WORLD ENVIRONMENT DAY SPECIAL

16-30 JUNE, 2021

Down To Earth

FORTNIGHTLY ON POLITICS OF DEVELOPMENT, ENVIRONMENT AND HEALTH

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SET IT RIGHT

Epidemiology, not geopolitics, should guide the world's COVID-19 vaccination drive

JINDAL SCHOOL OF ENVIRONMENT & SUSTAINABILITY

India's First Interdisciplinary Environment & Sustainability School

"IT SHOULDN'T BE CALLED CLIMATE CHANGE ANYMORE,

IT'S A CLIMATE CRISIS."

–Prof. Arjya Majumdar
***Dean,** Admissions & Outreach, JGU*

PROF. (DR.) ARMIN ROSENCRANZ
Dean, Jindal School of Environment & Sustainability

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Our Founding Dean **Armin Rosencranz** *(A.B., Princeton University; J.D., M.A., PhD, Stanford University)*, is one of the leading global experts in environmental law, policy and climate change. Apart from being a Trustee member of Stanford, he has taught Environmental and Natural Resources Policy, Energy Policy and Climate Change at Stanford University and University of California at Berkley for close to three decades and has been teaching at Jindal Global Law School since 2014/15.

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Re-embrace democracy, Free World

IT'S A make-or-break moment for our world. A race is on between the virus and its variants and vaccination. The speed at which the novel coronavirus is mutating means that nobody is safe until everyone is safe. According to WHO, the world needs some 11 billion doses of vaccines and these need to reach the poorest and the remotest places as quickly as possible. Otherwise, there is a fear that the virus will spread and it will return in a mutated form and make even the protected vulnerable to the new variant.

The issue is not about the vaccine, or even the ability of the world to manufacture it. As of June 2021, there are over 200 vaccine candidates in the offing—with 102 reaching the stage of clinical trials. According to WHO, the world will be able to manufacture some 14 billion doses by the end of 2021. China's two vaccine makers—Sinopharm and Sinovac—plan to produce around 3 billion doses. US headquartered Pfizer-BioNTech have ramped up capacity to 3 billion doses as have Oxford-AstraZeneca. And then there are others. So, there is no shortage *per se*.

The problem is related to the cost of the vaccine; it needs to be affordable by a vast number of people in the world. The going price of the vaccine is extremely opaque as companies are seeking profits wherever they can take them. WHO does not track the price and the only sources are media reports. A review shows the price in general ranges from US $2.50 to $20 per dose, with Oxford-AstraZeneca being the cheapest. Interestingly, while the EU paid $2.50 per dose, South Africa was charged $5.25. The vaccine by Sinopharm costs $15 per dose in Sri Lanka and $10 per dose in Bangladesh—in both cases the governments have placed the orders. But there are also reports that Sinopharm is selling its vaccine at $40 per dose in Argentina and that the US price for Moderna is $37. Vaccine companies want to keep the windfall coming. The strategy for ramping up capacity is to either do so themselves—like Pfizer, which has reportedly outsourced its legacy vaccines to other companies and will manufacture the 3 billion doses in-house—or sign contracts with other facilities so that the COVID-19 vaccine supply is ramped up but prices and profits remain intact.

Pandemic response will become truly global only when the vaccine becomes a global good

In all cases, the companies will control the price. Wherever they have offered discounts, as in the case of Astra-Zeneca in the EU, they say they have done so because the governments have invested in the research and development of the vaccine. But company executives have been quick to say these are "pandemic prices" and they expect the cost to increase manifold next year or the year after.

In this situation vaccine inequity is inherent and inevitable. Poor countries cannot afford the price of the vaccine. The Indian government, which has agreed just this month to vaccinate its 1 billion people free of cost, has placed orders for some 440 million doses (of the 2 billion it needs) at ₹150 per dose ($2) from Serum Institute of India (Covishield) and Bharat Biotech (Covaxin). This will put a burden on India's economy—already reeling from the pandemic losses. Yet, the country's universal vaccine programme is within its reach because of the low cost of each dose. There is no way other countries, from Bangladesh to Cameroon, can afford to pay $10-15 per dose to vaccinate their people free of cost.

