

TerraGreen

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VOLUME 14 | ISSUE 2 | May 2021

TERRA YOUTH

A Circular Economy for All

IN CONVERSATION

Dr Anant Sudarshan
South Asia Director of EPIC

SPECIAL HIGHLIGHTS

Electronic Pollution:
An Environmental Monster

Rejuvenating Kedia Using Multipoint
Intervention

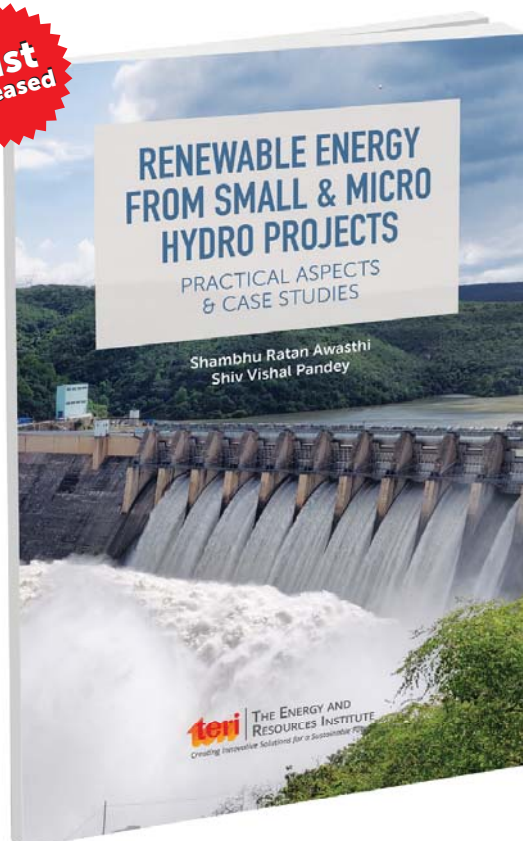
Rajaji National Park

A Biodiversity-rich Landscape in the Lap of River Ganga



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Energy production and utilization are directly associated with climate change. Harnessing energy from renewables can provide a viable path towards achieving sustainability and reducing carbon footprints, which can help mitigate the harmful effects of climate change. India is endowed with substantial hydropower potential.

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The Energy and Resources Institute
Attn: TERI Press
Darbari Seth Block
IHC Complex, Lodhi Road
New Delhi – 110 003/India

Tel. 2468 2100
Fax: 2468 2144
India +91 • Delhi (0)11
Email: teripress@teri.res.in
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EDITORIAL



“ Biodiversity is indeed the foundation which safeguards our planet, and we must find our own way to nurture biodiversity in our everyday lives. ”

Currently, India is grappling with a severe second wave of the COVID-19 pandemic as coronavirus cases in many parts of the country are rising sharply. Many health experts point out the presence of a 'double mutant' as one of the main reasons behind this sudden spurt of infections. As India battles to deal with one of the biggest health crisis in recent times, we must continue to follow all the safety measures and protocols. We need to rapidly vaccinate people, and also keep an eye on the mutations. If we do all this, I am hopeful we will be able to reduce the number of COVID-19 patients significantly and control the current outbreak.

Moving ahead, on May 22, we will be observing the International Day for Biological Diversity. Given the ongoing pandemic, the day will be marked by online campaigns and events. This year's slogan is, '*We're part of the solution*'. From nature-based solutions to climate, health issues, food and water security, and sustainable livelihoods, biodiversity is indeed the foundation which safeguards our planet, and we must find our own way to nurture biodiversity in our everyday lives.

This month's cover story on Rajaji National Park in Uttarakhand, highlights that the Park is the last sanctuary for a number of threatened animal species in the lesser Himalayan zone and upper Gangetic plains. Considering the abundance of nature's bounties in and around the Park, the area attracts a large number of wildlife conservationists and nature lovers. The Park was notified as Rajaji Tiger Reserve in the year 2015, making it the 48th Tiger Reserve in the country and second in Uttarakhand. This was a significant step, as the Park continues to sustain a wide range of endangered animals in the upper Gangetic plains, especially the Asian elephants and tigers.

The Feature article in this issue talks about the problem of electronic waste (e-waste) pollution that poses a major challenge to our environment. Electronic pollution is caused by discarded electrical or electronic devices. Used electronics which are intended for reuse, resale, recycling, or disposal are also considered e-waste. Informal processing of e-waste in developing countries leads to adverse human health effects and environmental pollution. Today, this waste has become the most expeditiously growing segment of the formal municipal waste stream in the world. The vital interventions that are needed include proper collection of e-waste, recovery and recycling of material by safe methods, disposal of e-waste by suitable techniques, a strict ban on the transfer of used electronic devices from developed to developing countries, and also raising public awareness on the impact of e-waste.

With these articles and many more of current interest, we hope that you enjoy reading this issue of *TerraGreen*. We do look forward to receiving your feedback and letters. Stay safe and healthy.

A handwritten signature in black ink, reading 'Vibha Dhawan'.

Vibha Dhawan
Director-General, TERI



I really enjoyed reading the April 2021 issue of *TerraGreen*. The cover story on Earth Day is very apt one as Earth Day continues to be a momentous and unifying day each and every year. The author very rightly says that if the global COVID-19 pandemic has taught one thing, it is this: everyone is affected by the pandemic, directly or indirectly. According to scientists, zoonotic diseases, such as COVID-19, can be traced to changes in land use and deforestation. We are taking over land that was home to other species in the past. SARS, H1N1, Ebola, MERS, Zika, and Nipah are also all examples of viruses jumping the species barrier. As the apocalyptic vision of 2050 seemed to suggest, such pandemics aren't bizarre manifestations of a small error in judgement. The pandemic is, in fact, a red flag pointing to an imbalance in our natural systems. I hope we do something

to prevent further damage and before it is too late for mankind.

Shankar Rao
Hyderabad, Telangana

The feature story published in the latest issue of *TerraGreen* made me think deeply about the present waste-to-energy (WtE) technologies in our country India. The introduction of various types of plastics into the waste stream led to waste management becoming significantly more complex. For a long time, WtE technologies struggled to address the problem of increasing share of plastics in solid waste. Novel technologies were developed to address this problem, but many are yet to match extant WtE technologies in terms of maturity. One of the contributing factors to the gap in maturity is the amount of time taken for the collective recognition of the issues caused by increased share of plastics in the waste stream. The current state of WtE technologies in India is one where the older and more mature technologies are heavily favoured due to factors such as affordability, scalability, and being time-tested.

C K Banerjee
Kolkata, West Bengal

My son Ankit liked reading the Babu&Bijili cartoon strip published in the April 2021 issue of *TerraGreen*. He learned about particulate matter from this informative and entertaining story. Please also publish about the wildfire in Uttarakhand in the forthcoming issues of the magazine.

Gayatri Kumar
New Delhi

Editor-in-chief
Ajay Mathur

Editorial Board
K Ramanathan
S K Sarkar
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Publishing Head
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Editorial Team
Abhas Mukherjee
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Design & Illustration
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Vijay Nipane

Production
Aman Sachdeva

Marketing, Sales & Distribution
Sanjeev Sharma
Nand Kumar Yadav
Alok Bhushan Singh

Head office
TERI
Darbari Seth Block, IHC Complex
Lodhi Road, New Delhi – 110 003
Tel. +91 (11) 2468 2100 or 7110 2100
Fax +91 (11) 2468 2144 or 2468 2145

Regional centres
Southern Regional Centre
TERI, CA Site No. 2, 4th Main, 2nd Stage
Domlur, Bangalore–560 071
Email: terisrc@teri.res.in

North-Eastern Regional Centre
Chachal Hengrabari, Express Highway
Guwahati- 781 036
Tel: 0361-2334790, Fax: 0361-2334869
Email: terine@teri.res.in

Western Regional Centre
House No. 233/GH-2, Vasudha Housing Colony,
Alto-St Cruz, Tiswadi, Goa-403 202
Tel: 0832-2459306, 2459328
Email: teriwrcc@teri.res.in

Overseas representation
TERI Japan
C/o IGES
Nippon Press Centre Building (8th Floor)
2-2-1, Uchisaiwai-cho, Chiyodi-ku
Tokyo, Japan - 100-0011, E-mail: teris@igesor.jp

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COVER STORY





PM Modi Announces India-US Agenda on Climate, Clean Energy

Prime Minister Narendra Modi, on April 22, 2021 announced the launch of the India-US Climate and Clean Energy Agenda 2030 Partnership while addressing the Leaders' Summit on Climate, a two-day virtual event hosted by US President Joseph Biden. 'As a climate-responsible developing country, India welcomes partners to create a template of sustainable development in India. This can also help other developing countries who need affordable access to green finance and clean technologies,' said Modi. 'That is why we are launching the India-US Climate and Clean Energy Agenda 2030 Partnership. Together, we will help mobilize investments, demonstrate clean technologies, and enable green collaboration,' he added.

Source: <https://www.thehindubusinessline.com/>

Management of Hazardous Waste in Maharashtra

The Maharashtra Pollution Control Board (MPCB) has instructed all producers and recyclers of hazardous waste to empanel transport services used by them. The move, officials said, will help in streamlining the management of potentially dangerous refuse, of which about 37 per cent annually goes untreated in the state. A recent circular issued by MPCB states that only registered transport services—which sign binding memorandums of understanding (MoUs) with their waste generators—will be allowed to transport hazardous waste materials in the state after May 21, 2021 to the four registered treatment sites in the state. As per data with MPCB, there are 7116 industrial units of varying sizes which produce hazardous waste in Maharashtra. These together generate about 1 million tonne of hazardous waste annually.

Source: <https://www.hindustantimes.com/>



Bengaluru Crematoria Struggle to Dispose of Medical Waste

The sharp rise in COVID-19 deaths in Bengaluru has triggered a big medical waste problem for the crematoria: They are struggling to dispose of the waste generated by the ambulance staff and relatives of the victims, besides the equipment used by crematoria staff. Concerned citizens say they have noticed that the crematoria staff, ambulance personnel and people who visit the place for the last rites of their dear ones often end up throwing PPE kits, gloves and masks inside the premises. The PPE kits are disposed of in the open areas of the crematoria. Citizens complain that the Palike is putting lives at risk by not setting up a proper disposing facility at the crematoria.

Source: <https://www.deccanherald.com/>



Dolphin Boom in Odisha's Chilika Lake

The population of dolphins in Chilika, India's largest brackish water lake, and along the Odisha coast has doubled in 2021 compared with last year.

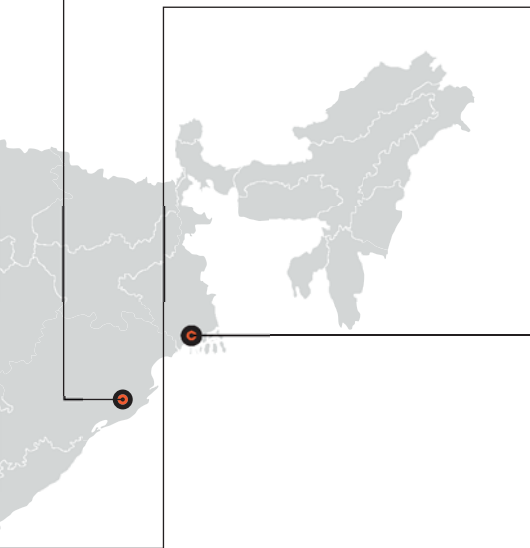
The wildlife wing of the State Forest and Environment Department released the final data on the dolphin census conducted in January and February this year, indicating a spectacular growth in numbers. Divided into 41 units, wildlife activists, academicians, Forest Department officials, NGO members, boat operators and researchers from the Bombay Natural History Society, Mumbai, participated in the estimation exercise.

Source: <https://www.thehindu.com/>

Solar Tree of 3.3 kWp Capacity Commissioned at NTPC Simhadri

On April 13, 2021, a solar tree of 3.3 kWp capacity, comprising 10 leaves each, having 330 Wp solar PV panels, was commissioned at NTPC Simhadri, Andhra Pradesh. The solar tree is unique in design and has been erected at the main gate entrance of the plant, symbolizing NTPC Simhadri's commitment to green power. On an average, it generates 2–2.5 kWp of power with more than 10 units of energy every day. The power generated by this solar tree is being used to cater to the power needs of the visitor pass section and the control room near the main gate.

Source: NTPC



East India Extremely Vulnerable to Climate Change: Analysis

Eight eastern states of Jharkhand, Mizoram, Odisha, Chhattisgarh, Assam, Bihar, Arunachal Pradesh, and West Bengal are most vulnerable to climate change and should be prioritized for funding and efforts to capacitate them against the associated risks, a report released by some of India's top institutes has assessed. Researchers at the Indian Institute of Science, Bengaluru and Indian Institute of Technology at Mandi and Guwahati, funded by the Department of Science And Technology have together done the assessment by defining vulnerabilities of states and districts using the Intergovernmental Panel on Climate Change's Fifth Assessment Report (AR5). The AR5 defines the risk of climate change as the interaction of three factors, namely, hazard, exposure and vulnerability, where vulnerability is defined as the predisposition to be adversely affected.

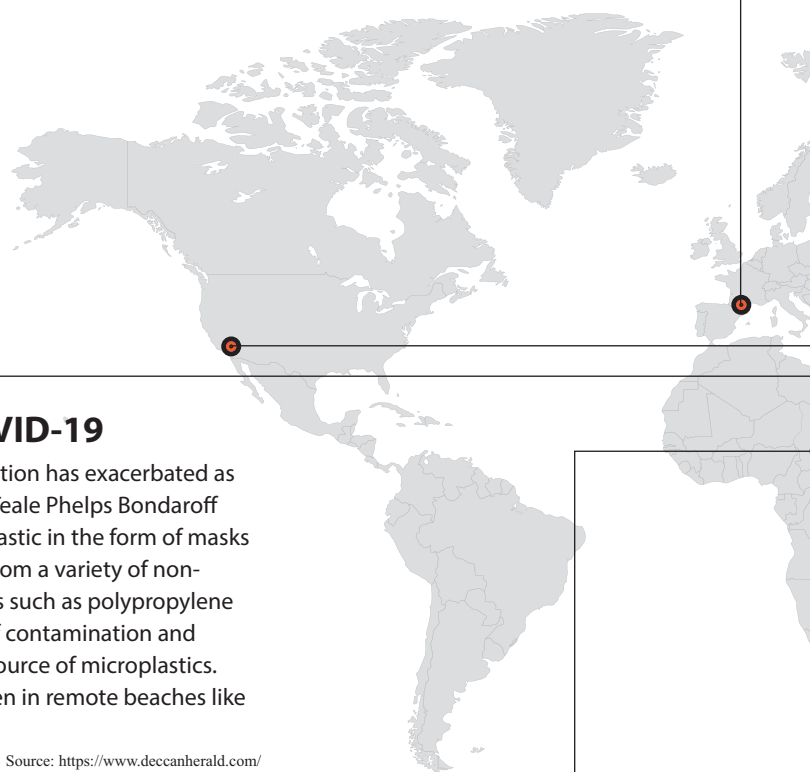
Source: <https://www.hindustantimes.com/>



EU to Cut CO₂ Emissions by 55 Per Cent by 2030

The European Union (EU) has adopted ambitious new targets to curb climate change, with a pledge to make them legally binding. Under a new law agreed between member states and the EU Parliament, the bloc will cut carbon emissions by at least 55 per cent by 2030, compared with 1990 levels. The EU parliament had pushed for a higher target of a 60 per cent reduction. 'Our political commitment to becoming the first climate neutral continent by 2050 is now also a legal one,' said EU Commission chief Ursula von der Leyen.

