in landfills, incinerators, or the environment, where it can persist for hundreds of years. The situation is alarming and highlights India's urgent need to tackle the global issue of plastic pollution.

To address this crisis, India has implemented a two-pronged approach, based on the Sustainable Development Goals (SDGs) and Extended Producer Responsibility (EPR), guided by SDG 12, which emphasises responsible consumption and production as it seeks to reduce plastic waste and promote sustainable alternatives. EPR mandates that manufacturers take responsibility for the plastic waste generated during production.

Therefore, innovators are making impactful contributions to mitigate the impact of plastic pollution and promote circularity in the plastics industry. Through cutting-edge recycling and packaging solutions, waste-to-energy endeavours, and advocacy, a select bunch of startups, such as Sea6 Energy, BINTIX, and Ishtiva Robotic Systems, are contributing to the broader effort to reduce plastic pollution, promote sustainability, and nudge India towards embracing a more circular economy.

The need for circularity: A circular economy model entails reducing waste and encouraging the reuse, repair, refurbishment, or recycling of products and materials. This efficient, environmentally friendly approach can lead to long-term benefits. However, stakeholders must proactively introduce steady changes in industries that pose challenges towards adopting circularity, particularly in sectors like plastics, which produce significant amounts of non-biodegradable and potentially harmful waste.

The practical implementation of a circular approach within the plastics industry requires a comprehensive understanding of its operations and a commitment to embracing scalable solutions. It is based on a set of fundamental principles. Firstly, choosing raw materials and production processes that minimise toxins, conserve resources, and safeguard local ecosystems is crucial.

Secondly, creating behaviour change and awareness at a citizen level regarding proper practices for sorting, disposing of and recycling plastics at home is essential. This empowers individuals with knowledge and drives responsible plastic management that can be catalysed from the grassroots.

Lastly, optimising the logistics of plastic waste collection, sorting and recycling while concurrently reducing reliance on land and water-based waste disposal is pivotal. This approach not only enhances efficiency but also reduces the impact of plastic waste management on the environment.

While, theoretically, such principles enable collaboration with stakeholders such as recyclers, manufacturers, brand owners and civic bodies, there are on-ground challenges in the plastic value chain that act as a hurdle to achieving circularity.

Hurdles to circularity: The transition towards a circular economy presents various challenges that demand our attention. The lack of efficient waste segregation and collection at its source increases recycling costs. The need for technological solutions to process low-quality, unsorted plastic waste also compounds these issues. The logistical hurdles in waste collection and transportation create additional complexity.

Embracing circular practices thus requires significant initial investments and increased operational expenses due to heightened energy consumption, chemical usage, and rising greenhouse gas emissions. There is a glaring obstacle of inadequate funding, with the Marico Innovation Foundation's 'Innovations in Plastics' report revealing that circular economy startups in India received only $6 million in funding in 2021, highlighting the unequal distribution of financial resources in this sector.

Occupational waste collection and recycling hazards, such as releasing cancer-causing dioxins, pose significant health risks. The absence of regulatory and market-based mechanisms hinders the operation of circular business models. For example, the need for more taxes on improper waste disposal and incentives for recycling exacerbates these challenges. Furthermore, the fluctuating costs of raw materials for bio-based or recycled plastics complicate matters by directly affecting profitability. Addressing these issues through strategic investment, regulatory reforms, and market incentives is essential to pave the way for a sustainable and circular plastic economy.

New age solutions to the fore: The journey towards a circular economy for plastics requires the collaboration of stakeholders from all industry segments. Government intervention and consumer

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engagement are equally crucial as industry-driven innovation. Government actions, such as stringent regulations against plastic waste and policies prioritising sustainable alternatives, motivate the plastics industry to explore renewable products. Similarly, informed and engaged consumers are vital to the success of sustainable product options. This collaborative effort offers a means to address our environmental challenges and significant economic opportunities. A few critical areas of investment are as follows:

Bioplastics: These versatile plastics are derived from renewable resources and have a lower carbon footprint. They are crucial in reducing our dependence on finite fossil fuels and finding applications across diverse industries. Global production capacity is expected to reach 7 million tonnes by 2026, a significant increase from 2.41 million tonnes in 2021. Pioneering startups like Sea6 Energy use tropical seaweed to produce bioplastics, showcasing their potential in advancing circularity goals.

New recycling techniques: In India, only 30 per cent of the annual 3.4 million tonnes of plastic waste produced is recycled. While investment in recycling methods, including catalysts, biorefineries, and reactors, is imperative, a few innovators are leveraging advanced technologies such as Artificial Intelligence and Machine Learning to transform plastic waste management. Take Ishitva Robotic Systems, for instance, which has developed an AI-powered sorting machine that can process and sort up to six tonnes of waste per hour and at a 50 per cent lower cost than international counterparts, thereby reducing the amount of waste destined for landfills or incineration.