So, the way ahead has two options. One, which Germany and the UK favour, is to buy the vaccine from their companies and supply it to WHO's COVAX facility—set up to distribute COVID-19 vaccines worldwide. Boris Johnson, host of the recently concluded G7 Summit has with much fanfare said his country will donate 100 million surplus vaccines—they bought in excess of their needs—of which it will dispatch 5 million by September 2021. All together, with the US contributing another 500 million, the G7 has said it will provide 1 billion doses by mid-2022. This is too little, too late—cases in Africa are already on the rise. There is also no plan on how the world will, in this strategy of buying and donating, be able to afford the cost of universal vaccination. COVAX is already facing shortages and broken promises of supply. This is where the second option of providing a temporary waiver on intellectual property rights (TRIPS) comes in. It will allow other companies to mass produce the vaccine. And, as it happened in case of HIV/AIDS drugs, the price would go down when this waiver is given. The reduced price will allow for increased availability and access. This makes the pandemic response truly global—and the vaccines a global good.

But this does mean that the "free world" has to deepen its tryst with democracy. To fight what US President called "autocracy" in the world, it will need to show how it will reestablish the "public" in the public—currently we have dismembered the state and allowed the market to grow and believed that this will empower societies. This has not. The state-market-consuming society combine has brought things to such a pass. This is what needs to be reinvented. For COVID-19 and beyond. DTE @sunitanar

Down To Earth

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COVER STORY

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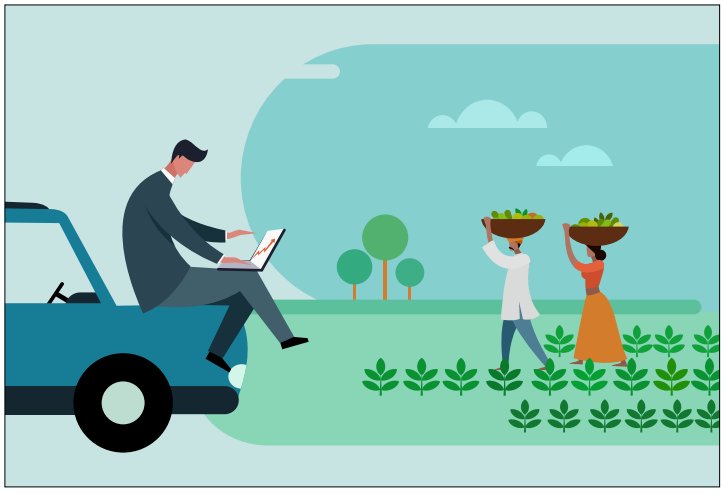


Engage

PHOTOGRAPH: ISTOCK

Encourage study of future technologies

The cover story "From oil to electric" (1-15 April, 2021) carries great significance in today's context, and the subject should be taught at the school level itself. In the current curriculum, rare earth elements are mentioned in general, without any focus on their potential real-world applications. Rare earth elements should be a standalone subject in the curriculum, with exhaustive details on their geographical availability, mining technology and the processing of their compounds for battery manufacturing. The subject should also include chapters on the various kinds of batteries required for different applications and their commercial manufacturing processes. This will inspire young students to gain more knowledge and develop the skills needed for research and development in the electric vehicle and related industries. Surely, this is much better than merely churning out jack-of-all-trade STEM (science, technology, engineering, mathematics) professionals into the system. Similarly, a separate subject on green hydrogen will also be beneficial.

L R SHARMA
SUNDERNAGAR, HIMACHAL PRADESH

Targeting big fish

This is in reference to "Going vegan: Where '*Seaspiracy*' gets it wrong about global fisheries", published online on May 17, 2021. The introduction to the blog, which states that "going vegan" will not stop ocean pollution, is incorrect. The seafood industry wrecks havoc in the oceans with its fishing activities, especially its dumping of fishing nets and plastic materials in the waters. If it is forced to dial back due to decreasing demand, then there will definitely be less pollution in the waters. It is true that several coastal communities across the world depend on fishing, but this documentary targets mass fishing, not the small fisherfolk. In fact, mass fishing has put the small fishing communities out of jobs and they are forced to abandon their traditional methods for modern, more harmful sea practices.

It is unlikely that the entire world will adopt veganism. But even if just 25 per cent of the population does so, or at least people stop eating seafood, these massive fishing industries will collapse. Fish will repopulate the oceans and the small fishing communities can return to their sustainable activities, both improving their own lives and preserving the biodiversity of the oceans and seas.

RAAJ
VIA EMAIL

Smart waste practices

This is in reference to "Why India's solid waste management system needs a digital overhaul", published online on February 25, 2021. Smart waste collection technology is employed to detect and gather waste for proper disposal. This technology helps waste collectors and transporters share

PHOTOGRAPH: CREATIVE COMMONS

real-time data of the composition and extent of the waste in bins, optimise collection routes and ensure proper segregation. This seems to be the most efficient way of waste collection. Small wonder, the global smart waste collection technology market is anticipated to succeed with a high compound annual growth rate.