Source: <https://www.bbc.com/>



Green Emergencies in the Time of COVID-19

Plastic pollution is not a recent phenomenon. But plastic pollution has exacerbated as a result of the pandemic. As per a global study conducted by Teale Phelps Bondaroff and Sam Cooke of OceansAsia, 4680–6240 metric tonnes of plastic in the form of masks entered our oceans in 2020. Single-use face masks are made from a variety of non-woven materials, spunbond and meltblown spunbond plastics such as polypropylene and are difficult to recycle due to their composition and risk of contamination and infection. These masks in the marine environment serve as a source of microplastics. These microplastics not just negatively impact ecosystems even in remote beaches like the Andaman and Nicobar Archipelago but also marine life.

Source: <https://www.deccanherald.com/>

African Elephants Face Growing Risk of Extinction

African elephants living in forests and savannas are increasingly threatened with extinction, the Red List of species in trouble showed recently, as conservationists called for an urgent end to poaching. The new assessments by the International Union for Conservation of Nature underscore the persistent pressures faced by the two species of elephants in Africa due to poaching for ivory and human encroachment. 'We must urgently put an end to poaching and ensure that sufficient suitable habitat for both forest and savannah elephants is conserved,' said Bruno Oberle, IUCN Director General. The Swiss-based body's latest survey said the savanna elephant was 'endangered' and the much smaller, lighter forest elephant was 'critically endangered'—its highest category before extinction in the wild.

Source: <https://www.reuters.com/>





California's Wildfire Season has Lengthened

California's wildfire problem, fuelled by a concurrence of climate change and a heightened risk of human-caused ignitions in once uninhabited areas, has been getting worse with each passing year of the 21st century. Researchers in the Department of Civil & Environmental Engineering at the University of California, Irvine have conducted a thorough analysis of California Department of Forestry and Fire Protection wildfire statistics from 2000 to 2019, comparing them with data from 1920 to 1999. They learned that the annual burn season has lengthened in the past two decades and that the yearly peak has shifted from August to July. The team's findings are the subject of a study published recently in the open-access journal *Scientific Reports*.

Source: <https://www.sciencedaily.com/>



Wildfire Smoke Linked to Skin Disease

A new study suggests that the dangers posed by wildfire smoke may extend to the largest organ in the human body, and our first line of defence against outside threat: the skin. During the two weeks in November 2018 when wildfire smoke from the Camp Fire choked the San Francisco Bay Area, health clinics in San Francisco saw an uptick in the number of patients visiting with concerns of eczema, also known as atopic dermatitis, and general itch, compared to the same time of the year in 2015 and 2016, the study found. The findings suggest that even short-term exposure to hazardous air quality from wildfire smoke can be damaging to skin health. The report appeared on April 21, 2021 in the journal *JAMA Dermatology*.

Source: <https://www.sciencedaily.com/>



Microbes Are 'Unknown Unknowns'

A new study has highlighted how little is known about microbes—the hidden majority of life on Earth. Despite their importance to human life and the health of the Earth, a new scientific paper has shown our 'profound ignorance' of microbial biodiversity and how it is changing. 'We have no idea whether global microbial diversity is increasing, decreasing, or staying the same,' said David Thaler, a biologist at Basel University and author of the paper. 'Most scientific papers tell us new facts. This is a different kind of paper; it does not answer anything but asks a new question.'

Source: <https://www.theguardian.com/>



Bringing Down the Sun

To Power India's Small Enterprises

A study by TERI explored the feasibility and potential of solar PV applications in the micro, small, and medium enterprises (MSME) sector in rural India. In this article, **Prashanta Kumar Swain** tells us about the findings of this study. He feels that solar power can provide MSMEs in India a cleaner, reliable source of electricity that can be locally generated and maintained. Its proliferation, however, requires a policy push.

The micro, small, and medium enterprises (MSMEs) sector in India has been one of the most significant drivers of the Indian economy over the last 50 years. As per the 73rd Round National Sample Survey (2015–16), around 63.4 million unincorporated non-agricultural MSMEs are estimated to be engaged in various economic activities in India that contribute to 29 per cent of the country's total gross domestic product (2016–17) and employ nearly 111 million people.

The central and state governments have been rolling out various policies and schemes from time to time to enhance and improve infrastructure, technology, financing, and institutional support for the growth of MSMEs. This has been with a special focus on micro and small enterprises (MSEs) that account for nearly 99 per cent of the MSME sector. Further,

access and availability of energy source has been one of the critical factors in MSE sector that determines its productivity and employment generation. The sector has been heavily reliant upon a wide range of fossil fuel-based energy sources (coal, wood, diesel, grid electricity, etc.) to meet its energy requirements for processing, etc., despite the fact that fuel prices and emissions are ever increasing. Field studies undertaken by different organizations in India have found that the Government of India has almost achieved universal electrification; however gaps still exist in the quality and reliability of power supply in the rural areas where the MSE units are often based.

At the same time, there has been a gradual shift in technology and price reduction in producing reliable energy through cleaner sources, particularly

solar photovoltaics. They are widely considered a clean and reliable energy source that not only reduce the dependency on fossil fuels but also significantly cut down the cost of production due to their local generation and management. Thus, it is imperative to use solar energy to enhance the productivity and competitiveness in the MSE sector.

A Study to Make the Sun Work for Our MSMEs

The Energy and Resources Institute (TERI) with funding support from Shakti Sustainable Energy Foundation, New Delhi, undertook a research study to explore the feasibility and potential of solar photovoltaic (PV) applications in the MSME sector in rural India. The objective of this study, which particularly targets MSE clusters, is to identify 8–10 small and micro enterprise clusters, develop a road map for solar intervention in the feasible clusters, and create evidence for policy intervention for scale up. To achieve this, the study undertook a situation analysis through literature review and preliminary national-level stakeholder consultation. It then conducted a scoping study in five shortlisted states, in which it further identified three clusters for a primary survey. The findings of the study were shared in two state-level roundtable



meetings and one national-level workshop, in which stakeholder feedback was sought on the findings.

Ultimately, the states of Karnataka, Telangana, Gujarat, Uttar Pradesh, and Jharkhand were chosen for this exercise. These states were chosen on the basis of factors, such as average load shedding hours, solar irradiance, aggregate numbers of MSMEs per households, employment percentage, favourable solar and MSME policies, and feedback from stakeholders.

Based on these factors, a primary survey was carried out in nine selected clusters—the Khasbag (Belgaum) power loom, Chhannapatna wooden toy, Sidlaghatta silk twisting and Shivarapatna stone idol-making clusters in Karnataka; the Gandhinagar and Kutch pottery cluster and the Kutch, Surendranagar and Patan salt clusters in Gujarat; and Bishnugarh brass, Maganpur sewing, and Kharasawan silk reeling in Jharkhand.

The findings from the primary survey were analysed based on the information gathered such as existing sources of energy, consumption pattern, types of equipment and their production processes, energy efficiencies, potential solar applications and incremental financial benefits, interest of micro-entrepreneurs of respective clusters to invest in introducing solar power systems, etc. Consequently, solar PV systems were designed for different categories of micro-entrepreneurs of clusters and potential business models suggested for possible implementation and to scale-up solar PV across similar clusters.

Key Findings

A total of nine micro-enterprise clusters—four from Karnataka, three from Jharkhand, and two from Gujarat—were studied. Most of them are traditional and quite popular in their respective states. In fact, the salt cluster of Kutch and wooden toy cluster of Channapatna



The pottery cluster of Gandhinagar in Gujarat

are also well known nationally. A majority of them, such as the wooden toy, silk thread twisting, and power loom clusters in Karnataka, and the silk reeling and brassware clusters in Jharkhand are already registered under different schemes of the Ministry of Micro, Small and Medium Enterprises (Ministry of MSME) for possible assistance.

The clusters in Jharkhand face unreliable power supply due to which the relatively energy-intensive brass utensil cluster prefers diesel generators over the local grid supply. However, the recurring fuel costs are an additional burden on the micro-entrepreneurs. These clusters, thus, present a huge potential for solar deployment to reduce production cost and increase profitability. In contrast, clusters of Karnataka and Gujarat received regular grid supply and power charges are highly subsidized (as high as 60 per cent of the electricity bill) by the government, especially in Karnataka. In this scenario, the role of solar intervention would be to relieve the state government of huge amounts spent on power subsidies, which can potentially be diverted to provide subsidies on capital costs of the solar systems.

Lack of adequate capital subsidy provision under solar schemes for industry and commercial sector may be one of reasons due to which micro- and home-based enterprise clusters have not yet opted for solar (around 10 per cent of the capital cost is available for solar by the industry departments in the studied states). However, most of the entrepreneurs have expressed their willingness to invest 10–20 per cent of cost of solar PV system if it is subsidized

and financed through various schemes. The MSME policies of all the three states encourage the use of non-conventional energy sources in manufacturing sector. However, the popular schemes of MSME (Prime Minister Employment Guarantee Scheme, Cluster Development Programme for Micro and Small Enterprise, etc.) do not explicitly mention the necessary subsidy provision for promoting solar PV in the sector. The study could not even find any exemplary effort to promote solar PV by leveraging any loan instrument (such as MUDRA loan) in the states studied.

Conclusion

The study has assessed the solar potential across the clusters and the aggregate potential found is quite encouraging. In this context, solar PV has huge potential in similar clusters across the country. Unlike household electrification, there is no central or state scheme to promote solar PV in the sector. In this scenario, there is a need for a multi-pronged strategy by engaging multi-stakeholders from the Ministry of MSME, Ministry of New and Renewable Energy, concerned state-level nodal agencies, implementing agencies, solar PV manufacturers, banks/ other financial institutions, technical and research institutions, etc.

The strategy will be about finding a way out for energy security through policy inclusion as well as schemes with explicit support for clean energy, including solar PV promotion that will boost productivity, employment, and growth in the sector. ■

Prashanta Kumar Swain, Fellow, CFRA, TERI.

Impact of Coronavirus Lockdowns

New Study Collects Data on Pollutants in the Atmosphere

One consequence of the coronavirus pandemic has been global restrictions on mobility. This, in turn, has had an effect on pollution levels in the atmosphere. Researchers from across the world are using this unique opportunity to take measurements, collect data, and publish studies. An international team has now published a comprehensive review providing an overview of results up to September 2020.

A major consequence of the COVID-19 pandemic has been global restrictions on mobility. This, in turn, has had an effect on pollution levels in the atmosphere. Researchers from across the world are using this unique opportunity to take measurements, collect data, and publish studies. An international team led by

Forschungszentrum Jülich's Institute of Climate and Energy Research—Troposphere has now published a comprehensive review providing an overview of results up to September 2020. The study also has its own dedicated website, where additional measurement data can be added to supplement and refine existing research

results. At the same time, this collection of data allows scientifically substantiated predictions to be made about the pollution levels of future mobility scenarios.

The meta-analysis was coordinated by Prof. Astrid Kiendler-Scharr, Director at Jülich's Institute of Climate and Energy Research—Troposphere. The analysis





covers the measurement data of around 200 studies from the first seven months following the onset of the pandemic. It focuses on the following air pollutants: nitrogen dioxide, particulate matter, ozone, ammonia, sulphur dioxide, black carbon, volatile organic compounds (VOCs), and carbon monoxide. A third of the studies take into account the prevailing meteorological situation when calculating the influence of lockdowns on the air composition. The Government Stringency Index (SI)—summarizing the severity of local shutdown measures in a number that can be compared at international level—acted as a reference value.

A key finding of the analysis is that lockdowns, which have the sole aim of slowing down the infection rate, are also reducing the global pollution of the atmosphere with nitrogen dioxide and particulate matter—the higher the SI, the greater this impact. However, this only applies to pollutants that primarily have an anthropogenic origin, that

is, those pollutants that are directly emitted by humans, especially in the field of mobility. In contrast, ozone levels increased. This increase was a result of atmospheric chemical processes caused by reduced nitrogen oxide levels in the air.

The study also highlights current gaps in the data collection and the need for further research. The authors are therefore of the opinion that the period of analysis should be extended to cover the entire year of 2020. The scientists place a particular emphasis on hydrocarbons, which have so far only been examined sporadically in studies, and on extended analyses looking at the impact of emission changes on the climate.

An important addition to the meta-analysis is a database that can be accessed via a website (COVID-19 Air Quality Data Collection—<https://covid-aqs.fz-juelich.de/>). It contains all data from the study on pollution levels, including data on pollution levels in

individual countries. Researchers can also find a list of publications to date and thus obtain a quick overview of previous studies.

The website also invites scientists to present data from their new studies and to thus become part of the reference system. It therefore acts as a 'living version,' with the presentation of collected results being constantly refined. Similarly, there are plans to further develop the data collection to include measurement results and the analysis of other pollutants that are not part of the current canon, for example, hydrocarbons.

The important data could also form the basis for better assessments of the impacts on atmospheric chemistry in future scenarios. This includes a considerable, long-term reduction in pollution levels for a comprehensive transition to electromobility. ■

Source: www.sciencedaily.com
(Materials provided by Forschungszentrum Juelich).

Electronic Pollution

An Environmental Monster

Air pollution, water pollution, soil pollution—these forms of pollution have been widely written about and spoken on. Ironically, not many know about electronic pollution, that poses a major challenge to the environment. What makes it even more detrimental for the environment is that it significantly contributes to all the other forms of pollution. **Namrata Gulati Sapra** talks about the monster called electronic pollution, which has been digging its toxic claws throughout Planet Earth and feeding off its energy more rapidly than the mind can imagine...







If you think you're being environmentally smart because you recycle or salvage your electronic equipment, you could be mistaken, for all those measures you are taking are unfortunately, adding to the already-increasing environmental woes.

Categories of E-waste

E-waste or electronic waste is divided into three categories. The first type includes heavyweight appliances, such as refrigerators, dryers, etc. The second category of e-waste is about smaller appliances, such as irons, blenders, and so on. The third type includes appliances related to telecommunication and computers. These include mobile phones, laptops, etc.

Malpractices of E-waste

Your mobile phones, CPUs and other machinery that have expired their shelf life, whether recycled or not, can end up as e-waste. For instance, the waste components of CPUs could be made up of extremely toxic components, such as lead, cadmium and beryllium, which are ill-famed for environmental degradation. Electronic scraps are not just limited to just these three lethal components—this list is painfully long. Glass, plastics, metals (both ferrous and non-ferrous), cement, mercury, arsenic, and so on, are all enemies of the environment since they contaminate the air, water and soil drastically upon release. That apart, many of these are carcinogenic in nature, thereby also holding the potential of putting the

health of workers at risk. It doesn't help that many of the components of the discarded electronic equipment end up in the rising mountains of landfills. Needless to say, landfills contribute in an unprecedented way to soil, air and water pollution since they emit greenhouse gases (GHGs) responsible for global warming. Making matters worse is the fact that when the e-waste is disposed of without any planning, it is illegally exported to other countries, which further become the dumping site, thereby aggravating the gigantic environmental challenge in question. As per a report released in the year 2020 by the UN, the world produced a whopping 53.6 million tonnes of e-waste in 2019. The situation seems dismal since this is the highest recorded e-waste produced

ever in the history of mankind.