Leveraging data: Harnessing the potential of data and artificial intelligence in waste management can lead to smarter and more efficient solutions. Waste management companies can enhance their operations by analysing waste generation and collection patterns data. Notably, initiatives like BINTIX, a data-driven door-to-door household waste collection service, optimise collection routes based on consumer patterns. This reduces unnecessary pick-ups, cuts fuel consumption and has prevented the release of 5.5 million kilograms of CO2 into the atmosphere, while supporting plastic awareness campaigns.

Sea6 Energy uses tropical seaweed to produce bioplastics, showcasing their potential in advancing circularity goals

BINTIX, a data-driven door-to-door household waste collection service, optimises collection routes based on consumer patterns

Towards a circular future: Indian start-ups hold significant promise in addressing gaps within the country's waste management ecosystem, positioning themselves as key players in driving innovation and contributing to the circular economy. These start-ups bring fresh perspectives and the potential for large-scale implementation of innovative solutions. However, a critical obstacle they face is the need for robust financial support from the government and the private sector. Adequate financing will enable startups to expend valuable time and energy pursuing essential resources for product testing, idea pitching, and establishing operations.

To bridge this support gap and facilitate the growth of these startups, innovation-focused platforms and enablers play a pivotal role. Through initiatives designed to foster the development of technologies, enable innovators, expand reach, provide market access, and support deployment, such organisations ensure that startups and innovator-entrepreneurs are well-prepared to lead India towards a circular future. By collaborating with major stakeholders, including the government and the plastics industry, these organisations create an environment conducive to innovation and deployment of technologies at scale.

Such collaborative efforts allow start-ups to focus on core areas of transformative change within the waste management sector, ultimately empowering them to fulfil their potential and contribute to a more efficient and sustainable circular economy in India. ◆

The power of technology

The journey may be arduous, but the vast opportunities compel us to press forward

DIPALI GOENKA,

India aims to become a $5 trillion economy by 2025 and stand tall among other global economies. While we are on track, this ambitious target can only be achieved when the top performing sectors of our economy perform in unison. To achieve this, the development in these high-performing sectors will have to be led by technology.

The textile sector has been among the top performing sectors in the country. An interesting aspect of this sector is the fact that it works closely in tandem with manufacturing and agriculture, two of the most important avenues that can fire up India's economic growth. Hence, the growth in the textile sector will automatically support agriculture and manufacturing. That being said, the growth will have to be technologically-led.

The potential of smart agriculture: Agriculture, the foundational step in the textile manufacturing process, stands ready for technological renaissance. An era of efficiency can be marked by the integration of Artificial Intelligence (AI) into the field of resource optimisation. With AI, there is a more sophisticated approach to pest control, and water and soil management that maximises productivity while minimising environmental effect. The development of smart farming methods has enabled textile companies to reduce their environmental impact and promote sustainability from the ground up.

Moreover, the emergence of IoT devices opens up opportunities to monitor real-time emissions and energy usage. We can pinpoint areas for improvement with the use of this real-time data, which helps us cultivate a culture of continuous improvement in our production processes. Harnessing technology in this manner not only elevates our environmental stewardship but also positions businesses as responsible contributors to the global sustainability agenda.

Streamlining sustainability in supply chains: Advancements like blockchain, robotics and various forms of automation not only streamline processes but also increase productivity in the warp and weft of sustainable textile manufacturing. Adopting cutting-edge equipment and data analytics ensures precision at every stage, minimising waste and resource usage.

This operational agility strengthens the dedication to environmental stewardship while also translating into significant economic savings.

The rapid pace of evolution necessitates a commitment to ongoing training and upskilling on various aspects of technology, automation, and industry 4.0. Smaller businesses are best positioned to grow in this scenario. They can expand their market share by effortlessly incorporating innovative technology into their operations. Furthermore, the smart use of digital platforms and e-commerce solutions allows these businesses to access a worldwide audience while also developing a powerful online presence.

The seamless integration of digital platforms facilitates real-time communication, enhancing transparency and, consequently, fostering trust among stakeholders. This trust not only adds resilience to the supply chain but also introduces and facilitates avenues for collective progress.

Using technology to drive sustainable practices: Zooming out to encompass the broader spectrum of sustainability, the role of technology becomes even more pronounced. Environmentally conscious practices are in harmony with the market's pulse, which is driven by consumer demand. The key is to use technology to align with these evolving consumer demands.

By integrating an ESG digital platform with automated data dashboards, organisations gain valuable insights into their environmental, social, and governance practices. This not only facilitates compliance with industry standards but also enhances transparency, aiding stakeholders in making informed decisions about the company's ethical standing. Powered by technology, such platforms work towards abiding by all the necessary compliance while also propelling businesses towards a future where environmental responsibility is synonymous with success.