SARITA
VIA EMAIL

Who to blame for COVID-19 resurgence

By now, it is quite clear that contrary to all claims of India's victory over the novel coronavirus, we may be staring down an abyss. While we were celebrating the falling number of infections, the disease was merely crouching for a spring, so to speak, with renewed vigour. Unfortunately, the sharp spike came at a time when the Union and state governments were busy battling it out for assembly elections. While there is much that the governments can be blamed for, we, the people, are not innocent victims either. The wearing of masks is the first and perhaps most important step in curbing the spread of the virus.

C K SUBRAMANIAM
NAVI MUMBAI, MAHARASHTRA

DTE TV

The ground opened up in central Mexico

A 5 m-wide-sinkhole that appeared in a farmland in Puebla, central Mexico, on May 29 has grown to about 92 m in diameter and 20 m in depth. Alarmed local authorities have

evacuated nearby residents, as the gigantic sinkhole continues to grow and threatens to swallow a nearby house. Officials think that the sinkhole appeared due to the extraction of groundwater from the field, which softened the subsoil. Public officials have announced a comprehensive investigation into the incident, including soil studies, which could take up to 30 days.

FOR MORE VIDEOS, SCAN

Digest

WHAT'S INSIDE

1,000 WORDS VIKAS CHOUDHARY

A goods carrier moves along the National Highway 11 near Sri Dungargarh, Bikaner district, Rajasthan, on a sultry summer day. Though several parts of Rajasthan reeled from scorching heat with maximum temperature recorded above 45°C between the last week of May and first week of June, a large part of north India has unusually escaped heat wave conditions during summer this year. Weather experts say this is due to frequent western disturbances that brought rain and thunderstorms to the region.

FOR MORE PHOTOS, SCAN

Jalna's climate crusader

Nivrati Ghule uses trainings and talks to help farmers in Maharashtra tide over drought and make agriculture rewarding

ISHAN KUKRETI

NIVRATI GHULE is a busy man during the cotton-sowing kharif season. It is not just his 2.02 hectare farm at Wakari village in Jalna district of Maharashtra that keeps him occupied, but also the phone calls from cotton farmers across the semi-arid Marathwada and Vidarbha regions. "I do not even get the time to drink water. I receive almost 100 calls every day during the cotton season," says the 42-year-old farmer.

Ghule is a trainer for the regional Krishi Vigyan Kendra (KVK), an agricultural extension centre that promotes scientific farm just 100 kg of cotton on his field, and had to work as a labourer to make ends meet. "My crop was entirely dependent on rainfall, which was scanty in the region. Since the yield was low, I never took farming seriously and did manual labour on the side," he says. All this changed in 2000, when he visited the KVK near his village. The centre helped Ghule understand the soil type of his farm and its needs, and taught him how to use water judiciously. Soon, he built compartment bunds around his field and constructed a well using the Maharashtra Employment Guarantee Scheme. As an immediate impact, water became available for irrigation. Over the next decade, Ghule's cotton yield from the same patch of land increased by five times. But his joy and excitement did not last long.

Located in the rain shadow region of the Sahyadri mountain range, Jalna is a drought-prone area. "Since 2011, the region has been hit by droughts every three years, rather than the usual five years," says Sumit Roy, associate director at Worldwide Fund for Nature's (WWF's) water, agriculture and sustainability standards programme. In 2017, WWF installed an automated irrigation station (AIS) and an automated weather station (AWS) in Ghule's field. AIS assesses moisture content of the soil and sends Ghule notifications on how much water is needed for the crops through an application on his mobile. A related application then releases the specified amount of water through a drip irrigation system, thereby helping him efficiently use the scarce water resource. AWS, on the other hand, alerts him about weather anomalies in the region, which he then shares with other farmers in the vicinity.

Ghule's knowledge on water storage and his skill to employ digital technologies have helped him adapt to the changing climate. While his cotton yield has now reached to 7,000 kg per harvest, he has also started growing other crops like soybean, okra, brinjal and pumpkin. Many other farmers in the region are also benefitting from his relentless guidance.

DEVELOPMENT

COVID-19 derails progress in SDGs

OVER 193 countries have since 2015 been working on the Sustainable Development Goals (SDGs), designed to preempt, tackle, and solve the failures, inequalities and disparities faced by people globally. Yet, the COVID-19 pandemic has made it clear that the world is nowhere near achieving SDGs by 2030.