That's not all. Sometimes, this e-waste is dug into the earth, making it more hazardous for the environment when it begins to rot. At this point, it emanates a smell and emits methane. This gas, consequently contributes to the greenhouse effect. Waste in the form of leachate, after its decomposition, adds to pollution. After the e-waste is burnt, gases are released into the air, thereby polluting it. Further, acid rain is caused.

The Hazardous World of Digital Electronics

The indiscriminate use of electronics has led to electronic pollution in myriad ways. To begin with, electronic devices are made up of conductors, such as copper and other rare metals. The latter make up batteries and other parts of the devices. These components are found in mines. Mining, in itself is a process that does extreme harm to the environment by changing the face of landscape and being detrimental to the health of ecosystems. The digging, which is a crucial part of the process of mining, causes additional harm to Mother Earth since toxins are released into the air. On the other hand, gold, commonly used in digital electronics, involves gold mining, the byproducts of which include mercury and cyanide. These byproducts are further responsible for the contamination of water supplies. The pollution-causing process does not end here. To transport the devices from the point of origination to the supplier, shipping is the most common mode of transportation executed. Though shipping is the fastest and one of the most efficient means of transport for the purpose, the ships are fuelled by low-grade oil. This oil contains sulphur that exacerbates the challenge of pollution. The pollution-causing process does not end here. In fact, it is the starting point.

When the devices finally reach us, the environment is affected in many different ways, right from the word go.

Once you plug in the charger to power up a laptop or a phone, remember that you are adding to the greenhouse effect, thanks to the tonnes and tonnes of GHGs that are emitted. Even the apps that are downloaded in large numbers around the world on a daily basis have an environmental cost attached to them. Together, the smartphones and data centres account for a large part of the e-pollution. It is being estimated by researchers and scientists that in the technological industry, data centres along with the smartphones will leave the biggest carbon footprint on the face of Earth in 19 years from now. While by themselves the smartphones do not elevate pollution levels (since they consume little amounts of energy), as established before, it is the process of production that is one of the biggest enemies of the environment.

Though it is great that smartphones consume little energy, it is not so great that these gadgets have a short shelf life, thereby adding to the already rising levels of e-waste. As for the data centres, they are massively energy dependent and run on the electricity that is produced by fossil fuels.

Setting a Precedent—Switzerland

Though electronic advancement is a barometer of any country's progress, where all the machinery and electronic equipment end up and how they are it is discarded holds up a mirror to social and eco-consciousness. If this is anything to go by, Switzerland is truly setting a precedent for the world on how to manage e-waste effectively to minimize electronic pollution. Despite being a large producer of e-waste, the country is prudently managing it. It is remarkable how dedicated the Swiss are towards recycling devices, which has led to a dip in electronic waste-related pollution. The citizens of Switzerland have shouldered the responsibility of ensuring that e-waste is recycled. In order to achieve this goal, a take-back system has been established. This is an e-waste collection point, where the consumers can give their waste equipment. They can also take e-waste to electronic shops that specialize in selling e-waste all through Switzerland.

The electronic waste that Switzerland produces is not disposed of in landfills. Instead, it is incinerated, which means



that it is burnt to reduce to ashes. This practice of waste management can be traced back to the 1960s when the country began to install incineration plants aimed at producing clean energy and heat. A rather farsighted initiative that also helps the country meet its energy needs. A watertight system also ensures that all the Swiss rules and regulations with regards to the recycling of e-waste are followed. The country is also leaving no stone unturned when it comes to spreading the culture of e-waste recycling in other countries and is sharing its success stories with countries, such as Colombia, Egypt, and Peru.

On one hand, Switzerland is taking prominent steps to eliminate as much electronic pollution as it can, countries, such as China, India and the USA, are far behind when it comes to e-waste management. No wonder then that the three countries accounted for as much as 38 per cent of the e-waste across the globe in 2019. When looked at individual levels, the statistics were rather telling—China's production of e-waste exceeded 10



million tonnes. The USA painted a rather displeasing picture too as its e-waste was close to 7 million tonnes while for India, the number stood at 3.2 million tonnes.

The metropolitan cities in India are primarily responsible for contributing in a colossal way to the menace of electronic pollution. Among these cities, Mumbai takes the cake while other cities, such as Delhi, Chennai, Bengaluru, Surat, Kolkata, Pune and Hyderabad also

add significantly to the high levels of electronic pollution in India.

However, it is heartening to know that start-ups such as Karo Sambhav are taking note of the worsening condition of e-waste in India. In a short span of just three years, the promising start-up has collected gigantic amounts of e-waste (13,000 million tonnes). This waste was then responsibly recycled. The start-up has made the corporate sector, which is



highly responsible for raising electronic pollution levels in the country, an important part of the promising movement.

Things aren't looking too great either in the COVID-19 era. The technology trends that prevailed in the UK in the year 2020 exacerbated the dilemma with regards to e-waste as during the lockdown, more and more people discarded their electronic equipment in an attempt to declutter their homes, which did no good to the environment. As the work-from-home norm prevailed during the lockdown, more electronic devices, such as laptops, dongles, etc., were also bought for home to facilitate work. Naturally, this must have exacerbated the environmental challenge confronting us and our future generations manifold; future generations because there is no sign of the challenge easing out in the future. On the contrary, more trouble awaits us on the horizon and the figures seem to reiterate this fact. On an average, 50 million tonnes of e-waste is generated by the world every year and there isn't a ray of hope in sight as per the UN, which has stated that this number will be more than double by the time we enter 2050. The organization has pegged the number at 110 million tonnes, to be precise.

Accra—Home to the World's Largest E-waste

It is common to sight never-ending mountains of e-waste in Ghana's capital, Accra. Various countries across the globe conveniently use this part of the world to discard electronic goods that are of



no use anymore. Naturally, these rising mounds of e-waste have a debilitating impact on the environment, making it extremely toxic.

This mound, by the way, is famous, or let's say, infamous as Agbogbloshie dump. It is said that this dumping site of e-waste has some of the most lethal chemicals ever. Located near River Odaw, Agbogbloshie is a result of illegally traded e-waste from the western countries. The primary points of origination of this waste are the United States and western Europe. The air quality, thanks to the particulate matter is so horrendous here that it poses a serious threat to the health of those who work here in large numbers. One could say that they are so poor that they trade their health for the sake of money. Severe ulcers, nausea and of course, chronic respiratory problems—to name a few, have become a way of life for them and they cannot seem to find a way out of this environmental predicament. Researchers at the United Nations have maintained that the expanding scale of e-waste around the world is a very serious threat not just to the environment, but also mankind since it could prove to be a major health

hazard. The workers at Accra are living proof of this claim. Well, the said dangers are not just limited to humankind, but extend to the food chain, given that the livestock is commonly found here. In fact, the dumping site is a grazing spot for the livestock.

Ghana imports unparalleled amounts of e-waste, thereby flouting the Basel Convention that prohibits the act of dumping e-waste by developed countries into developing countries. Researchers have often reiterated the significance of addressing the grave challenge that Agbogbloshie poses to the environment with respect to electronic pollution, yet the note of caution sounded repeatedly by the experts has been left unheeded by the rest of the world. Germany, however, has taken note of this warning and has taken a noble initiative on its part to help tackle this challenge. The country has proposed setting up a recycling system here. A football pitch as well as a health clinic for the workers is also in the works. One can only hope that the rest of the world follows suit. ■

Namrata Gulati Sapra is a freelance writer who regularly contributes articles and other content for TerraGreen.



‘Heat Hampers Productivity at Work’

While weather conditions are known to impact productivity, a recent study has revealed that it gets harder for people to work when it gets hot, and this may lead to a reduction in national output in warmer years. **Dr Anant Sudarshan**, South Asia Director of the Energy Policy Institute at the University of Chicago (EPIC), co-authored this study with **E Somanathan** of the Indian Statistical Institute, Delhi; **Rohini Somanathan** of Delhi School of Economics; and **Meenu Tewari** of University of North Carolina at Chapel Hill.



About the Study

According to the study, people are less productive at work and more likely to be absent on hot days. The aggregate effects are large enough to significantly reduce the output of the manufacturing sector. By using several high-frequency microdata sets of worker output and a nationally representative dataset of more than 58,000 factories across India, researchers found that plants produce about 2 per cent less revenue for every one-degree rise in annual temperature. This is reflected in lower Indian GDP output in hot years and possibly also lower year-on-year growth. Researchers estimated that the greatest declines occurred in labour-intensive plants.

This study indicates that climate control in the workplace removes productivity declines but not absenteeism, presumably because workers remain exposed to high temperatures at home and outside. And the fact that climate control is expensive makes its use limited.

The authors argue that although the focus of the paper is on Indian manufacturing plants nevertheless, because heat stress is a universal physiological mechanism, there are implications for any sector where labour is important such as construction or services.

Following the release of the report, **Dr Anant Sudarshan** told *TerraGreen* on what this means for India in the next few years.

The study details on how heat impacts productivity and will reduce it in the times to come. Which are the sectors that are going to be hit most?

We can imagine any sector which is labour intensive to be impacted. There are variables such as the factory's size, the kind of temperature control technologies they may have, etc., that will also play a critical role in determining the impact.

In a labour-intensive country such as India, which relies heavily on manpower



Dr Anant Sudarshan

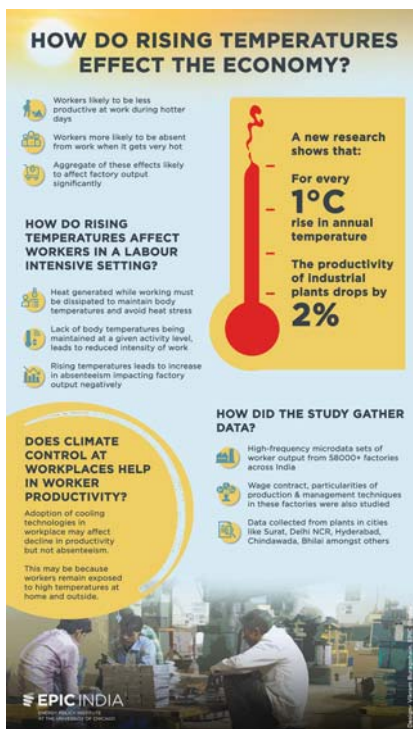
for work, does this mean more use of machines than people?

It is difficult to deny that if reduced productivity heavily impacts revenues, industries may adopt some degree of automation. The fact that those changes may influence wage inequality is another subject of concern.

Over the last few years, there has been an emphasis on energy efficiency and use of efficient cooling techniques. Will these help the labour force working in these factories?

Our study indicates that labour productivity tends to decline in the absence of climate-control facilities. What it also tells that if you provide cooling facilities, you may see improved productivity. Still, there is no improvement in absenteeism trends on scorching days—presumably because even when the workplace has air conditioning, the workers still spend a lot of time in their home and outside—facing high temperatures.

What is the solution to this problem? Can it be addressed effectively—in a way that it does not hamper employment?



The use of climate control (air conditioning) solves a big part of the problem by making temperatures lower at work—even if it does not eliminate absenteeism. However, climate control costs money because it uses a significant amount of electricity and thus raises operating costs. For many small industries with tiny profit margins, the extra cost will not be feasible, and they may have to put up with the reduced labour output. Ultimately, there is no easy solution for all industries, that is exactly why the issue is important and climate change is dangerous. Hopefully in the future, we will be able to produce ways of cooling that do not cost as much to operate.

Need to adapt and protect workers

The effect of high temperatures on lower crop yields has been previously established. This paper shows that rising

temperatures can also hurt economic output in other sectors by reducing the productivity of human labour. The damage is greatest when already warm days become hotter. If India wishes to succeed in becoming a manufacturing powerhouse using cheap labour, we need to think hard about how we can adapt to a hotter world.

The trends that we see in our data makes us think that warm countries in the developing world may face a pervasive 'heat tax' that could damage the competitiveness of their manufacturing sectors and further hurt the wages of poor workers. Research into low-cost technologies to protect workers from ambient temperatures may have significant social value. ■

Interview by Sapna Gopal, who is an independent journalist and writes on clean energy and environment. She can be reached on sapnagopalmd@gmail.com

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Rajaji National Park

A Biodiversity-rich Landscape in the Lap of River Ganga

Rajaji National Park is a magnificent ecosystem nestled in the Shivalik range and the beginning of the vast Indo-Gangetic Plains, representing rich floral and faunal diversity. The Park constitutes an important repository of the wild fauna and the last refuge of a number of threatened animal species in the lesser Himalayan zone and upper Gangetic plains. Considering the abundance of nature's bounties heaped in and around the Park, the area attracts a large number of wildlife conservationists, nature lovers, and eco-tourists. On the occasion of International Day for Biological Diversity (May 22), **Dr Ritesh Joshi** and **Kanchan Puri** have expressed their views about the wilderness and biodiversity of the Rajaji's landscape, which is also a haven for Asian elephants.

RAJAJI
NATIONAL PARK
राजाजी राष्ट्रीय पार्क

RAJAJI NATIONAL PARK

...a unique repository of
Shiwalik bio-diversity

Established: 1983

Area: 820.42 sq. km.

RAJAJI
NATIONAL PARK
राजाजी राष्ट्रीय पार्क

The world famous Rajaji National Park was established in the year 1983 with the aim of maintaining a viable population of the Asian elephants. The Rajaji National Park is one of the crucial wildlife habitats in the state of Uttarakhand, forming the northwestern limit of the range of Asian elephants and tigers in India. The Park has been designated as a reserved area for 'Project Elephant' by the Ministry of Environment, Forest and Climate Change, Government of India, to strengthen the management and conservation activities. The Park was notified as Rajaji Tiger Reserve in the year 2015, making it the 48th Tiger Reserve in the country and second in Uttarakhand. Declaring Rajaji National Park as the Tiger Reserve is noteworthy because it sustains a wide range of endangered animals in upper Gangetic plains, especially the Asian elephants and tigers. Besides, the reserve has a great conservation value, as it is an important part of Terai-arc landscape between Yamuna and Sharda rivers, which is known as Rajaji–Corbett Tiger Conservation Unit, having an area of about 7500 km².

Even though the park was established in 1983, final notification for the park was issued in the year 2013 because of non-settlement of rights of the local people and several other legal problems. Further, in the year 2002, this elephant range was also designated as the

11th Elephant Reserve in the country, and was named as the Shivalik Elephant Reserve, with an area 5405 km². In addition to the existing core area of 820.42 km² of the Rajaji National Park, few portions of Laldhang and Kotdwar forest ranges of the Lansdowne Forest Division and Shyampur forest range of the Haridwar Forest Division, which is 255.63 km², have been merged under the Rajaji Tiger Reserve, making it 1076 km² area.