At the same time, standards for regulations and compliance requirements are constantly moving goalposts, of which textile manufacturers need to stay abreast to ensure they are adhering to their goal of ethical manufacturing, which ultimately maintains their relevance and competitive advantage in the market.

As leaders in the textile industry, embracing the power of technology for sustainable manufacturing is a moral imperative. The journey may be arduous, but the vast opportunities unveiled by technological integration compel us to press forward. By recognising challenges as gateways to profound opportunities, businesses can proactively shape a sustainable future. ◆

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Business India CLIMATE CHANGE SPECIAL

ESG integration for India Inc

ESG integration propels Indian businesses towards sustainability, resilience, and global recognition

AMIT KAPUR

VISHNU SUDARSAN

The sustainability world is abuzz with excitement. Environmental, Social, and Governance (ESG) factors have been gaining global prominence as indicators of a company's business practices and impact on society. The world's best-governed companies have embraced sustainability as a business imperative, integrating ESG within their mission and purpose. Over the past decade, several Indian businesses have adopted ESG, and many more are being urged to ensure ESG integration. An increasing number of companies are reporting their carbon emissions in their sustainability reports. Regulatory bodies play a crucial role in this regard. SEBI, the securities market regulator, introduced the voluntary reporting Business Responsibility Report (BRR) framework in 2012 among publicly listed companies and a more detailed Business Responsibility and Sustainability Report (BRSR) framework in 2021.

During FY23, SEBI has made it mandatory for India's top 1,000 listed companies to file BRSR. SEBI encourages companies to conduct a materiality assessment to identify ESG factors most relevant to their business operations. The nine principles of NGRBC (National Guidelines of Responsible Business Conduct) align in the BRSR report. Addressing challenges such as resource constraints in adapting to new standards, businesses have moved forward to achieve cost savings, improved brand value, and enhanced resilience against emerging risks.

This is positive news – as what can be measured can be managed! Carbon reporting will fortify the acceleration of the transition towards a low-carbon world. As Indian exporters prepare to comply with the EU's Carbon Border Adjustment Mechanism, adjustments to their manufacturing processes will be necessary. With the introduction of the Indian Carbon Credit Trading Scheme, it is anticipated that suitable financial incentives will facilitate the shift away from the high-carbon sector.

The increasing demands in the non-financial reporting space have created an urgent need for heightened accountability and transparency to meet stakeholder requirements, encompassing the environment, employees, and society. Businesses are compelled to align their value-creation and wealth activities with ESG imperatives by internalising the higher social and environmental costs. ESG integration in India places emphasis on social responsibility, concentrating on reducing the carbon footprint and improving governance standards. Companies are concentrating on fair labour practices, diversity and inclusion, and community engagement. This enhances corporate reputation and the well-being of society. Investors, both domestic and international, are progressively considering ESG criteria in their investment decisions in India.

Integrating ESG practices, specifically Scope 1, Scope 2, and Scope 3 emissions, in India involves aligning business operations with sustainable principles. Scope 1 emissions refer to direct emissions from owned or controlled sources. Scope 2 includes indirect emissions from purchased energy. Scope 3 includes other indirect emissions, including supply chain management. In India, companies can integrate ESG into their operations by incorporating some of these measures in their business operations:

Assessing emissions: Conduct a comprehensive assessment to quantify emissions, considering factors like energy consumption, fuel use, and emissions from operations.

Renewable energy adoption: Invest in renewable energy sources to reduce emissions, contributing to both environmental and economic sustainability.

Energy efficiency measures: Implement energy-efficient technologies and practices to minimise emissions – optimising manufacturing processes and/or using cleaner fuels.

Stakeholder engagement: Engage with stakeholders, including employees, customers, and local communities, to reinforce social and governance aspects through transparent communication about sustainability initiatives and continuous interaction, training, and workshops with a robust employee social benefit scheme.

Capacity building: Invest in employee training and awareness programs to build internal capacity for ESG integration, fostering a culture of sustainability within the organisation.

That being said, ESG integration is a continuous improvement process to achieve long-term sustainability goals. ESG practices are at a relatively early stage of development in most countries, for a variety of reasons like limited availability of ESG financial products, an evolving conducive regulatory regime, limited fiscal benefits, et al. Sustainable financing of ESG business operations, especially in the context of the Global South, will be vital in the long term. India needs a robust regulatory framework underpinning the development of a liquid carbon credit market, including carbon credit exports, regulatory certainty, access to ESG funds at better terms, especially for Small and Medium Enterprises.

In conclusion, as the nation strives for sustainable development, businesses are aligning with ESG principles into business practices and operations to meet regulatory requirements, access ESG-friendly capital, and secure a resilient and responsible future. ◆

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Eco-innovation: AI's contribution

A sustainable business landscape is not only a necessity but a collective responsibility that will shape the business narrative

RAVI CHHABRIA

The integration of technology has transformed enterprises into data-centric entities. Formerly limited to transaction records, this now underpins business operations and innovations. This exponential growth in its generation, however, comes at a significant environmental cost. Projections suggest a 15-fold surge in data center energy demand by 2030, predicted to represent 8 per cent of the global electricity demand, raising concerns about sustainability and environmental impact.