A recent survey conducted in 28 countries by the World Economic Forum and market research firm Ipsos has identified that the top three goals of global priority—no poverty (SDG 1), zero hunger (SDG 2) and good health and well-being (SDG 3)—are the worst hit. While COVID-19 has affected SDG targets across the globe, the impact is maximum for developing countries across Africa and Asia.

The UN Development Programme, which monitors SDGs, says that by 2030 around eight of the 10 people, pushed into poverty as a result of COVID-19, will live in countries that are at the bottom of the human development index; Africa will bear the maximum burden. SDG 1 is the bedrock of the goals and a poor show here will impact almost all of the other goals. In the best case scenario, 118 countries will have 3 per cent population living under extreme poverty. The tally will increase to 158 by 2050. Progress in SDG 2 is expected to be worse, with just 78 countries on path to tackle hunger by 2030; in the worst case scenario, the number drops to 61. SDG 3 also remains a challenge, with the best case scenario showing 128 countries bringing their maternal mortality ratio below 70 per 100,000 live births by 2030.

Though India is close to meeting SDG 3, COVID-19 appears to have hurt its progress in SDGs 1 and 2.

Status India

Ranking on global SDG index

117th of 193 countries

SDG 1: No poverty

25 of 37

states and Union Territories (UTs) close to achieving this goal

SDG 2: Zero hunger

11 of 37

states and UTs show progress

SDG 3: Good health and well-being

30 of 37

states and UTs have almost met this target

Source: *SDG India Index 2020, NITI Aayog*

SPACE

Scientists scramble to detect solar storms

A GEOMAGNETIC solar storm that occurred in May, the biggest in over a decade, has scientists renewing their efforts to improve space weather prediction systems. Although the recent storm did not cause any adverse impacts, such events have the potential to disrupt or even wreck communication and navigation systems. Solar storms occur when particles from the Sun's outermost surface, called the corona, erupt and interact with the Earth's magnetic field. These storms manifest in two ways—through *aurora borealis* or Northern Lights and geomagnetic storms. The latter are quite difficult to predict—current systems only give an 8-minute warning for an incoming storm. However, the prediction efforts are seeing breakthroughs. On June 7, scientists from the US and Germany have revealed a network that uses artificial intelligence to detect solar storms by tracking coronal "holes" left on the Sun's surface by the solar eruptions.

POLLUTION

Global citizens seek legal recourse for cleaner air

COURTS ACROSS the world are hearing cases on citizens' "right to clean air". On June 3, the EU Court of Justice censured Germany, saying that between 2010 and 2016, as many as 26 cities breached permissible limits of nitrogen dioxide (40 microgrammes per cubic metre) in the air. The court's rebuke opens up Germany to fines. In South Africa, the Pretoria High Court may soon rule on a pollution case in the eastern region of Mpumalanga Highveld. Citizens sued the government in 2019 for toxic levels of nitrogen dioxide and sulphur dioxide in the air. While the former is primarily emitted by automobiles and industries, sulphur dioxide is linked to coal-based plants. Both cause respiratory disorders like asthma and bronchitis. The court heard the case in May but reserved its judgement. In Jakarta, Indonesia, too, people await a district court's ruling on June 24, in a case on the government's failure to curb air pollution.

QUERY

Blue whales in Indian waters

1 Where were the blue whales found?
For the first time, researchers from the University of Washington, US, have detected blue whales off Lakshadweep. The group may be of pygmy blue whales—the smallest of the mammal's subspecies—known to live in the Indian Ocean.

2 How did the scientists track the whales?
Blue whales are difficult to spot, so researchers track the songs the mammals use to communicate. For the study, scientists placed underwater microphones near Kavaratti Island, Lakshadweep's capital. Recordings of whale songs between 2018 and 2020 confirm their presence between the winter and summer monsoon months.

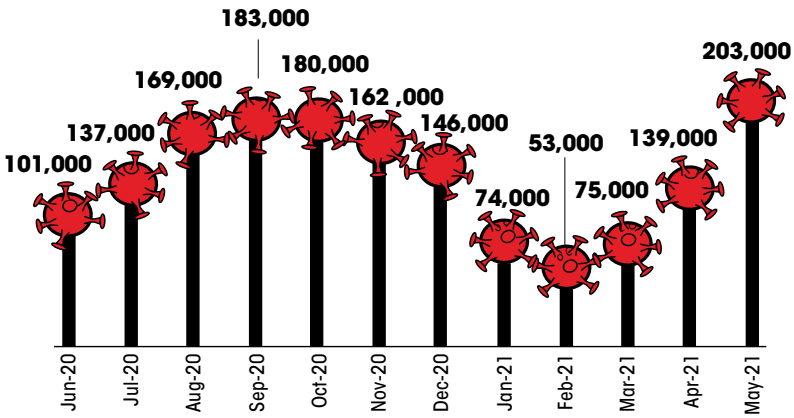
3 What does their presence mean for Lakshadweep?
Blue whales are endangered and efforts to protect them are underway. Now that their presence in Lakshadweep is confirmed, the island must be included in all whale conservation plans.