Rajaji National Park falls under the tropical moist and dry deciduous forest type and upper Gangetic Plains biogeographical zone. The reserve constitutes an important repository of the wild fauna and is the natural heritage of Uttarakhand and the last refuge of a number of threatened animal species. This can also be attributed to a wide altitudinal range and presence of the River Ganga, flowing across the reserve. The reserve holds about 49 species of mammals, 28 species of serpents, 12 species of turtles/tortoises, nine species of lizards, 10 species of toads and frogs, 49 species of fish, and more than 300 species of birds. Diverseness of floral and faunal species and high probability of sighting of the elephants have always attracted the researchers and tourists to stay connected with the reserve. Records of the Rajaji National Park reveal that the number of foreign and national tourists has increased in recent years. During the years 2000–2001, nearly 5800 tourists enjoyed wildlife safari in Rajaji National Park, which



generated a revenue of ₹172,625 (\$2447.71). However, during the years 2015–2016, nearly 45,590 tourists visited the Rajaji National Park, from which a revenue of ₹10,202,739 (\$144,668.41) was received.

Some of the dominant floral species of the reserve are *Shorea robusta* (sal), *Mallotus philippinensis* (kamala), *Acacia catechu* (cutch), *Haldina cordifolia* (kadam), *Terminalia bellirica* (bahera), *Ficus benghalensis* (Indian banyan), and *Dalbergia sissoo* (Indian rosewood). Elephant is the flagship species of the reserve and other wild animals found in the reserve include *Panthera tigris* (tiger), *Panthera pardus* (leopard), *Ursus thibetanus* (Himalayan black bear), *Melursus ursinus* (sloth bear), *Hyaena hyaena* (hyaena), *Muntiacus muntjak* (barking deer), *Naemohedus goral* (goral), *Axis axis* (spotted deer), *Rusa unicolor* (sambar), and *Sus scrofa* (wild boar). Among reptilian fauna, the *Crocodylus palustris* (mugger crocodile) and *Ophiophagus hannah* (king cobra) represent Rajaji's faunal diverseness. This protected area is one of the important wildlife habitats in northwestern Shivalik landscape, which also forms the northwestern distribution range of the tigers, elephants, and king cobra in the country.

Rajaji National Park is one of the potential sites to observe wild elephants in their natural habitat. As per the recent estimates carried out by the Uttarakhand Forest Department in the year 2015, Uttarakhand harbours nearly 1800 elephants, which are distributed within 14 protected areas, including reserve forests. Interestingly, these population estimates indicate that there is a marginal increase in the number of elephants over the years. The estimation also reveals that Rajaji National Park has been maintaining a stable population of the elephants for the last 1.5 decades, which averaged 394.5 ± 71.90 (range 302–469). While working on the ecology and behaviour of the elephants



Tiger in the Chilla forest of the Rajaji National Park

in the park during the years 2000–2011, the first author recorded the male–female sex ratio of the elephants as 1:4.4. In another estimation carried out by the Uttarakhand Forest Department in the year 2015, the male–female sex ratio of the elephants was found as 1:2.4. All these figures, if taken into account, reveals that the park consists of a healthy sex ratio of elephants.

It is now widely acknowledged that the elephants are intelligent and learning to adapt to their changing natural environments. Such adaptations in elephants not only make them less vulnerable to changing environment but also support other animals in maintaining their existence during severe environmental conditions.

The Rajaji National Park has been one of the potential natural habitats for tigers in north India. In fact, historical account reveals that entire terai and bhabhar tract including the foothills of the Shivaliks once consisted of a healthy population of tigers. However, since the last 4–5 decades, the population of tigers was recorded as shrinking mainly due to the habitat fragmentation. In the Park, tigers are mainly concentrated in eastern axis and only few individuals are remaining in southwestern axis. This is mainly because of disconnectivity of habitats and larger landscapes. As per an estimation carried out by the Wildlife Institute of India, the population of tigers in the Rajaji National Park was about 15 in the year 2011, which is almost stable. A study carried out on the status of tiger and leopard in the Rajaji–Corbett Tiger Conservation Unit during 1999–2000 revealed that tigers are not utilizing the west bank of the Ganga River, that is, the southwestern part of the park. This study indicated that there could be 6–10 adult tigers in the entire 1500 km² habitat block, which includes the forest divisions of Shivalik, Dehradun, Narendranagar, and Rajaji–Motichur area of the Rajaji National Park. Since the last two decades, the Park has witnessed a



Spotted deer with her fawn in Chilla forest



Van Gujjars at the Gaindakhatta rehabilitation site

stable population of tigers, though the Park has been considered as a favourable breeding ground for tigers. As Lansdowne and Haridwar Forest Divisions adjoin the park, therefore based on landscape-level planning a feasible habitat management proposal could be formulated to strengthen tiger movement across the Rajaji–Corbett wildlife corridors.

Rajaji National Park has a huge potential for bird-watchers, as a large number of winter migratory birds arrive in the reserve every year, especially at the onset of winter (from mid-October to November) and stay in different locations of the reserve until the onset of summer. Most of the winter migratory birds arrive from parts of central China/Tibet, south Siberia, central and south Asia and some other countries having extreme cold climatic conditions, especially during winter. Besides this, some bird species from Himalayan region also arrive in the reserve during the winter. Since the last one decade, large flocks of migratory birds were observed decreasing. Climate change and anthropogenic activities in roosting sites were some of

the causes observed, which affected bird migration in the northwestern Shivalik landscape.

Pallas's fish eagle (*Haliaeetus leucoryphus*), Eurasian teal (*Anas crecca*), gadwall (*Anas strepera*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), red-crested pochard (*Netta rufina*), ruddy shelduck (*Tadorna ferruginea*), bar-headed goose (*Anser indicus*), black-necked stork (*Ephippiorhynchus asiaticus*), black stork (*Ciconia nigra*), painted stork (*Mycteria leucocephala*), Pallas's gull (*Ichthyaeetus ichthyaeetus*), black-headed gull (*Chroicocephalus ridibundus*), western yellow wagtail (*Motacilla flava*), Himalayan Griffon (*Gyps himalayensis*), darter (*Anhinga melanogaster*), wood sandpiper (*Tringa glareola*), great-crested grebe (*Podiceps cristatus*), and demoiselle crane (*Grus virgo*) are some common migrant birds reported in the Rajaji National Park. The Ganga River flows across the reserve and some of the small islands are also situated across the vast Gangetic plain, which provides feasible feeding grounds to these migratory species. Dudhia forest in Haridwar forest range, Jhabargarh forest in Chilla forest range and Gohri forests are some of the potential locations for observing these birds in natural environment. Besides, riparian corridors of River Ganga and its tributaries are some of the natural habitats for these winter migrants.

Gujjar Rehabilitation in Rajaji National Park

Gujjar Rehabilitation in Rajaji National Park is a model to showcase India's commitments towards biodiversity conservation. Gujjars are a nomadic pastoral community, who arrived in the Shivalik hills from the former state of Jammu & Kashmir (nowadays an Indian Union Territory) nearly 200 years ago, as part





of the dowry of a princess of Nahan (at present, a part of Himachal Pradesh). In Shivaliks, they raised domestic buffalos and practised pastoralism, spending winter and the beginning of summer (from October to April) in the Shivalik foothills and peak summer and monsoon (from May to September) in the Himalayan alpine pastures. These traditional migrations generally take about 20 days to complete one-side journey from lower to higher altitude areas or from higher to lower altitude areas. Livelihood of Gujjars is primarily based on rearing buffalo and cattle, and selling milk in local markets. For achieving the objectives contained in the provisions of the Wildlife (Protection) Act, 1972, Gujar relocation was commenced effectively in the 1980s, especially after the establishment of Uttarakhand state in November 2000.

Initial attempts were made in 1984 to resettle Gujjars (by the then Uttar Pradesh State Government, and now Uttarakhand) but the programme could not be succeeded because of non-participation of Gujjars in the programme. Besides, the fear of divesting of their traditional rights was another reason, which encouraged them not to leave the forest. With the passage of time, the programme was made more effective because of sincere and dedicated efforts by the Government and Gujjars' understanding about the benefits of urban life. This resulted in successful rehabilitation of about 98 per cent Gujjars in two different rehabilitation sites, namely Pathri and Gairdikhatta.

As a result of effective implementation of the Wildlife (Protection) Act, out of total nine forest ranges, seven ranges are completely free from Gujjars so far, which has reduced anthropogenic pressure in the Park. The programme has motivated Gujjars to lead urban life, which has considerably enhanced their livelihood and socio-economic status. Nowadays, most of their children are receiving education from schools, established by the state government at rehabilitation sites. Besides, they are cultivating some cash crops and vegetables in the land provided to each family at rehabilitation sites. Gujar relocation in the Rajaji National Park can be considered as a model demonstration to showcase effective conservation programmes of the country, which has facilitated in achieving the objectives of the Indian Wildlife Act on one hand, and has provided





better livelihood options to the pastoral Gujjars on the other hand. This conservation initiative has also ensured priorities of wildlife conservation and is a milestone to showcase the successful rehabilitation and ecological restoration model and to share conservation lessons with other range countries.

Four crucial wildlife corridors exist across the Rajaji National Park, which connect the reserve with Corbett Tiger Reserve, namely Motichur–Kansrao–Barkot (2.5 km long x 2 km wide), Chilla–Motichur (3.5 km long x 1 km wide), Rawasan–Sonanadi (10 km long x 5 km wide), and Motichur–Gohri (4 km long x 1 km wide). During 2000–2011, the movement of elephants was restricted in some of the corridors, mainly because of developmental activities. Some population of the elephants was also observed rarely using Chilla–Motichur and Motichur–Kansrao–Barkot corridors. However, the elephants were observed using the Rawasan–Sonanadi corridor on a regular basis. The



widening of the Haridwar–Dehradun national highway, which exists across the reserve to four lanes, would affect the movement of elephants across the Motichur–Chilla, Motichur–Gohri and Motichur–Kansrao–Barkot wildlife corridors. Keeping in view the importance of biodiversity and animal movement across these corridors, efforts are also being made to provide the animals with a natural connectivity to move across larger landscapes. Four flyovers are under construction (each ~0.5 km long) in different animal-crossing areas, which lie within the Motichur–Kansrao and Motichur–Chilla corridors. In southwestern part of the Park, access of the elephants to the Ganga River, which flows within the park area, has been restricted, mainly because of the presence of a national highway, railway track, and human settlements. Some recognized bulls used to move across Ganga occasionally by crossing the populated area and national highway and railway track. However, the movement of the elephant groups has almost been restricted in this part. In eastern part of the Park, movement of the elephants along the Ganga River could be seen in summer when their movements are confined nearer to the riparian corridors.

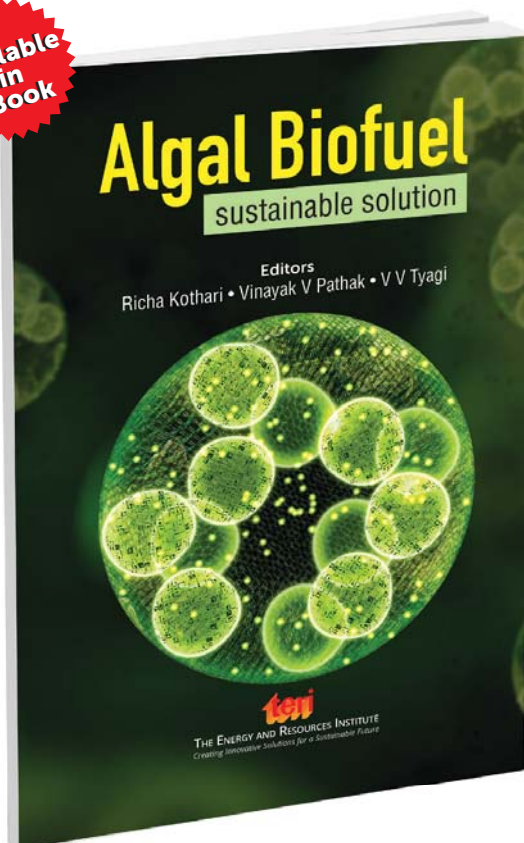
Today, since most of the wild animals are listed under various Schedules of the Indian Wildlife (Protection) Act 1972, Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and in the Red List of Threatened Species of the International Union for Conservation of Nature (IUCN), the future survival of the wildlife in the Rajaji National Park largely depends on effective management and conservation approaches. Moreover, local community and stakeholder's participation in conservation initiatives and habitat's monitoring would be an effective management and conservation strategy.

In north-west India, Rajaji National Park is one of the crucial protected areas, which is a stronghold of Asian elephant population with approximately 17.19 per cent of its overall population in Uttarakhand. The undulating tropical moist deciduous and mixed forests and vital upper Gangetic plains further enhance the significance of this protected area. In such a situation, providing a natural connectivity for frequent movement of wildlife within the large landscapes is one of the major challenges, which has to be addressed on priority. ■

Dr Ritesh Joshi is Scientist 'E' in the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India (GoI), New Delhi and has keen interest in wildlife conservation, protected area management, and nature education. Ms Kanchan Puri is Programme Coordinator in Environment Education Division, MoEFCC, GoI, New Delhi having deep interest in biodiversity conservation and environment education.

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Rejuvenating Kedia

Using Multipoint Intervention

Although the Ganga–Yamuna doab is known to be the most fertile region of India, one is persistently struck at the impoverishment among agriculturists here. Delving into the problem some years ago, Greenpeace activists decided to look into the dynamics that lie at the root of it. **Dr Rina Mukherji** brings out the fact that it is to Kedia village's credit that her farmers and householders are showing the way by fighting climate change, using re-discovered, time-tested, home-grown methods on small landholdings.

There were three districts that caught the attention of the Greenpeace activists who decided to look into the reasons behind the fact that although the Ganga–Yamuna doab is known to be the most fertile region of India, one is continually struck at the impoverishment among agriculturists here. These districts were: Samastipur, Nalanda, and Jamui. But, Samastipur had a major agricultural university, while Nalanda was, by all means, a progressive district with a lot going for it. That left out Jamui, which was a highly neglected district, totally dependent on agriculture, with small and marginal farmers making

up 96 per cent of its population. This was how Greenpeace zeroed in on Jamui district, where a host of problems triggered by climate change were being faced by local farmers. In spite of fairly good total rainfall of 1000 mm, the crops were being starved of water. The rains were no longer during the monsoon months, but came early. This had compelled farmers to tap groundwater resources to cater to the demands of the modern high-yielding rice and wheat varieties, which they were cultivating. Water resources were depleting fast, leaving the locals high and dry, especially during the summer months. Kedia

village, where except one household owning five acres of land, everyone had landholdings in the range of 2–3 acres, seemed the ideal point of intervention. The village had only 100 families; this was seen best-suited for a cohesive approach. Seeking to find solutions, Greenpeace initiated several rounds of discussions involving the farmers, scientists at the Krishi Vigyan kendras, and government officials. At the end of it, they found that there were eight major points that needed to be looked into, as regards the intervention by the farmers' collective which they had organized. 'These were,' to quote Greenpeace Project Coordinator



Kedia farm surrounded by trees



and Sustainable Farming Campaigner Ishteyaque Ahmad: 'a. Redefining biomass residues and their conservation; b. Biomass-based soil rejuvenation and pest management; c. Ecological farming practices; d. Water conservation; e. Knowledge co-creation; f. Community enterprise; g. Enhancing agrobiodiversity; and h. Ensuring government investment in infrastructure building.'