Sustainability in data-driven operations: As energy consumption rises due to data operations, sustainability is poised to become the linchpin of strategic business initiatives. Enterprises will look towards deploying innovative solutions that provide visibility into their carbon footprint and actionable insights to curtail their environmental impact. Leveraging advanced technologies and sustainable practices can transform business operations. Here are the key areas for strategic intervention to cultivate sustainability and reduce carbon footprint:

AI-optimised data centre management: Implementing AI-driven management strategies are crucial for reducing energy consumption. Advanced machine learning optimises server workloads, intelligently allocating resources based on real-time demand. Predictive analytics coupled with AI anticipate hardware failures, allowing for preemptive maintenance and minimising downtime. Concepts like self-healing data centers powered by AI promise to autonomously address inefficiencies for optimal performance and sustainability.

Intelligent cloud resource allocation: AI can revolutionise cloud computing by introducing intelligent resource allocation and load balancing. Machine learning enables dynamic adjustments to resources in response to varying workloads, enhancing operational efficiency and reducing overall energy consumption. Future developments may see AI managing decentralised cloud networks, optimising information distribution and storage for increased sustainability.

Automated renewable energy integration: AI facilitates the seamless integration of renewable energy sources into data center operations. Smart algorithms predict high-energy demand periods and switch to renewable sources when available. In the future, fully autonomous energy management systems may optimise the use of solar, wind and other renewable sources based on real-time availability and demand patterns.

Cognitive data management for efficiency. Utilising cognitive computing in data management enhances efficiency by intelligently organising and prioritising its storage, optimising retrieval times and minimising energy-intensive transfers. AI-driven archiving systems can proactively identify and move rarely accessed information to low-energy storage mediums, preserving energy-intensive resources for critical information.

AI-enhanced cloud security for green computing: AI contributes to green computing by enhancing cloud security. Intelligent threat detection algorithms identify and neutralise security threats in real-time, reducing the need for resource-intensive security protocols. Future AI-driven quantum-resistant encryption algorithms may secure information in the age of quantum computing, ensuring both security and sustainability in cloud operations.

AI-enabled carbon footprint analytics: AI provides real-time insights into an organisation's carbon footprint using advanced analytics algorithms. These algorithms process inputs from various sources, including energy consumption, resource utilisation and supply chain activities. Future AI systems may offer comprehensive sustainability dashboards, including predictive models forecasting the environmental consequences of different operational scenarios.

*Towards 2024***:** As we approach 2024, the trajectory of business operations is undergoing a profound shift towards environmental responsibility. The symbiosis of technology and sustainability is at the heart of this transformation. Businesses are actively reshaping their strategies to align with ecological responsibility, as evidenced by the S&P Global Corporate Sustainability Assessment revealing that 24 per cent of the Indian companies already have a plan to address the physical impacts of climate change.

From AI-optimised data centres to intelligent cloud resource allocation and the integration of renewable energy sources, corporations are adopting innovative solutions. These initiatives underscore a collective commitment to mitigating the environmental footprint of business operations. Moving forward, the future of business success lies not just in technological prowess but in the conscientious integration of sustainability into every facet of operations. The journey towards a greener, more sustainable business landscape is not only a necessity but a collective responsibility that will shape the business narrative in the years to come. ◆

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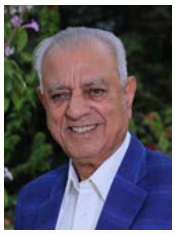
Shared commitment

Well-informed, decisive action to combat climate change should be a priority for all



S.N. LADHANI

Close your eyes and imagine a possible sustainable world after 2050, an era of net zero emissions for our future generations, a world where our commitment to tackling climate change goes beyond wishful thinking and becomes a reality defined by concrete and effective action. On this path to 2050, the critical actions to reduce greenhouse gas emissions are implemented now, creating a sustainable balance that strengthens the resilience of communities, economies and ecosystems to the impacts of climate change, so that we can see reality now with eyes closed and eyes open.

At the centre of the sustainability ecosystem are people – our consumers and employees – and the development of sustainable solutions that make our business resilient to respond to current and future challenges while creating positive change for the planet. It is a world where products are developed for the circular economy so that they can be reused, recycled or repurposed.

Sustainability is central to our business and our business strategy. Well-informed, decisive action to combat climate change is a priority for our company. Every individual in the company contributes to a shared commitment to reduce, reuse and recycle.