TRACKER

India disposes 12 per cent of its biomedical waste (BMW) without treatment. This is worrying due to the recent rise in COVID-19 related BMW, which is 33 per cent of non-COVID waste

	2017	2018	2019
00 BMW generated per day (in kg)	559,080	614,740	619,119
00 BMW that gets treated (in %)	92.8	86.9	88

Average monthly COVID-19 biomedical waste (in kg per day)



Source: *State of India's Environment: In Figures*, using data from Central Pollution Control Board

BITS GLOBAL

China reported the world's first human case of H10N3 bird flu on June 1.The patient was admitted in a hospital in the country's Zhenjiang province on April 28 after developing fever and other symptoms. There is neither any evidence of human transmission of the virus nor have any other reported cases been reported since then.The source of the current infections remains unknown.The H10N3 virus is rare among avian populations; it causes influenza and respiratory illness.

A fire-stricken container ship sunk off the coast of Sri Lanka on June 2, after it caught fire on May 21 due to a leak of nitric acid. The ship was carrying 25 tonnes of the compound, which is used in fertilisers and explosive industries.The *X-Press Pearl* disaster has disrupted Sri Lanka's marine life by also dispelling 3 billion plastic pellets into the ocean. Authorities are worried that a potential oil spill from its remains will destroy coral reefs near Colombo.

The US Senate on June 8 passed a $250 billion bill to boost funding for technology research and development and improve the country's global competitiveness.The bill proposes to expand the role of the US' National Science Foundation to fill the gaps in advancing new-age technologies such as artificial intelligence.

Deforestation in Brazil's Amazon rainforest surged at a rate of 67 per cent in May 2021 as against the same month last year, shows data with Inpe, the country's space research institute. Much of the land cleared is targeted for cattle ranches, farms and logging. This is the third consecutive month that deforestation in the region has risen, it says.

BITS INDIA

India may have lost 3 per cent of its GDP due to global warming of 1°C over pre-industrial levels, as per a June 8 report by London-based think tank Overseas Development Institute (ODI). The effects of rising temperatures, such as acute water scarcity faced by over 1 billion people in the country, are hindering its economic growth, ODI says. At this rate, if the world warms by 3°C, India may lose 10 per cent of its GDP.

The country will blend 20 per cent ethanol (E20) in petrol by 2025, five years ahead of the earlier deadline, Prime Minister Narendra Modi announced on June 5. Blended fuel results in fewer carbon emissions. Currently, the country blends 8.5 per cent ethanol in petrol. The promotion of E20 blended fuel will also reduce the country's dependence on oil imports
.

The National Tiger Conservation Authority on June 7 ordered the temporary closure of all tiger reserves in the country after a spate of animal COVID-19 cases at the Arignar Anna Zoological Park in Chennai. On June 3, a nine-year-old Asiatic lioness in the zoo died of the disease, while nine other lions tested positive. Zoo officials have quarantined the infected lions and are collecting samples for genome sequencing, as well as testing other mammals for the virus.

Assam got its seventh national park, the Dehing Patkai Wildlife Sanctuary, on June 9. This is the second such park to be recognised in the state within a week, after the notification of Raimona National Park on June 5. Dehing Patkai was upgraded to a national park after protests against coal mining within its boundaries, which along with increased deforestation and human settlements, threatened contiguous rainforests in the area.

FRAMEWORKS

■ The Ministry of Road Transport and Highways has published **draft Central Motor Vehicles (Amendment) Rules, 2021** to exempt certain battery-operated vehicles from fee payment for issue or renewal of registration certificates.

■ The Union agriculture ministry has issued the **Fertilizer (Inorganic, Organic or Mixed) (Control) Third Amendment Order, 2021** to clarify the criteria to classify straight or simple potassium and micronutrient fertilisers.

■ The Ministry of Power has issued the **Draft Bureau of Energy Efficiency (Manner and Intervals for Conduct of Energy Audit (Accounting) in electricity distribution companies) Regulations, 2021**. The draft mandates an energy audit for all electricity distribution firms, within four months of the new rules coming into effect.