Realizing the challenge posed by caste dynamics in Bihar, Greenpeace activists were particular on insisting on the non-negotiability of social and cultural inclusion in their initiative. Yet, the differing perspectives of government officials and conflicting interests of certain farmers' groups did pose a challenge. Additionally, and most significantly, the high amount of pesticide used until then also needed

to be overcome. However, knowledge co-creation with the help of the farmers, and the screening of films to bring forth the manner in which other groups across India had overcome their agricultural challenges helped usher in a much-needed change. The farmers themselves realized and endorsed the need to conserve water, and in view of the same, volunteered to stop using borewells. A close look at existing government schemes presented a pleasant surprise, though. The government had funds allocated for soil and water conservation, agro-forestry, vermicomposting, and biogas plants—all of which are interlinked to organic farming—under various heads. Unfortunately, these were scattered, and operated by different departments. Greenpeace undertook the necessary liaison and facilitation

exercises for the farmers, and soon, matters got going. There were provisions for building canals and vermicomposting facilities under The Mahatma Gandhi National Rural Employment Guarantee



Act (MNREGA), social forestry was managed by the Horticulture Department, while the sinking of shallow wells was funded by the Soil & Water Conservation Department of the Bihar government. Once Greenpeace took the matter up, the state government responded with élan, and became proactive in releasing funds for each one of the activities, and ultimately went on to bring in a cohesive structure to oversee all related work.

Initially, it took 10–12 months to completely wean farmers off chemical fertilizers. But, at the end of two years, the use of urea had gone down by 55 per cent, while the use of diammonium phosphate (DAP) had come down by 43 per cent, with the farmers forming their own collective and microfinancing venture. The newly-formed farmers collective—the *Jivit Mati Jaivik Jamui Abhiyan*—went on to write to the state government and demand the sinking of shallow wells in Kedia; the government responded with the sinking of 13 new wells, as also improved infrastructure. Very soon, there was a notable rise in the groundwater level.

Noting that there was nutritional deficiency, and also food self-sufficiency was lacking in the village, the villagers were instructed to make optimal use of their water resources. 'Women, we found, were the most receptive to these ideas. Hence, we got them to make the most of soak pits around their homes, by growing



kitchen gardens. Pumpkins, bottle gourd, brinjals, green leafy vegetables that are easily grown, high in nutrients and fibrous, were promoted.' Ahmad tells me. This also helped tidy up the surroundings and prevent the outflow of water.

The next step was to put an end to the monocropping of rice and wheat crops that had prevailed in Kedia, until then. Anandi Yadav, who owns 3 acres of land, tells me, 'We had noted how the water level in wells in adjoining villages was dropping drastically in summer. We wanted to prevent this; although since a tributary of the Ganges-Rakshijor flows past our village, we are better off. We had also noticed how fevers, diarrhoea, and dysentery had become frequent in our

villages ever since chemical fertilizers had become the norm.' Hence, the farmers were easily persuaded to return to traditional land-race varieties, and mixed cropping. The reduced costs were also a major attraction, since natural organic methods spelt *Apna beej, apni khaad* (Our own seeds, and our own fertilizer).

To retain soil moisture, and prevent the soil becoming barren once the Kharif or Rabi crop was harvested, lentils, legumes and vegetables were introduced. Thus, in the post-Rabi months, the farmers started planting mung. Since mung is leguminous, it also improved the nitrogen content in the soil. The area around wells was utilized, meanwhile, to grow a variety of vegetables for the market. 'We were particular to promote vegetables such as brinjals, beans, and gourd, which have greater biodiversity, as also a wide variety of green leafy vegetables,' Ahmad tells me. In the farms, 4 feet wide beds alternating with one foot wide water channels were made, wherein mixed farming was promoted using the 'Living Soils' approach. Thus, tall plants, were grown alongside mid-level bushes, tubers and herbs, just so that pests could be controlled or quarantined, since each species is attacked by a specific pest. The farmers have now learnt to plant trees



Kedia well being used to pump water into farms



Kedia woman tending to her farm

such as neem along village roads for not just providing shade, but for providing valuable raw material for biocomposting and manure. Meanwhile, greener farms all the year round have seen a surfeit of birds return to the village. Rather than drive the birds away, farmers have learnt to welcome them as natural predators to control pests. In turn, mixed farming now provides farmers with an income throughout the year.

Take the case of farmer Anandi Yadav, who owns just three acres of land.

Anandi Yadav now grows lentils and mustard on 30 per cent of his land; vegetables and turmeric on 10 per cent of his land; while retaining 60 per cent for growing rice, wheat, and maize. Yadav has a vermicomposting unit and makes his own biocompost for his farms. Other farmers in the village have also availed of loans through the microfinance scheme run by their Committee to set up their own vermicomposting and biogas units.

At the moment, Yadav, along with farmers Rajkumar and Manoj Tanti, has been in the forefront for demanding that government-run anganwadis opt for organic produce from within their respective villages to feed their children. 'This can ensure a ready market

for our produce.' The farmers are also in favour of the state government making higher investments in creating decentralized infrastructure for soil and water conservation, besides allocating enhanced budgets for climate-resilient, and biodiverse agricultural practices.

Already, this small village of 100 farmers is showing the way by growing nearly all its requirements. With the help of a total of 75 open wells here, the farmers' collective here has turned its 45 acres of farmland into 100 per cent organic.

Spurred on by the Kedia model, and suggestions to implement a single-window scheme for undertaking all agriculture-related schemes for farmers, the Bihar government is now in the process of setting up the Bihar State Organic Mission. Under its Organic Farming Promotion Scheme, the Bihar government intends to turn 21,000 acres comprising 13 districts from Patna to Bhagalpur on both sides of the Ganges into an organic corridor. Farmers in the belt have already been given a financial incentive of ₹6000 per acre to switch over to organic farming methods, in addition to various subsidies. 'We have already converted 14,270 acres into

organic farming. We plan to achieve our target of turning 21,000 acres organic by March 2021,' Joint Director, Organic Cell (Bihar Government) Bankatesh Narain Singh, told me earlier. The state government has set up a model organic farm at Fatua, to popularize organic produce. Currently, organic produce from the government farm, as also various farmers, is being sold in the Mithapur and Sachivalaya areas of Patna. 'The idea is to eventually set up marketing hubs for organic produce in all cities and towns of Bihar,' Singh informs me. To this end, the Bihar government has recently allocated funds for the re-silting, cementing and rejuvenation of 80,000 wells in the state, at the cost of ₹60,000 per well.

It is to Kedia's credit that her farmers and householders are showing the way to a world wrought by climate change, using re-discovered, time-tested, home-grown methods on small landholdings. One hopes that it will ultimately help us usher in disease-free, food-secure communities for a better world. ■

Dr Rina Mukherji is an independent journalist with more than 25 years of experience. She holds a doctorate in African Studies and has several media and academic awards to her credit.

India's RE Capacity Goal by 2030

To Offset Major Carbon Emissions

In this article, **Ramya Ranganath** says that once all the sanctioned renewable energy projects attain fruition in 2021, and all the gaps are plugged, India is well underway towards achieving both its 2022 and 2030 target of 175 GW and 450 GW of renewable capacity, respectively. It will help India in achieving its intended nationally determined contributions.

The Jawaharlal Nehru National Solar Mission (JNNSM), initiated in 2010, is an endeavour by the Government of India (GoI) to promote solar power in the country. The JNNSM has a set target of 100 GW solar photovoltaic (SPV) capacity additions by 2022. On a larger note, India set a target of installing 175 GW of renewable energy (RE) capacity by 2022. Of this, 100 GW will be from solar power, 60 GW from wind energy, 10 GW from bio-energy, and

5 GW from small hydro projects. The Ministry of New and Renewable Energy (MNRE), GoI, has been drafting various policies and subsidies in order to help developers and the country as a whole reach this target within the stipulated period.

In a more recent development, the Centre announced a new target of 60 per cent of installed energy generation from renewable sources by 2030. In September 2019, way before the

COVID crisis struck, the Hon'ble Prime Minister of India, Shri Narendra Modi addressed the Climate Action Summit at the United Nations. At the Summit, PM Modi declared India's new clean energy target of 450 GW by 2030. Additionally, 60 GW will come from hydro-electricity, making the target 510 GW in total. Currently, the Phase III of the JNNSM is underway. Here, the cumulative goal for grid-connected SPV installations is 100 GW, including rooftop solar installations.



Current Status of Renewables in India

India generates a large amount of energy from renewables. As of February 28, 2021, the total grid-connected RE capacity installed in India is:

- 39.08 GW of solar power
- 38.78 GW of wind power
- 10.14 GW of biomass power
- 4.7 GW of small hydro power
- 168 MW of waste-to-energy projects

More than 38 per cent of the country's installed electricity generation capacity is from RE sources. This amounts to approximately 93 GW as of February 28, 2021, which is more than halfway through to achieving the target of 175 GW by 2022 (*Source: mnre.gov.in*). Until recently, large hydro was not considered a renewable energy source. However, it has now been classified under renewable sources. Now, large hydro plants can also sell their energy through renewable energy purchase obligations.

Renewable energy also received foreign direct investment (FDI) inflow of \$9.68 billion, between April 2000 and September 2020. India is expected to receive investment of \$500 billion by 2028, in the renewable industry. The country's clean energy sector is among the top ten largest in the world. Many private developers have already invested and are planning to invest heavily in the renewable sector. Many projects are in the offing, and once commissioned, will



get the country closer to its target of 175 GW.

The GoI has floated multiple schemes and initiatives. Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan (KUSUM) is a scheme by the MNRE to promote off-grid and distributed solar power projects. Sustainable Rooftop Implementation for Solar Transfiguration of India (SRISTI) is another scheme that has been established to enable the propagation of rooftop solar (RTS) projects. The MNRE will be giving custom and excise duty benefits to the RTS sector. This will reduce setting up costs and boost growth of the sector. A plan to add 30 GW of clean energy projects along a desert on the western border of India is underway. The Delhi Government shut down the thermal power plant in

Rajghat in order for it to be developed into a 5000-kW solar park. These are some of the many subsidies, schemes and initiatives taken by the country to promote renewables and achieve its ambitious targets in the sector.

Attaining the Goal of 450 GW Renewable Energy by 2030

Yes, the target is ambitious. And yes, it requires a lot of planning, execution and deployment, systematically over the next few years. But is it achievable?

In the Paris Agreement, India has pledged a target of Intended Nationally Determined Contributions of achieving 40 per cent of its total energy capacity from clean energy sources by 2030. This was at the United Nations Framework Convention on Climate Change (UNFCCC) conference of the parties in Paris in 2015, and stood at 350 GW of RE. At the Climate Week in New York, the target increased to 450 GW. This exceeds the Paris targets.

While we have already seen the significant and commendable progress made in this regard, the country still has a long way to go. Taking the present RE capacity into consideration, the ecosystem needs another 250 GW of clean energy capacity to be up and running in the next 10 years. Speaking



at an event towards the end of 2020, titled 'Safeguarding the Planet,' Prime Minister Narendra Modi said that more technological and financial support is required for developing countries. He also stated that climate change must be handled in an integrated, comprehensive, and holistic manner. While addressing the G20 Summit, PM Narendra Modi said that India is planning on exceeding its Paris targets. Modi spoke of the International Solar Alliance (ISA), saying that it was spending billions of dollars on training people and focussing on research and development (R&D) in the field of renewables.

India needs to make a resolute effort in terms of policy changes. The industry needs to mature and become a more demand-based sector than a policy-driven sector. This will happen through creating mandates for RE project creation at a state wise and national level. Apart from this, projects need to have fixed tariffs and should be long term, with more safety protocols both physically and fiscally. Infrastructure is a big issue that is delaying projects in renewables. Fixing infrastructural and related issues will go a long way in speeding up the process of achieving both the targets (2022 and 2030). Transmission infrastructure is outdated or does not reach remote pockets of the country. Transforming transmission infrastructure should take priority. The Green Corridor project aims to do just that. Also, the Solar Park scheme will go a long way in fixing transmission and land procurement-

related issues, provided these parks are developed adequately and within the stipulated time frame. Intermittency is a serious issue when it comes to renewables. Battery storage and round-the-clock projects will solve this issue to some extent. Extending schemes and subsidies for battery storage is the onus of the government. Fixing these factors will go a long way in helping developers commission projects faster and reach our national-level capacity-addition targets.

Impact of the Coronavirus on Renewable Energy: the New Normal

The pandemic has slackened economies globally and India is no exception. The energy sector has taken a beating on account of the outbreak-induced slowdown. The demand for power has decreased post the onset of the coronavirus. However, the RE industry has been immune to the virus-related economic downturn. During the outbreak, electricity generated from clean sources ruled the roost in countries such as the US and across Europe. Experts predict that India's RE capacity may double in 2021 compared to the previous year. Even with the pandemic looming large, 8.2 GW of SPV capacity was auctioned in the country by September 2020. Round-the-clock projects are also gaining traction. The major bottleneck, though, is the financial apathy of

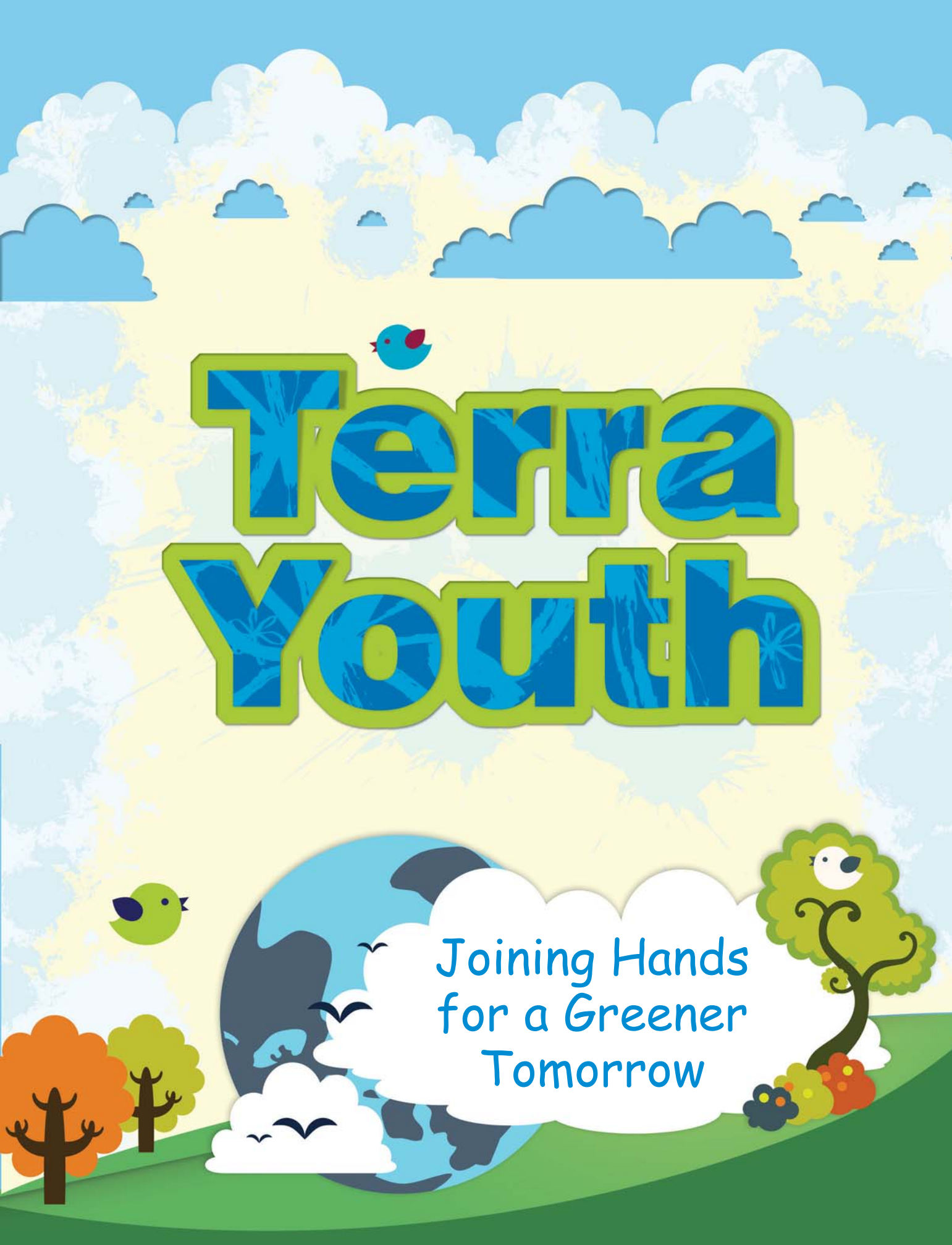
distribution companies (DISCOMs) preventing and delaying payments to generators. However, these utilities were in hot water much before the pandemic struck. Despite that, this issue needs to find some sort of practical resolution if national renewable targets need to be met.