Water: A priority for our company, water is the first ingredient in all our beverages and essential to the communities in which we operate. As a local company operating in more than four states, we have a responsibility to help protect critical resources. Today, across our seven plants, we are 110 per cent water-neutral, having put back more than 1 litre of water for every litre drawn. In addition to this, we are expanding our rain water harvesting ponds by 1.2 million kl.

Packaging: As part of the 'world without waste' initiative, we are the first coke bottler in India to launch 100 per cent recycled PET (rPET) bottles for our packaged soft drinks, taking another significant step towards a circular economy. Today, SLMG commits that 10 per cent of all PET bottles made would be made out of 100 per cent recycled resin. In line with the government, this number would go up to 30 per cent by 2025. Additionally, an investment of ₹1crore is going towards a blockchain dashboard showcasing collection details with documents to track plastic recycling.

Climate: At SLMG Beverages, our commitment to environmental protection goes beyond individual initiatives. In our sustainability journey is the revolutionary transformation of our last-mile delivery using fleet of 2,000 electric vehicles to redefine the way Coca-Cola beverages reach our customers. By 2030, SLMG plans to increase the fleet strength by 8,000 electric vehicles supporting climate goals reducing carbon emissions.

Solar: At SLMG Beverages, our sustainable journey is illuminated by the power of the sun. The switch to renewable energy will result in circular economy and in regenerating nature. With SLMG already covering 70 per cent of all its power through solar energy, an additional 12.5 MW is being added in Ayodhya, Unnao and Chhata. Harnessing the sun's energy enables us to significantly reduce our carbon footprint and harmonise our activities with our commitment to the environment.

Reverse vending machines (RVM): SLMG, which is committed to environmental sustainability, operates 12 RVMs in Agra. These vending machines play a crucial role in promoting recycling and a community-led approach to sustainable living. In 2024, the company plans to expand its RVM network by a further 20 machines to promote a circular economy and encourage responsible waste management.

All of these endeavours are testament to our unwavering commitment to creating a sustainable and resilient future for generations to come. By implementing a joined-up approach to our priority sustainability issues, SLMG Beverages plans to spend more than ₹25 crore on quality, safety and environment in 2024 to combat climate change. Furthermore, SLMG plans to spend more than ₹75 crore on sustainability in 2024.

SLMG Beverages is proud to embark on this transformative journey towards sustainability with its commitment to lead way in sustainable business practices and initiatives that reflect our unwavering commitment to our planet. At SLMG Beverages, we do not just want to make exceptional Coca-Cola beverages, we want to ensure that every sip is a step towards a greener, more sustainable future.

SLMG Beverages, a flagship company of Ladhani Group and a franchise bottler for Coca-Cola in India, today supplies 90 per cent of Coca-Cola beverage products in Uttar Pradesh, 100 per cent in Uttarakhand and has presence in Bihar and Madhya Pradesh as well. In Uttar Pradesh, it has seven plants with a production capacity of 21,000 bottlers a minute. It caters to more than 300 million people through its 1.5 million outlets, and a network of more than 1,500 distributors, including in rural areas, with highly successful bottling franchises across all the four states. ◆

The author is chairman & managing director, SLMG Beverages

'We are committed to the mission'

Namami Gange Mission, the flagship programme set up to restore the glory of the national river, was set afoot in 2014 and is being implemented in more than half a dozen states. In Uttar Pradesh, its flow-stretch covers as much as 1,400 km and the success of the mission, to a great extent, depends on results of the 'Clean Ganga' initiatives in the state. Anurag Srivastava, principal secretary, Namami Gange & Rural Water Supply, Uttar Pradesh explains to Ritwik Sinha, the overall strategy to accomplish the grand objective of the mission

Namami Gange mission, the leading river rejuvenation programme, has been in operation in this country, with a significant part of the action under it being Uttar Pradesh-centric. Do we have concrete turnaround signs now, nine years after the initiation of the programme?

In January this year, our chief minister had rightly observed that the dolphins, which were on the verge of extinction, are again seen in the river, as this ancient lifeline of the country has become cleaner than before. Our studies substantiate this too. As many would be aware, dolphins act as indicators of river health. So, if dolphins are thriving or beginning to do so in Ganga, it surely is one of the soundest indicators of the improved health of the holy river, also referred to as 'Maa' simply due to the immense benefits it extends to whole humanity like a caring mother.

We are committed to the mission, which is aimed at restoring the ancient river's health and its pristine glory by identifying the 'culprits' and 'treating' them well!

How would you explain the actual action unfolding, particularly revamping or creation of green-field waste treatment units in the state?

Over the years, discharge of mostly toxic and non-biodegradable, untreated waste and chemicals by large number of industrial plants in riverine areas of UP, Bihar and West Bengal have been among the biggest culprits responsible for the falling health of the river, considered life giver by many. That is why, perhaps, driven by committed leadership, work is on in an express speed mode to get a majority of the 63 sewage treatment projects, worth ₹14,067.98 crore sanctioned for Uttar Pradesh, ready soon. Of these, 30 have already been completed and work is underway in 15 others. For 18 other projects, tenders have been invited. By the time all 63 are functional, 2,117.35 minimal liquid discharge (MLD) of additional water will be treated.