IN COURT

NATIONAL GREEN TRIBUNAL

■ The National Green Tribunal (NGT) told the Union defence ministry to comply with all rules on disposal of biomedical, domestic, electronic and weaponry waste. The tribunal was hearing a case on waste management in cantonments and military stations. The ministry previously set up an apex monitoring committee to facilitate compliance.

■ Gujarat assured NGT of action on illegal construction on the Vishwamitri river in Vadodara, as part of the Vishwamitri Riverfront Development Project (VRDP). The project itself has been abandoned due to environmental violations.

■ NGT expressed dissatisfaction on the delay in setting up of ropeways and sewage treatment plants in Manali and Rohtang Pass, Himachal Pradesh. These steps are to curb pollution due to vehicular movement.

HIGH COURTS

■ The High Court of Tripura told the state government to look into complaints that relatives of COVID-19 patients admitted in care centres in Agartala moved freely between wards, without personal protective equipment. The court also noted that the number of positive cases reported by the state every day does not correspond to the number of tests undertaken.

■ The Kerala High Court censured state authorities for not ensuring strict enforcement of laws against encroachment on pedestrian facilities and public spaces in the state. The matter came up in a case regarding a writ petition by the Trivandrum Chamber of Commerce and Industry seeking guidelines to mark certain areas for public rallies and demonstrations. The court asked the authorities to detail the steps taken to curb such encroachment.

So far...

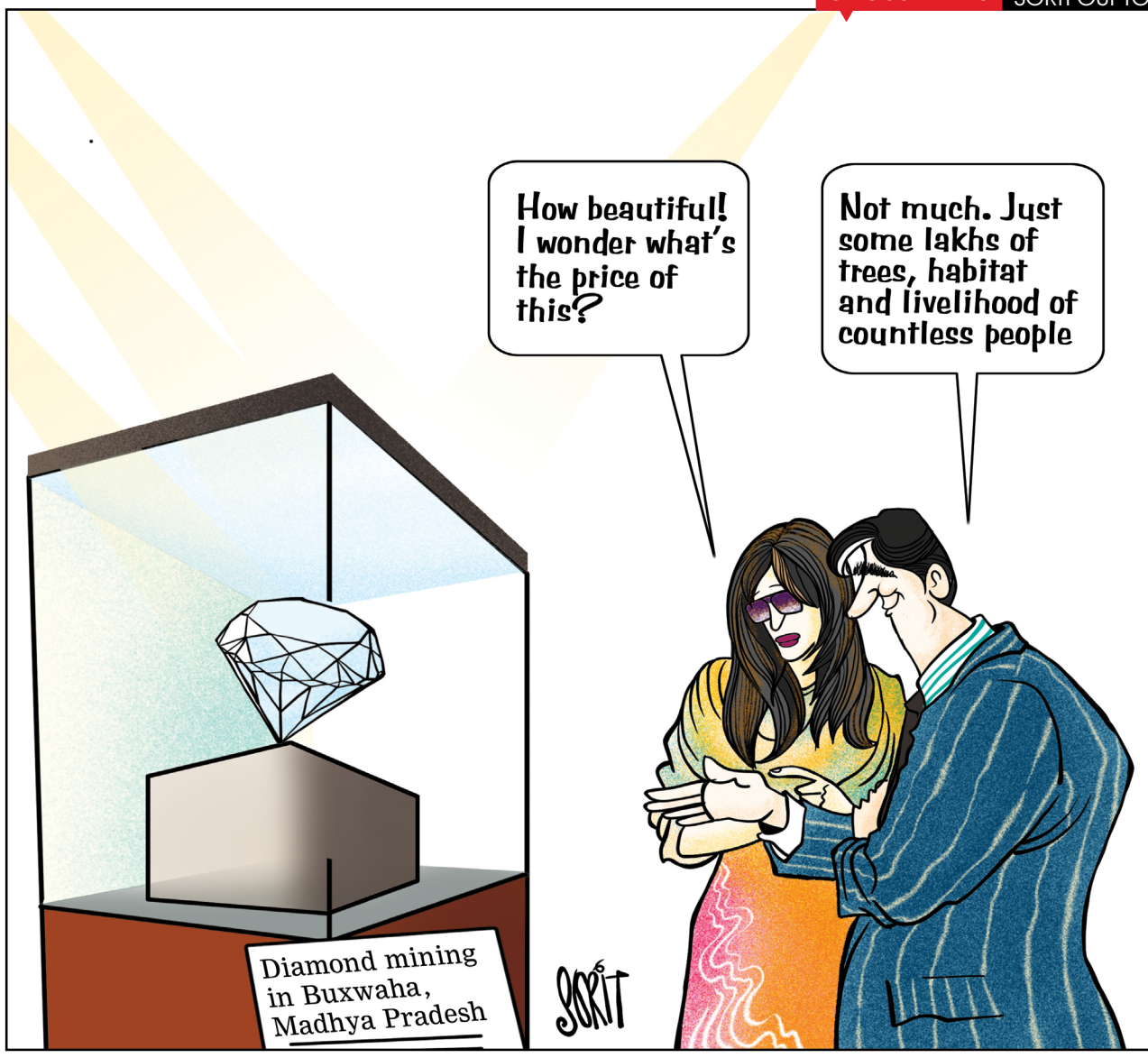
Number of cases on environment and development tracked from January 1 to June 8, 2021