Conclusion

India is a hotbed for RE projects. Also, India's response to the pandemic was efficient and united, putting the country on the map. Many countries have turned to India for help and support during the outbreak. India has also supplied COVID vaccines to various countries. This is a big step forward in terms of building credibility for 'Make in India' products, getting us closer to the goal of self-sufficiency. The economy, however, has taken a drastic beating. Recovery and the process of rebound will have to be multi-pronged. Renewable energy can play a huge role in economic recovery in the country. Added renewables increase energy security, reduce our dependence on oil and coal imports, which becomes a cost-saving endeavour. It tackles climate change, helps us achieve Paris targets, and plug the energy gap in both urban and rural settings. Rooftop solar projects translate to reduced overheads for commercial and industrial as well and individual and residential entities. Moreover, expanding RE capacity creates more jobs in the country, something which is of utmost importance at the moment. Once all the sanctioned projects attain fruition in 2021, and all the aforementioned gaps are plugged, India is well underway towards achieving both its 2022 and 2030 target of 175 GW and 450 GW of renewable capacity, respectively. ■

Ramya Ranganath has worked with several websites and agencies as a content specialist. She writes on clean technology and her focus is primarily on renewable energy and clean mobility. She is passionate about contributing to the adoption of clean energy for transformation and well-being of people and ecosystems.





Terra Youth

Joining Hands
for a Greener
Tomorrow

A Circular Economy for All

'What Goes Around Comes Around!'

In this article, **Sarah Berry** highlights that for a rapidly developing country such as India, the adoption of a circular economy is of paramount importance, not only because of the rate of growth the country is undergoing and projecting, but also because of the numerous benefits this concept brings with it.

My recent visit to a bookshop took me by surprise: I saw it filled with deeply engrossed individuals trying to secure their next 'best friend'. The surprise element was more attributed to an amalgamation of the pandemic and the hostile takeover by e-books. However, whatever said and

done, though technology seems to have taken over most of our lives, there still seems to be ample room for the 'old school'.

Technology dissemination that happens via devices of all shapes, sizes and forms has made our lives so dependent on it that we no longer

remember meeting dates, birthdays, phone numbers, and so on—as we used to do earlier. And, this is just one aspect. We humans do not seem to have enough of our technical gadgets.

As per Invest India, the world's fastest growing industry, that is, Electronics System Design and Manufacturing (ESDM)



continues to transform lives, businesses, and economies across the globe. The global electronics market is estimated to be over \$2 tn. India's share in global electronics manufacturing has grown from 1.3 per cent in 2012 to 3 per cent in 2018. Some other noticeable points are as follows:

- India is expected to have a digital economy of \$1 tn by 2025
- One of the largest electronics markets in the world anticipated reaching \$400 bn by 2025
- India's ESDM sector is expected to generate \$100–130 bn in economic value by 2025.

The above figures do not come as a surprise, given the fact that more than 60 per cent of India's population is below 35 years of age; but what does come as whopper is what we do with these gadgets once their life-span, albeit a short one, draws to a close. Of the more than 2 million tonnes of e-waste generated annually by India, a dismal 17 per cent or whereabouts is what is recycled for re-usage! Reasons are aplenty: the know-how pertaining to effective, intelligent, sustainable recycling of this huge mass of e-waste is missing; what is known hardly accounts for what one can term as recycling; the informal nature of the sector; faulty policies, regulations and rules; and most importantly the motivation behind recycling of e-waste as an industry is absent. These are just some of the many hurdles.

The declaration of achieving a \$5 trillion economy by 2025 throws the spotlight on the manufacturing sector, across products, which makes the concept of a circular economy imperative. As per a report by the Ellen MacArthur Foundation, circular economy would have the most impact on three focus areas: cities and construction, food and agriculture, and mobility and vehicle manufacturing.

Let us understand what is, actually, meant by a circular economy: in definition it is, basically, right the



opposite of a linear economy. As the name suggests, in a circular economy what goes in as input and results in a certain output is re-introduced into the cycle so that any waste generated during that particular journey is re-utilized as much as possible. This way, value and profit are enhanced as the life span of products, in diverse forms, is extended. In other words, these three R's are integral: reuse, recycle, and remanufacture, if you can't reduce.

For a rapidly developing country such as India, the adoption of a circular economy is of paramount importance, not only because of the rate of growth the country is undergoing and projecting, but also because of the numerous benefits this concept brings with it: reduction of environmental distress, increase in business savings and profits, efficient production processes and quality outputs. In order to understand the dire need of application of the concept of circular economy to our country, here is a look at some hard-hitting facts that not only serve as food for thought but also underline the need for a faster adoption of this approach.

According to an article in the *Business World*, between 1970 and 2015, India registered a sixfold increase from 1.18 billion to 7 billion tonnes in annual material consumption. By 2022, India will be the most populous nation in

the world, and it is expected that by 2030, its annual material consumption would double to 14.2 billion tonnes due to population growth, urbanization, economic mobility, and the resulting growth in per capita resource consumption. Currently, India's resource extraction of 1580 tonnes/acre is 251 per cent higher than the world average of 450 tonnes/acre. While Europe recycles 70 per cent of its consumption items, India recycles only 20 per cent. India is also the third-highest emitter of greenhouse gases, and accounts for 9.2 per cent of total world emissions. Given that India aspires to become a global manufacturing hub, we would witness higher levels of consumption of raw materials, than what is required to meet India's domestic needs. Therefore, India's traditional take-make-waste linear economic approach will cause severe ecological damage with untoward economic and social ramifications.

So, where lies the solution? It is multipronged. In recent times, the concept of PRO or Producer Responsibility Organization, introduced to provide further impetus to the EPR or Extended Producer Responsibility, has gained momentum; this term attributes the responsibility of collection and return of e-waste generated from a producer's products back to them



to ensure environmentally sound management of such e-waste. E-waste recycling is a science that needs the required infrastructure and know-how, so that the e-waste supplied is actually recycled under stringent conditions, which is why the Ministry of Electronics and Information Technology (MeitY), Government of India has initiated several programmes that encourage technical know-how that is, in application, both affordable and effective; the latter is not only important for the well-being of the environment and the humans associated with these recycling processes, but also to serve as the genesis for an entire sector that is both lucrative, sustainable, and very much needed.

As per an article by Samar Lahiry in *Down To Earth*, The MeitY has developed affordable technologies to recycle valuable materials and plastics in an environmentally sound manner, including two exclusive PCB recycling technologies, namely, 1000 kg/day capacity (~35 MT e-waste) and 100 kg/batch (~3.5MT e-waste) processes, with acceptable environmental norms. The 1000 kg PCB/day continuous process plant would be suitable for creating an eco-park in the country, whereas, the 100 kg PCB/batch process plant would be suitable for the informal sector. This could be done by upgrading and transforming the present state of affairs of informal sectors.

As per a report by the Ellen MacArthur Foundation on the Circular Economy,

dated 2016, some of umbrella measures, in the domain of agriculture, that support the concept of a circular economy are (summarized): regenerative agricultural production, more resource-efficient agricultural practices enabled by technology, digitally-enabled asset- and knowledge-sharing solutions, digitized food supply chains, and peri-urban and urban farming, among others.

The importance of the concept is very valid in the construction/housing sector too, which is seeing a steady growth despite the setback brought by the pandemic. Concepts such as sharing spaces effectively and safely are re-emerging, slowly and steadily. This encourages resource sharing and reduces pressure on spaces and connected infrastructure. Besides, rethinking the design element including the type of material used, the spread of spaces and the possibility of easy deconstruction, reassembly and replicability are being considered. Data plays a crucial role even here, especially pertaining to the life cycle of construction material, and sustainable construction using disruptive innovations. This is also where the modular concept plays a significant role.

In an interesting article by Prasanna Karthik, for ORF, he notes: 'In order to successfully transition to a circular economic model, there are many forms of digital, engineering and process technologies that need to be built and developed. While market forces will incentivize the development of digital technologies, the government must play a key role in promoting the development

of engineering and process technologies required to build a circular economy. Across the 10 polluting sectors, key engineering and process technologies that are central to developing a robust circular model of production must be identified and investments into their development must be funded and facilitated either directly by the government or through innovative models that attract private sector investments.'

The move towards a circular economy should not be a knee-jerk reaction, but obviously it has to be a well strategized, planned and implemented move, with the latter involving a multi-pronged approach involving different stakeholders—right from the citizens (awareness generation, understanding, accepting, facilitating, skilling/reskilling) to governments at diverse levels (central to local; with sectoral guidelines and implementation of these on a strong foundation); from simple, standardized, cost-effective innovations that enable easy implementation and adherence for long-term sustainability to foolproof policy making and enforcement; and from funding solutions to long-term, sustainable partnerships, it is an approach that requires thoughtful strategizing, careful planning, and effective implementation, not to forget Big Data which if collected efficiently real-time, collated in a timely fashion, and extrapolated serves as the base on which the entire concept of a circular economy can stand strong whilst bracing winds of change.

Waste is not waste until we waste it. This is the essence of a circular economy—a necessity for survival of Mother Earth and the human species. ■

Sarah Berry is the Head of Communications at the Centre for the Digital Future (CDF). The contents of this article have been compiled and authored by the author herself, and do not reflect the opinions of the organization (CDF) in any way.

ABGUS

Promoting Water Sustainability

ABGUS has set up a treatment pond in Village Dhangi in district Patiala, Punjab to recycle and reuse 40,000 litres of wastewater per day. The water management here is all set to benefit around 2755 people and 350 households in total.

Akhil Bhartiya Gramin Uthan Samiti (ABGUS) is a voluntary civil society organization working in Punjab, Rajasthan, Delhi, and Haryana. It was formed in 1987 by a group of young professionals coming from different academic backgrounds. ABGUS has been working in the areas of empowerment of children, women, and community for their holistic development. ABGUS has executed and implemented several programmes, such as natural resource management, skill development, vocational training, child development, quality school education, improved learning outcome, menstrual hygiene management, community health, women empowerment, and self-help groups for women. ABGUS has also been building capacities of organizations and leaders for sustainable community development, partnering with various CSR entities,

as well as national and international organizations.

On April 6, 2021, ABGUS, with support from Hindustan Unilever Limited (HUL) inaugurated a Water Management Project in Village Dhangi of block Nabha in district Patiala, Punjab. This wastewater management project is aimed to recycle the wastewater and reuse it for irrigation and groundwater recharge along with rainwater harvesting.

In India, villages are facing acute water scarcity for domestic and agriculture activities. Water-intensive crops, low-water efficiency, and unregulated groundwater are the main factors that account for agriculture water demand. The increasing level of water pollution has also played a key role in the unsustainability of the water supply. Such challenges have major consequences concerning water and

might worsen the situation in the future. By analysing the need and importance of sustainable water management, ABGUS has continuously worked in the fields of water conservation and water management. The project was planned to implement a combination of various processes through four-well systems of wastewater treatment for reuse other than human consumption, such as irrigation and gardening. Introduced by Sant Baba Balbir Singh Seechewal, it is a primary treatment used in Seechewal, Punjab which removes heavy solid particles, separates oil, and remaining material from water. The water wells need to be cleaned regularly; otherwise, they produce very poor effluents with high suspended solid content, which can be detrimental to the constructed wetland and cause clogging of waterbeds. To ensure continuous effective operation, the accumulative material, therefore, must be emptied periodically.

On the successful inauguration of the project, Mr Rajesh Verma, Chief Functionary & Secretary, ABGUS said, 'Benefiting around 350 households and a total of 2755 people, the project will reduce the usage of freshwater by providing an option of treated water to farmers aiming at water sustainability with appropriate technologies of water recycle-reuse-recharge.' Further adding to this, he also said that the project has engaged, empowered, and evolved community-sustained processes for water management. ■



Sultanpur National Park

A Paradise for Birds and Birdwatchers

In this series of articles starting this month, **Amarjeetsingh Bishnoi** and **Shakti Bishnoi** share their wonderful experiences with their family in the lap of nature in Sultanpur National Park in Haryana.

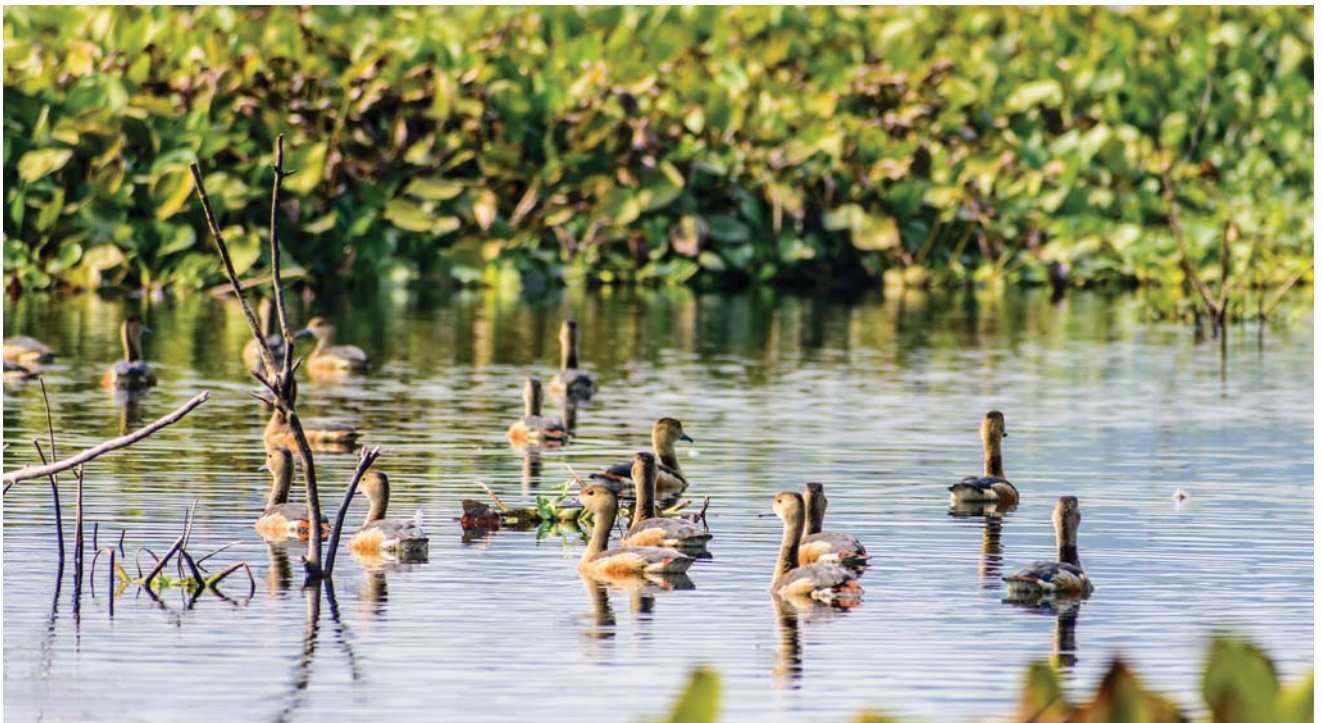
Haryana has two National Parks, eight Wildlife Sanctuaries, two Wildlife Conservation Areas, four Animal and Bird Breeding Centres, one Deer park, and 50 herbal parks, which are managed by the Forests Department, Haryana. Wildlife and forest areas of Haryana lie mainly in the foothills of Shivalik hills range in the north and Aravalli hill range in South Haryana. Aravalli Mountains in Haryana are part of the Sariska to Delhi leopard wildlife corridor (including 'Western-southern

Haryana spur' which entails Satnali-Dadam-Tosha hill (ranges).