As of now, under the State Namami Gange Programme (SNGP), the under-construction sewage treatment plants (STPs), which are part of 15 ongoing projects, have total sewage treatment capacity of 543.3 MLD. Additionally, another 18 STPs, part of another 18 projects, with a total treatment capacity of 924 MLD, are at the tender processing stage. Besides, the DPR of 16 sewage schemes is under consideration as part of the Namami Gange scheme. Their total proposed capacity is 317 MLD through 12 STPs.

As part of Namami Gange programme, so far construction of 28 STP (30 projects) has been completed with a total treatment capacity of 650.05 MLD. As of now, 550 MLD sewage is being generated across the state and 129 STPs with a capacity of 4041.08 MLD, for water treatment (including projects in the trial run) are on.

Under the state sector and AMRUT scheme too, various water treatment facilities are under construction or in the planning stage. So far, (31 March 2023), ₹4,854.72 crore have been spent on this, showcasing our resolve to 'catch' the culprits that have polluted our perennial lifelines that have long been worshipped for their eternal kindness and the bounties of happiness they have brought along with them for so long.

Sewage treatment facility, either operational or about-to-be, are in Prayagraj (Naini, Phaphamau, Jhunsi), Kannauj, Naraura, Garh Mukteshwar, Anoopshahr, Kanpur, Ayodhya, Bithoor, Mathura-Vrindavan, Varanasi, Chunar, Firozabad, Moradabad, Kasganj, Etawah, Shuklaganj-Unnao, Sultanpur, Jaunpur, Baghpat, Muzaffarnagar, Budhana, Lucknow, Ghazipur, Mirzapur, Bareilly, Kairana, Farrukhabad, Agra, Meerut, Saharanpur, Ayodhya, Shamli, Hapur, Manikpur, Dalmau, Gulauti, Badhalganj, Chandauli, Deoband, Gorakhpur, Tanda, Mau (Dohrighat), Aligarh, Bulandshahr, Garh Mukteshwar, Ram Nagar and Hathras.

Namami Gange mission entails a holistic approach that includes

significantly improving river linked assets. What does your report card say on that front?

The schemes which I mentioned are aimed at cleaning the untreated water that flows into rivers and hence checking river pollution. Apart from this, *ghat*s, cremation grounds and *kund*s are being constructed or revived. In this connection, 69 *ghat*s and 13 cremation grounds have been completed.

In Varanasi, 26 bathing ghats have been revamped. Also, the beautification and revamp of eight *kund*s too have been completed. In Vrindavan, a project to revive nine kunds has been envisaged and clearance sought from National Mission for Clean Ganga (NMCG), which is expected soon.

Apart from this, Hapur's Pooth Ghat, Fataha Ghat in Mirzapur, Bajrang Ghat and Hanuman Ghat in Jaunpur, Kachla electric crematorium in Badaun and Bhagaon crematorium in Mirzapur are also under process. As of now seven *ghat*s in Varanasi (Dashashwamedh Ghat, Kila Ghat, Naukayan Ghat, Gyaan Ganga Ashram Ghat, Saraswati Ghat, Mahewa Ghat, Rasoolabad Ghat and Fatehpur Ghat (Nageshwar Dhaam Ashram Ghat) are under construction and would be completed by October 2024.

River Cities Alliance (RCA) is an important component of this mission to pave the way for better collaboration among stakeholders. How is it really playing out in terms of your contribution to the mission?

As many as 25 urban local bodies have been boarded on the River Cities Alliance platforms. The RCA is a joint initiative of the department of water resources, river development and Ganga Rejuvenation under the Ministry of Jal Shakti and the Ministry of Housing and Urban Affairs and has a vision to connect river cities and focus on sustainable river centric development. The RCA that began with 30 member cities in November 2021 has now expanded to 109 river cities across India.

In this connection, Urban River Management Plan (URMP) of Kanpur and Ayodhya has been ready with the support of National Institute of Urban Affairs (NIUA) and NMCG. Before this, the URMP of Bareilly and Moradabad was readied by NIUA. Besides, these municipal bodies have cleared proposal for readying URMP for Lucknow, Saharanpur, Varanasi, Agra, Gorakhpur and later for Prayagraj too.

The district Ganga Samitis are organising weekly meetings. The minutes of the meeting are uploaded on Ganga District Performance Monitoring Systems (GDPMS) portal. For better river health, 4,639,275 plants have been planted in 8,820.15 hectares along the rivers in the state.

For the treatment of industry-hit effluents construction of common effluent treatment plant (CETP) or its upgradation is being done for Banthar, Jajmau, Mathura, Gorakhpur, Farrukhabad and Unnao. In Mathura, the upgraded CETP has started working.