NATIONAL GREEN TRIBUNAL	SUPREME COURT	HIGH COURTS
176	55	97

FOR DETAILED VERDICTS, SCAN

CROSS HAIRS

SORIT GUPTO



BIG NUMBER

2 billion

people in South East Asia are expected to face food and water shortages if the Hindu Kush-Himalayan mountains lose up to two-thirds of their ice cover by 2100

Source: Melting Glaciers, Threatened Livelihoods: Confronting Climate Change to Save the Third Pole by United Nations Development Programme

VERBATIM

"POPULISM'S FALSE PROMISES ARE PROVING NO MATCH TO BIOLOGY: AS COVID REMINDS US, WE'RE NOT JUST INTERCONNECTED, WE'RE INSEPARABLE"

WINNIE BYANYIMA

Executive Director, Joint United Nations Programme on HIV/AIDS (UNAIDS) on unequal access among countries to AIDS medicines and treatment. A recent UNAIDS report says the world has missed its goals to curb the disease, risking another pandemic by 2030

Compiled by Rajit Sengupta, Sanjit Kumar, K M Sheeja, Susan Chacko, Tejprakash Bhardwaj and Dakshiani Palicha

संदेश

5 जून, 2021

विश्व पर्यावरण दिवस

'ईको सिस्टम को मूल रुप में लाना है'

''आप सभी को विश्व पर्यावरण दिवस की हार्दिक शुभकामनाएं। संयुक्त राष्ट्र पर्यावरण कार्यक्रम ने वर्ष 2021-30 के दशक को 'ईको सिस्टम पुनर्बहाली पर यूएन दशक' घोषित किया है। इस दशक में हमें ऐसे विश्व का निर्माण करना है जहाँ वर्तमान और भविष्य में पृथ्वी के सभी जीवों के स्वास्थ्य और कल्याण की बात हो और मनुष्य और प्रकृति के बीच बेहतर तालमेल स्थापित हो सके।

हमारे लिये यह गौरव का विषय है कि छत्तीसगढ़ में ईको सिस्टम के संरक्षण की आदर्श परंपरा रही है। ईको सिस्टम की बहाली प्रकृति और मनुष्य के बीच एक जुटता को भी बल देती है। हमें यह प्रयास करना होगा कि हम अपने स्थानीय पर्यावरण का प्रबंधन ऐसे करें जिससे कि प्रकृति को नुकसान भी न पहुंचे और प्राकृतिक संसाधनों का भी विकास से संबंधित गतिविधियों में उपयोग हो सके। आईये हम सभी छत्तीसगढ़ के ईको सिस्टम की बहाली का संकल्प लें, और पर्यावरण को बचाने के लिये हर संभव प्रयास करें''

हमारे समाधान प्रकृति में हैं।

जहाँ है हरियाली
वहाँ है खुशहाली

श्री भूपेश बघेल
माननीय मुख्यमंत्री, छत्तीसगढ़

छत्तीसगढ़ पर्यावरण संरक्षण मण्डल
(आवास एवं पर्यावरण विभाग, छत्तीसगढ़ शासन)

PHOTOGRAPH COURTESY: SAVE LAKSHADWEEP FORUM

PLAN FOR THE WORSE

A slew of administrative and land reforms initiated in Lakshadweep pose an existential threat to the islands and have provoked widespread protests

JINOY JOSE P, KOCHI AND **SHAGUN KAPIL,** NEW DELHI

LAKSHADWEEP IS on the boil. Four regulations that the administration of India's smallest Union Territory initiated between January and April this year have triggered protests in the otherwise calm coral islands, igniting a debate on conservation of their unique culture and ecology.