Sultanpur Bird Sanctuary

Sultanpur National Park (formerly Sultanpur Bird Sanctuary) is located in Sultanpur village on Gurugram-Jhajjar highway, 15 km from Gurugram, Haryana and 50 km from Delhi. The area covered by the Sultanpur National Park is approximately 142.52 hectares.

As a bird sanctuary, it was the efforts of Peter Michel Jackson, famous British ornithologist, and honorary secretary of the Delhi Birdwatching Society, who wrote to the then Prime Minister of India, Smt. Indira Gandhi, founder of the society, in 1970 about the need to declare the Sultanpur Jheel near Delhi, a bird sanctuary, and she asked him to take her there. She had to cancel at the last minute, but later instructed the then Chief Minister of Haryana, Shri Bansi Lal, to protect the wetland.



As a result, the area was declared a Bird Sanctuary in 1972. On 13 July, 1989 the reserve was upgraded to a National Park. It has an area of 1.43 km². Over 370 (approx.) species of birds out of 10,005 species of birds in the world have been sighted at this protected area. Visitors can observe the birds while enjoying the wonderful local weather. One can observe the sanctuary on foot, for peaceful interaction of humans with the sanctuary birds and animals.

Migratory Birds

Among the approximately nine migratory bird species out of the total around 9000–10,000 species of birds in the world, nearly three species migrate to India due to seasonal changes, including 175 long-distance migration species that use the Central Asian Flyway route which also include Amur falcons, Egyptian vultures, plovers, ducks, storks, ibises, flamingos, jacanas, pochards, and sociable lapwing. Among these, approximately 10 species of birds are found at Sultanpur Bird Sanctuary. Some of them are resident, while others come from distant regions, such as Siberia, Europe, and Afghanistan.

Every year, over a 100 migratory bird species visit Sultanpur Bird Sanctuary to feed. During winter season, the sanctuary provides a panorama of migratory birds, such as Siberian crane, greater flamingo, ruff, black-winged stilt, Eurasian teal, common greenshank, northern

pintail, yellow wagtail, white wagtail, northern shoveller, rosy pelican, spot-billed pelican, gadwall, wood sandpiper, spotted sandpiper, Eurasian wigeon, black-tailed godwit, spotted redshank, starling, bluethroat, and long-billed pipit. In summer, about 11 species of migratory birds, such as Asian koel, black-crowned night heron, grey heron, Indian golden oriole, knob-billed duck, blue-cheeked bee-eater, blue-tailed bee-eater, and cuckoos come here.

Resident Birds

Resident birds include the common hoopoe, paddyfield pipit, purple sunbird, little cormorant, Indian cormorant, common spoonbill, grey francolin, black francolin, Indian roller, white-throated kingfisher, spotbill, painted stork, black-necked stork, white ibis, black-headed ibis, little egret, great egret, cattle egret, crested lark, red-vented bulbul, rose-ringed parakeet, red-wattled lapwing, shikra, Eurasian collared dove, red-collared dove, laughing dove, spotted owl, rock pigeon, magpie robin, greater coucal, weaver bird, bank mynah, common mynah, and green bee-eater. Other wild animals of Sultanpur are blackbuck, blue bull, hog deer, wild dog, sambhar, caracal, hedgehog, wild cat, mongoose, Indian porcupine, striped hyena, honey badger, wild pig, leopard, and four-horned antelope.



Delight to Watch Migratory Birds

As both the authors of this article are ornithologists, they want their daughter to learn maximum about nature and spend time in bird watching, observing birds and behavioural aspects to impart her knowledge about different perspectives of life and also insight on the lifestyle of birds. So, they went to visit the sanctuary from their home in Delhi during the month of December. It is just an hour's drive from Delhi's hustle-bustle to a world of serenity and tranquility. December is usually considered the month of adventure and holidaying and as fog started conquering Delhi, the authors thought that the nearest gateway for exploring nature was Sultanpur Bird Sanctuary and so they decided to spend time amidst birds. They feel that no joy in this world can replace the delight of enjoying winter mornings by waking up to the sounds of melodious migrant bird songs. They reached in the evening and stayed in the guest house of Sultanpur Bird Sanctuary. Fog was playing the game of hide and seek but as they say everything happens for a reason... ■

To be continued in the next issue.





Climate has Shifted the Axis of the Earth

Melting glaciers redistributed enough water to cause the direction of polar wander to turn and accelerate eastward during the mid-1990s, according to a new study in *Geophysical Research Letters*, AGU's journal for high-impact, short-format reports with immediate implications spanning all Earth and space sciences. 'The faster ice melting under global warming was the most likely cause of the directional change of the polar drift in the 1990s,' said Shanshan Deng, a researcher at the Institute of Geographic Sciences and Natural Resources Research at the Chinese Academy of Sciences, the University of the Chinese Academy of Sciences and an author of the new study.

Source: <https://www.sciencedaily.com/>

Flexible Diet May Help Leaf-Eating Lemurs Survive Deforestation

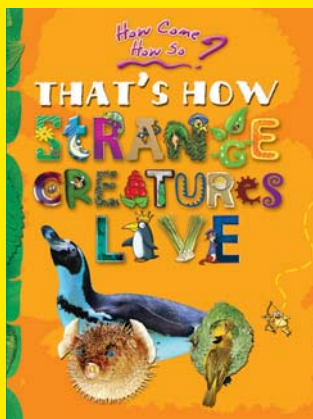
A new study sequencing the genome of four species of sifakas, a genus of lemurs found only in Madagascar's forests, reveals that these animals' taste for leaves runs all the way to their genes, which are also more diverse than expected for an endangered species. Sifakas are folivores, meaning that the bulk of their diet is composed of leaves. Leaves can be difficult to digest and full of toxic compounds meant to prevent them from being eaten. Because of that, leaf-eaters typically have all sorts of adaptations, such as a longer digestive tract with special pouches where bacteria help break down the food.

In a new study that appeared on April 23, 2021 in *Science Advances*, researchers sequenced genomes from Coquerel's (*Propithecus coquereli*), Verreaux's (*P. verreauxi*), golden-crowned (*P. tattersalli*), and diademed (*P. diadema*) sifakas. The individuals sequenced had been wild-born but were housed at the Duke Lemur Centre, with the exception of two Verreaux's sifakas, one wild and one born in captivity.

Source: <https://www.sciencedaily.com/>



To know more... Read



ISBN: 9788179935507

HOW COME? HOW SO?

THAT'S HOW STRANGE CREATURES LIVE: THE AMAZING LIFE OF BIZARRE ANIMALS

YooFisaca Syngkon Nongpluh

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Sweet and Sticky Success

Sundarbans' Honey, for Nature and People

This article talks about an initiative by WWF India with the support of multiple partners across 16 villages of Sundarbans, which is enabling the *moulis* in the region to reduce incidents of human–tiger conflict with innovative apiary management practices. From collecting wild honey inside mangrove forests, members of the cooperatives are now harvesting apiary honey from Sundarbans forest camps and packaging bottles of honey, which are sold under the brand name Bonphool Natural Mangrove Honey.

More than 4.5 million people who live on the fringes of the Indian Sundarbans depend on its unique ecosystem for non-timber

forest products and fish. Traditional honey collectors or *moulis* have been collecting honey from mangrove forests for years. One of the main livelihoods

of the communities here, traditional honey collection is a risky job. As the *moulis* travel through creeks and narrow channels searching for wild



beehives, they often find themselves at risk of attacks from tigers. Nearly six honey collectors die each year in the Sundarbans due to human–tiger conflict.

An initiative by WWF India with the support of multiple partners across 16 villages of Sundarbans is enabling the *moulis* in the region to reduce such incidents with innovative apiary management practices. Tarun Choudhury from Maipith village of Kultali in Sundarbans says, 'I joined a group of 20 honey collectors from Maipith village in 2019. WWF India and 24 Parganas (South) Division Forest Office supported us with bee boxes placed in the forest camps. The honey harvested from these boxes is double the amount collected from the wild. The risk involved during wild honey collection such as encounters with tiger, crocodile, and snake is also minimized as our apiary boxes are placed in the forest camps,' said Tarun.

From collecting wild honey inside mangrove forests, Tarun Choudhury and members of the cooperatives are



now harvesting apiary honey from Sundarbans forest camps and packaging bottles of honey, which are sold under the brand name Bonphool Natural Mangrove Honey. He is elated that Sundarbans honey is now reaching across India. 'There is a good demand for this honey, and our income has more than doubled. The Forest Department and WWF India are taking the initiative of including more traditional honey collectors in this group.'

At present, the cooperative is processing the honey manually. It is a time-consuming method and it is difficult to control the quality of the honey as per industry standard. In 2020, Discovery Communications India's crucial support has allowed for scaling up efforts and supply Bonphool to all honey enthusiasts. Now, a honey processing unit will be set up to remove excess moisture and wax to yield better quality

honey. This honey will be then bottled for marketing. The plant will ensure steady supply of Bonphool honey in the market maintaining industry standard.

Barely a year old, Bonphool has seen a boost in its sales on popular online shopping platforms and a dedicated webpage has been set up by the forest department. The cooperatives have sold more than 20,000 honey bottles since its launch. As demand for organic and sustainable honey soars, this project continues to help local communities make the most of the opportunities that lie ahead. ■

Piloted in 2014 by WWF India, this project would not be possible without the support of WWF India's partners, such as Bose Institute, Canara HSBC Oriental Bank of Commerce Life Insurance, Discovery Communications India, Panchayat and Rural Development Department, Sundarban Biosphere Reserve, and the West Bengal Forest Directorate.



Less is More

Most people don't need more protein. They need less. **Maneka Sanjay Gandhi** exposes the mythology of protein and explains why it should come from plants, not animals.

Dieticians are constantly asked by their vegetarian/vegan patients on how to increase their protein intake. This is a result of the constant bombardment of advertisements for milk, eggs and meat which use protein as their main sales gimmick. Fake news is the norm in food selling: high protein diets based on meat/milk are recommended for putting on muscle or losing weight and vegans are constantly told that they will suffer from protein deficiency.

The truth is that protein deficiency is extremely rare except in actual starvation as every cell contains protein. In fact, today we have the opposite—people suffering from diseases of protein excess, such as acidity, osteoporosis, gout, chronic kidney disease, and cancers.

Protein is essential for life—it is a building block of every human cell and important in growth and tissue repair. It exists in every plant and animal product. In fact, most people tend to get too much of this rather than too little. Protein deficiency can wreak havoc on the body.

But, protein deficiency goes hand-in-hand with total energy deficiency. In simple terms, you cannot be protein deficient unless you are already starving from lack of food or on a diet of pizza and ice-cream. How much protein do you need? The recommended daily allowance used to be 0.8 grams per kg of body weight. This translates to 66 grams of protein per day for an adult weighing 75 kg. But recommended amounts have more than halved in the past 20 years or so as several chronic diseases have been linked to eating too much animal (not plant) protein. The average adult needs to consume between 45 and 55.5 grams of protein per day (COMA, 1991). Only 8 per cent of your diet needs to be protein (WHO, Hegsted, 1968; Irwin and Hegsted, 1975; Scrimshaw, 1976; COMA, 1991). Even this value includes a large safety margin, as people's real needs are even lower.

The myth that we should eat more protein dates back to the beginning of the last century. The scientific view then was that health and fitness depended on eating generous amounts of protein,

particularly meat (Millward, 2004). The myth reached epic heights in the 1960s. A UN report called for a 'global strategy to avert the impending protein crisis'. International aid began to focus on projects to address the so-called protein gap. The US government subsidized the production of dried milk powder for the world's poor (Campbell and Campbell, 2005).

But studies showed different results. Studies in the UK by Widdowson and McCance found that orphanage children grew faster than the general population when they ate a bread-based diet, with only a small fraction (14 per cent) of their protein coming from milk products. And they did not grow any faster when their milk doubled! Bread provided the children with plenty of energy to support their growth, whilst meeting more than double their protein needs (Millward, 2004).

In 1969, the protein gap disappeared 'at the stroke of a pen' when researchers concluded that almost all staple foods contain enough protein for human needs and the main problem for children

in developing countries is simply malnutrition—a deficit of calories, meaning, the quantity of food/calories they get is very little rather than the proteins they get.

Grains supply the vast majority of the calories the world eats, and they provide protein too— even though most people equate protein with animal foods, such as meat, fish or dairy. In fact, all plant foods—grains, pulses, peas, beans and lentils, nuts, seeds and vegetables— contain protein. The only exceptions are sweets and junk foods. Especially good sources of high quality protein include soya products, rice, pasta, wholemeal bread, baked beans, chickpeas, kidney beans, lentils, pumpkin, sesame, quinoa, amaranth, buckwheat, and nutritional yeast, as well as hemp and chia seeds.

To give you a comparison between some meat and vegetarian products, a standard 50 g beef burger contains 10.2 g of protein and three (90 g) fish sticks 12.1 g; half a 225 g can of baked beans contains 11.5 g of protein; an average serving of pasta (190 g cooked) contains 8.5 g, an average serving of kidney beans (160 g cooked) 12.4 g, and a small packet (25 g) of peanuts contains 6.1 g.

The problem facing the world is too much protein and far too much protein from meat. Most people who eat meat/milk are consuming twice or thrice their daily recommended protein intake. While meat is protein dense it also has saturated fat and cholesterol. An excessive consumption of animal protein increases the risk of diabetes by 22 per cent. There is a compelling case that animal proteins increase the risk for cancer, heart disease, osteoporosis and type 2 diabetes (Yang et al., 2002; Holmes et al., 2003; Sieri et al., 2002; O’Keefe et al., 1999; Campbell et al., 1998; Campbell and Junshi, 1994; Messina and Messina, 2000; Hu et al., 1993; Song et al., 2004). This was particularly evident in the China Study—one of the largest and most comprehensive studies ever undertaken to examine the relationship between diet and disease. Huge differences were seen

in disease rates based on the amount of plant foods participants ate compared to animal foods (Campbell et al., 1993; Campbell and Junshi, 1994; Campbell and Campbell, 2005). According to the director of the Department of Nutrition at Harvard-affiliated Brigham and Women’s Hospital, the data is ‘pretty strong against increasing meat to get protein.’