Examination of river water is done regularly by UP Pollution Control Board as per a pre-decided protocol and the report of the investigation is uploaded on the UP Pollution Control Board's portal.

Do you have preliminary indications to suggest that due to initiatives in the recent past, the quality of river water has begun improving and not deteriorating further?

As part of National Water Quality Monitoring Programme, encouraging development has been recorded at 36 places of the water quality check on River Ganga between July and August 2023. The samples collected from locations included Bijnor, Hapur, Bulandshahr, Badaun, Farrukhabad, Kannauj, Kanpur, Rae Bareli, Pratapgarh, Fatehpur, Kaushambi, Prayagraj, Mirzapur, Sonbhadra, Varanasi and Ghazipur.

Now, different stretches of Ganga River have recorded better quality and been upgraded from priority 4-5 in pollution index. Previously the block between Kannauj and Varanasi was ranked Four and now ranked Five are two other stretches – Farrukhabad to Prayagraj and from Mirzapur to Ghazipur. In sections ranked 4, the biochemical oxygen demand (BOD) is 6-10 PPM while, in section Four, it is 3-6 PPM. BOD measures the amount of oxygen required to remove waste organic matter from the water in the process of decomposition by bacteria that live only in an environment having oxygen.

Chlorine has also been used to ensure that post treatment, the water is free of pesticides and in some places ultraviolet rays too are being used.

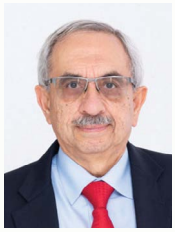
What are the other components of this grand mission – which may be lesser visible today but nevertheless have a critical role?

We are setting six Ganga Bio-diversity Parks in the state. These include the parks at Mohanpur, Mirzapur, Ramghat, Bulandshahr, as also Ujhani Park at Badaun; Alamgir Park, Hapur; Mahatma Vidur Park at Bijnor; and Kamakhya Bhavani Park, Ayodhya.

Furthermore, a conscious effort has been made to promote organic and natural farming so that riverine areas around Ganga and its tributaries are free of pollution and pesticides. That is why organic farming has been promoted in 1,23,580 hectares area across 27 districts along the riverine belt. Bundelkhand district too is a part of the project. Natural farming is being pushed in a big way as part of which 6,220-hectare area has been identified for the purpose. ◆

Preserving people, profit and planet

There are many paths for achieving carbon neutrality. But the cheapest way is through energy efficiency