What are the Risks of Eating Too Much Protein?

- High-protein diets may tout weight loss, but this is a short-term gain. Excess protein consumed is usually stored as fat and can lead to weight gain over time.
- Eating large amounts of protein can lead to bad breath. The body produces chemicals such as acetone, which exit the body in your urine and breath.
- Diarrhoea can come from too much dairy—especially true if you’re lactose-intolerant (as are most Indians) or consume protein sources, such as fried meat, fish, and poultry.
- *Dehydration*: Your body flushes out excess nitrogen with fluids and water. This can leave you dehydrated even though you may not feel more thirsty than usual.
- Excess protein can damage people with pre-existing kidney disease. Excess nitrogen is created and damaged kidneys have to work harder to get rid of it.
- Eating lots of meat and dairy foods as part of a high-protein diet may lead to heart disease in women according to a 2010 study by Bernstein, Qi Sun, Hu et al. A 2019 study published in the *European Heart Journal* (Wang, Bergeron et al.) showed that long-term consumption of meat can increase trimethylamine N-oxide (TMAO), a gut-generated chemical linked to heart disease.
- Very high protein diets have a higher risk of kidney stones and gout.



Are you having too much protein? These are the symptoms: intestinal discomfort and indigestion, unexplained exhaustion, nausea, irritability, headache, diarrhoea, inability to concentrate, and so on.

Get your proteins from plants. One cup of dal has 16 g, for instance. You should not be having more than 30 grams per meal and plant proteins can do a better job of meeting your protein needs than animal products, both because they are less concentrated sources of protein making it less likely that you’ll get too much and because they are more likely to be present with other nutrients, such as fibre, vitamins, minerals, and phytochemicals. ■

Pointless Plants

Incredible Story of Nathan from Planes to Plants

Twenty-three-year-old Nathan Raab lost his job as a commercial airline pilot during COVID-19, and decided to make a change from spraying jet-fuel over the planet to set up his own eco-friendly company instead, Pointless Plants. Here, we present his amazing journey and his pioneering initiative.

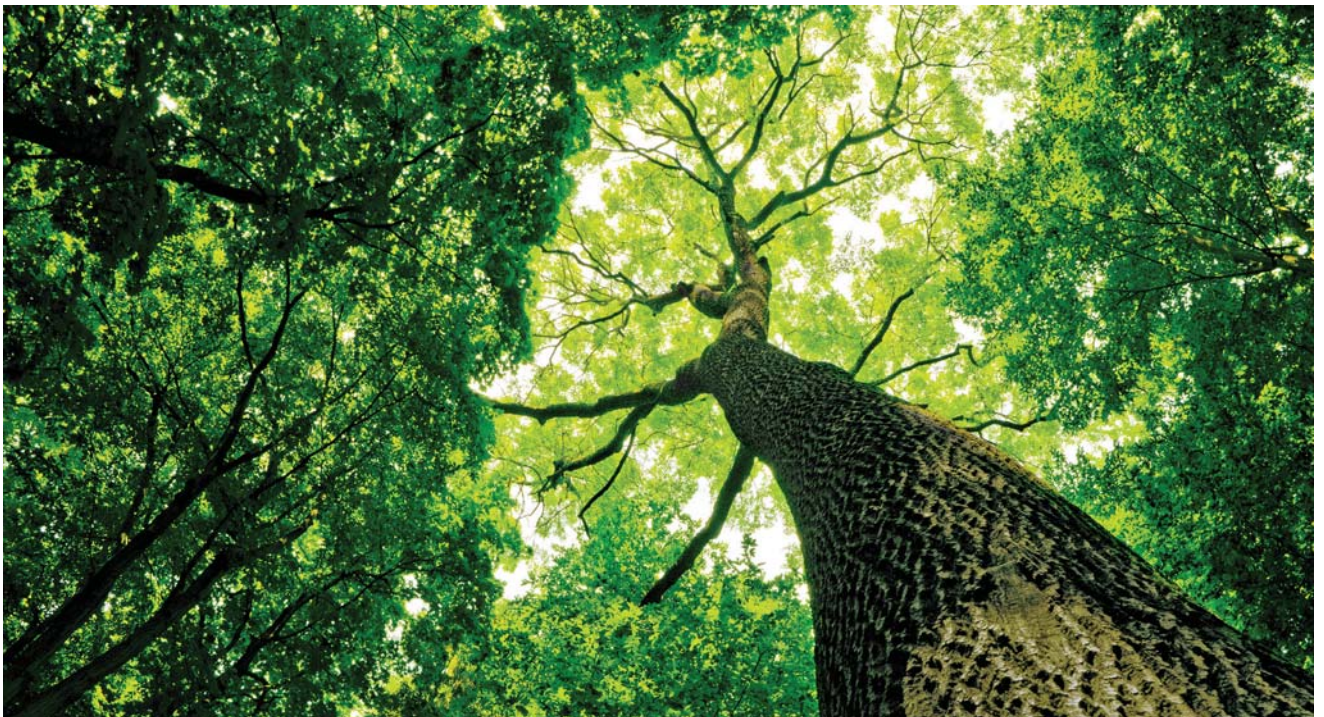
Pointless Plants' has one mission—to make the world greener. For every plant they sell, Pointless Plants plants 10 trees. Starting in 2019, the business has planted 32,732 trees as of March 3, 2021. Pointless Plants was nominated for a 2021 Glamour Wellness

Award for Sustainability Initiative. Nathan was a pilot for four years, flying from Gatwick and Heathrow and lost his job during the COVID-19 crisis. Wanting to do something positive instead, to make a more positive change, Nathan decided to promote plants instead of planes.

Pointless Plants' celebrity clients include Tom Daley and Bake Off's Candice Brown.

Nathan on Tree Planting

'For every order we receive, 10 trees are planted by Ecologi in association with The Eden Reforestation Projects



in Madagascar. You can see how many trees have been planted to date here. Madagascar is known for its incredible biodiversity, with over 200,000 endemic species of plants and animals living on the island. However, over 90 per cent of the country's virgin forests have been destroyed, with animal species being displaced and the local people no longer able to farm and live off the land. Estuaries once populated by mangrove trees are now bare of life, leaving the earth to be washed away into the ocean,' says Nathan.

'By purchasing a plant through Pointless Plants, you help to fund the non-profit, Eden Reforestation Projects, and their reforestation of the Madagascar Island. Leaders in responsible reforestation, Eden Reforestation Projects have, to date, planted 265 million trees, while creating an incredible 2.6 million work days for local communities,' informs Nathan.

Nathan on Founding the Brand

'I've always found plants fascinating and pretty much every time I bought fruits from the supermarket, I would use its seeds to propagate its plants. My go-to favourite was the mango: I could



get a tree out of a little seed. I began pondering the logistics of starting a mango tree farm in a one-bedroom flat in Crawley. I thought, 'We could give this mango tree a name. We could call it Maggy, give it a story and Maggy would be our pal forever.'

Nathan says that the real growth in their seedling of a business came a little later. Like many people around the world,

he was made redundant from his day job when the COVID-19 pandemic hit. 'I knew this was the universe's way of telling me it was time to get some help. So, half of the business was sold to raise the money to take it to the next level. This cash moved us from a bedroom to a warehouse and, after months of nurturing and careful attention, Pointless Plants has begun to thrive.'

Nathan's Mission Statement

'Pointless Plants is on a mission to make our planet a greener, healthier and happier place to live. We do this by offering affordable plants to everyone and providing the best service we can—all while giving back to the planet. For every order made, we plant 10 trees somewhere in the world. We are very conscious of the impact we have. We don't want to just be a trendy brand; we want to represent a community of people who use their voices to do the right thing for the Earth.'

Nathan feels he could write pages and pages about zero-hour contracts,





company politics, and companies making millions of pounds while harming the planet. But, this won't change anything. This outdated model of business is no longer sustainable in the twenty-first century and what truly matters are actions. 'After growing up with dyslexia, I am very simple with my words but also believe that the right choices are simple, too. I wanted to create a company that is nice to people and to the planet and that company is Pointless Plants.' 'We do not measure our success by looking at our balance sheet. We measure our success by looking at how many trees we have

planted in shrinking forests around the world. Our commitment to planting trees is not just a gimmick; we really believe that it has the power to change the world.'

Nathan's Tips on How Planting Trees Benefits the World

Planting trees have a huge number of benefits, including:

- Restoring animals' habitats, which, in turn helps increase biodiversity by

giving endemic species the chance to thrive

- Removing carbon dioxide from the atmosphere by putting it back into the plants and soil, and therefore helping to reduce global warming
- Cleaning the air by removing pollutant gases, such as nitrogen oxide, ammonia, sulphur dioxide and ozone by trapping these gases in their leaves and bark
- Restoring local ecosystems that have been destroyed by deforestation or other external factors
- Reducing the impact of flooding and soil erosion, which helps to protect nearby communities and their livelihoods
- Providing an income for tree planters in lower income countries.

'Since we began in 2019, we've planted trees in Australia following the Black Summer bushfires through One Tree Planted and in other parts of the world,' Nathan signs off. ■

For more information please check: <https://pointlessplants.com/pages/our-story>



Need for Women Empowerment

In Agriculture Sector

If you are visiting a village during the sowing season, hunching women planting seedlings is one of the most common sights. But thinking of a farmer always brings to our mind the image of a man. Probably that is why we often fail to see the plight of the women working in the fields. Despite being one of the biggest contributors to the gross domestic product (GDP), agriculture is still an unorganized sector and women working in the sector are the biggest casualty.

Women working in the agriculture sector in India bear the twin responsibility of performing well both in and off the field, much like any other women professionals in India. But unlike them, women working in the fields never get their dues—the International Labour Organization (ILO) indicates that women form 41 per cent of the world's agricultural labour force, which rises to 49 per cent for low-income countries,¹ and yet these women find a mention in discussion papers or strategy documents.

Status of Women Farmers in India

It will startle many to know that as much as 80 per cent food produced is done by women working in the agriculture sector. While they are present at all levels of the value chain—pre-harvest, production, post-harvest, processing, packaging, and marketing—labour-intensive sowing, transplanting, and weeding are heavily dependent on them. The Economic Survey 2017–18, interestingly, pointed at the 'feminization' of the agriculture sector, noting that with growing rural to



urban migration by men, an increasing number of women are assuming multiple roles as cultivators, entrepreneurs, and labourers.² According to the 2017–18 data published by the National Sample Survey Office (NSSO), over 70 per cent of rural women workers are engaged in agricultural work.³ Women comprise 33 per cent of the agriculture labour force and 48 per cent of the self-employed

farmers. However, the agricultural census of 2015–16 finds that only 13.9 per cent women are owners of landholdings. Bihar is probably the biggest example of this dichotomy where 50.1 per cent of the total farming workforce comprises women but only 7 per cent women have land rights.⁴ Despite carrying out as much as 75 per cent of all farming-related work across most regions of India, their wages are 1.4 times less than their male counterparts. More alarmingly, the work participation rate of rural women

¹ Details available at https://www.ilo.org/global/about-the-ilo/newsroom/statements-and-speeches/WCMS_621364/lang--en/index.htm

² Details available at <https://pib.gov.in/Pressreleaseshare.aspx?PRID=1518099>

³ Details available at <https://www.devex.com/news/can-better-data-change-the-fate-of-india-s-invisible-female-farmers-96664>

⁴ Details available at <https://www.oxfamindia.org/women-empowerment-india-farmers>

between 15 and 59 years was 51.6 per cent in 1993–94 but declined to 37.2 per cent in 2011–12, according to the NSSO data on periodic labour force. The Census 2001 shows that out of the total number of agricultural workers, women and men comprised 39 per cent and 61 per cent, respectively; by the next Census, 37 per cent were women and 63 per cent were men. The rate of labour dropout is higher for women in agriculture—between 2004–05 and 2011–12, 27 million female workers left agriculture, and only 5 million of them joined non-farm sectors; the rest simply withdrew from the labour force. However, the entire 6 million male workers who left agriculture during this period joined non-farm sectors.

Bringing Gender Parity to Agriculture May Open New Dimensions

In most of the cases, women working in the agriculture sector bear responsibility without power, mainly because men are in charge. They are the first casualty in cases of job loss and lie at the receiving end in cases of domestic discord. The prevalent gender-based discrimination and social norms ensure

that most of their work remains unseen, unrecognized, and undervalued. They are at a high risk of sexual harassment and other forms of gender-based violence, both on and off the field. Amid all this we miss noticing the qualities that may make women a more preferred workforce in agriculture.

Why Would Women Make Better Farmers?

Due to income distress and other cascading factors impacting agriculture, many farmers are migrating to the cities for better income, with rarely a chance to come back. They leave their families, comprising women and children, behind in the villages. Owing to societal norms, women are less likely to migrate to cities and hence, are available for the field-based work. Secondly, and probably the more vital point is, as many studies have suggested, women have better emotional intelligence, a quality that makes one aware of, control, and express one's emotions, and to handle interpersonal relationships judiciously and empathetically. Hence, if women oversee farming, we may expect prudent and informed decisions will cohabit with

the financial considerations—a fact that will certainly consolidate farming as a community activity and facilitate our goal of achieving food security.

Creating an Enabling Environment Is the First Step

Acknowledging the status of 'women farmers' will bring agriculture at par with employment that will encourage equal opportunity, for such a status will only reinforce a human right enshrined in our constitution and international labour standards, which promote gender equality as a means to women's economic empowerment.

The first and most important step in achieving the goal is allowing girls unhindered access to secondary education. This will ensure that the girls receive basic education that they will need to fall back on in future—education enables them to inculcate better decision-making ability and understand available information in a comprehensive manner. Education will also address their apprehensions about the latest technology, such as digital data and smartphones. Over the years, Indian agriculture is on a rapid digitization spree while most of the women in rural areas hardly own a smartphone.

Once ready for the market, these women will need proper infrastructure and access for formal financing to start with the work. A robust infrastructure and smooth financing options may foster women entrepreneurs from the rural areas who will, eventually, have the unique opportunity to voice their concerns. In time, they may well become the flagbearer of ideas that will protect rural women from unacceptable forms of work, enhance their social protection, and close the gap in representation by ensuring their voices are heard. ■

Article contributed by Rajesh Aggarwal, Managing Director, Insecticides India Limited.



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Fight Coronavirus Together

We all can fight coronavirus together by following these measures:

- Wash your hands with soap and water frequently for 20 seconds or use alcohol-based hand rub. Do not touch your eyes, nose, or mouth if your hands are not clean.
- Cover your nose and mouth with a disposable tissue or flexed elbow when you cough or sneeze.
- Practice social distancing and avoid close contact with people who are unwell.
- Avoid mass gathering and crowded places.



Sneeze inside the corner of elbow



Stay at least 6 feet from others



Use alcohol-based hand sanitizers



Wash hands frequently with soap



Wear face mask outside



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