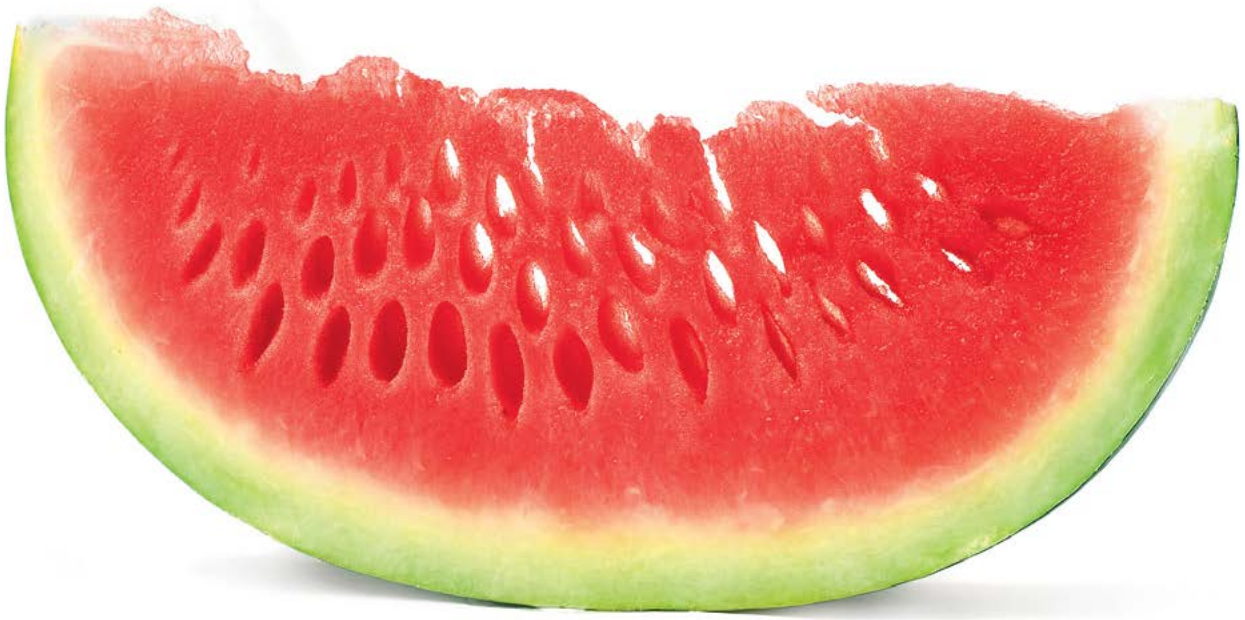
NADIR GODREJ

It is no longer Climate Change
Within a tolerable range.
A crisis is what it's about
With fires, floods as well as drought.
Every week a constant blast
Far worse than seen in the past.
If we must, we will adapt,
Prevention though would be more apt.
There is a cost to adaptation,
It's rising fast in every nation
As well as for the world at large.
And this will be a heavy charge.
In fact, we should by now conclude
Prevention would be really shrewd.
It actually would cost much less,
Indeed, avoid a lot of stress.
A uniform carbon tax
Would protect all our backs,
Collected by each Nation state
But universal in its rate!
All GHGs would be fair game.
Every country should charge the same.
The benefit that this would yield
Would be a level playing field.
Competitors just wouldn't care
Because this system's very fair.
Just how high should this tax be?
A range of numbers we can see.
But Sixty dollars per metric tonne
Would surely get reduction done.
For carbon this could be the rate
For others we would calibrate.
The appropriate rate we would select
Based on the Greenhouse Gas effect.
Based on today's emissions rate
Quite candidly I should state
It wouldn't be a trivial sum
But there's no reason to be glum.
In dollars it would be Two Trillion
It is a lot but not a Zillion!
Compared to global GDP
The percentage is less than three.
Compared to taxes then again
The percentage is less than ten!
Of course, some would then take a call
To reduce emissions not pay it all.
But bear in mind it's not a cost.
For the economy nothing's lost.
A UBI could be instated.
Some other tax could be abated.
And if this is indeed just so
The economy would still grow.
Don't you think it's very nice,
That there is no real price
Since very little would be lost
As adaptation has a higher cost.
But in the absence of a carbon tax
There is no reason to be lax.
While this would be best for all
Not every nation will take this call.
Businesses shouldn't wait
It doesn't pay to wake up late.
I believe it would be nice
To set an internal price.
Efficiency will always pay
Green energy's cheaper every day!
There may be some short-term pain
But over time we'll surely gain!
Emissions distribution isn't fair
The developed world had the lion's share
The developing world started late
But the impact on them is really great.
It would be fair to give some relief
But all the same, it's my belief
That my suggested solution
Could well lead to a resolution
Without any significant pain.
There is indeed much to gain.
But still, it would be very nice
If the first world pays a higher price
Or provides financing or technical aid
And encourages global carbon trade.
Climate change is now a curse
It steadily is getting worse.
Technology can save the day.
So far it has turned out that way.
As technology takes a leap
Green energy gets very cheap.
Keen observers quickly saw
That Solar also tracks Moore's law.

The author is Managing Director, Godrej Industries

Whether groundnut shell or bagasse
Our India's full of biomass.
New bamboo varieties are on the way
They can help to save the day.
Nuclear should no longer chafe
Modular nuclear is very safe.
At first, we thought we'd have to spend
But that's not true, for in the end,
The more we thought, the more we slaved
We did invest but we also saved.
And solar is still getting cheaper
And as we do start digging deeper
It will soon hit the goal
Of being cheaper than even coal.
There are many paths that we can see
For achieving Carbon neutrality.
But the cheapest way is certainly
Through energy efficiency.
In times of plenty it was fine
To overuse and over design!
But now we find we always gain
If we only use our brain.
Real interest rates are very low
And high returns quickly flow
From any energy saving device.
For business this is very nice.
Not only are returns quite brisk
There's also very little risk.
In India mandated CSR
Does help us all go very far.
Multiple benefits is what one sees
With water projects or growing trees.
Good livelihoods are created.
Our carbon emissions are abated.
Trees planted at a river's source
Maintain the flow throughout its course.
So many benefits we can see:
The preservation of biodiversity,
Now different species can be tried
Useful products can be supplied
Like biomass or edible fruits
And yet the trunk and the roots
Can sequester carbon, clean the air,
A win-win that is very fair.
An oil producer can now boast
To be COP 28's proud host.
Do fossil fuels still have scope?
With the climate crisis is there hope?
Many think it's time to turn
As there's no way to safely burn.
For any oil producing nation
There is one hope, that's sequestration!
The mines, the fields, from which we source
Can also be a rich resource.
Now CO2 can take us far
When it's used for EOR.
But when you use even more
Some more oil's pushed out for sure.
Though not enough to make it pay.
A carbon price could pave the way
And technology would save the day.
There could be other factors.
Algae grown in bioreactors.
As already discussed, one also sees
Scope through bamboo and through trees.
We can preserve people, profit and planet.
With a proper price and if we plan it!

We take out the pips.
And leave you the fruit.



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