All the regulations await approval by the Union Ministry of Home Affairs, but parts of the regulations have been implemented through two executive orders by the Union Territory administration. The regulations "will have irreversible

While the government says the new regulations will help develop Lakshadweep as a tourist hub, protesters say they will destroy the archipelago's ecology and culture

`Our protest is against the anti-social and anti-public new legal measures'

MOHAMMED FAIZAL P P

I WOULD like to make it clear that our protest is never against the Central government, but against the arbitrary decisions taken by Praful K Patel, the Administrator who is currently in charge of Lakshadweep. Our protest is against the personal interests that he is trying to enforce in Lakshadweep by colluding with the legal system. Our protest is against the abuse of power and blatant misuse of power. Our protest is against the weird anti-social and anti-public new legal measures enacted by the Administrator. It is the ulterior motive of the Administrator to destroy the traditional life of islanders through wrongly drafted promulgations. Our protest is for the restoration of the peaceful life of the people of Lakshadweep. It is to ensure a prosperous life for the coming generations on the soil of Lakshadweep for which our forefathers gave their lives.

(Author is a leader of the Nationalist Congress Party and member of Parliament from Lakshadweep. This piece is excerpted from his Facebook post dated May 24)

ecological, social and cultural ramifications on the inhabitants of this rich and fragile island ecosystems," says a June 11 statement by Vikalp Sangam, a grouping of 70 civil society organisations protesting the proposed changes. It is pertinent to take a closer look at the four draft regulations and the Ordinances.

Draft Prevention of Anti-Social Activities Regulation, 2021

This was the first of the four new draft regulations, dated January 28, and aims to curb criminal activities on the islands. Section 3 of the regulation allows the administration to detain a "person with a view to preventing him from acting in any manner prejudicial to the maintenance of public order". This detention can be up to a year (Section 13) without public notice. The authority making the detention order has to communicate to the detenu grounds of detention within seven days from the date of detention (Section 8) but it does not have to "disclose facts which it considers to be against the public interest to disclose". Worse, the expiry or revocation of a detention order "shall not bar the making of another detention order under Section 3 against the same person", the regulation states. "What is the aim of bringing such an act to a place which has perhaps the lowest crime rate in the country?" Mohammed Faizal P P, leader of the Nationalist Congress Party and member of Parliament from Lakshadweep told the media (see 'Our protest is...'). Such measures may end up being misused and might become tools to muzzle dissent, he said. As per the latest National Crime Records Bureau

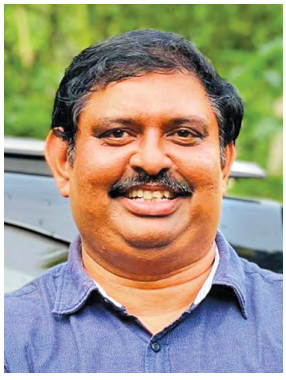
data, Lakshadweep had no cases of murder, kidnapping, robbery, rape or dacoity in 2019.

Draft Lakshadweep Animal Preservation Regulation, 2021

This draft regulation, dated February 25, prohibits "selling or buying beef or beef products". If found guilty, a person can be "punished with imprisonment for a term which may extend to ten years but shall not be less than seven years and with fine which may be extend to five lac [sic] rupees but shall not be less than one lakh rupees", reads the regulation (see 'An attempt to...'). Similarly, through an executive order on February 23, the administration removed the ban on alcohol in Lakshadweep. "It does not seem innocent when the administration introduces curbs on the sale and use of cow meat in Lakshadweep, whose population comprises nearly 95 per cent Muslims," says U C K Thangal, one of the convenors of Save Lakshadweep Forum, a collective of islanders formed in May to oppose the reforms. As per Census 2011, Lakshadweep's 96.58 per cent population is Muslim.

'An attempt to interfere in eating habits of the people'

H K MOHAMMED KASIM



SUCH A regulation is required in a territory where there are large number of domestic, commonly maintained, stray and wild animals requiring common laws and procedures for peaceful existence, and to avoid cruelty towards animals. In Lakshadweep nothing of this sort is available; only few domestic goats and very few milking cows, may be less than 10 in major islands and even less than that in other minor islands. Slaughter animals are brought from the mainland on a season to season basis and they are not regular animals of the islands. Slaughtering is mainly of cows (after their milking age) and of bulls.

The main intention of bringing out this draft is to ban beef. Banning of beef is not a question of any island's economy, but an attempt to intervene in the eating habits of the people. It will put the people living with this trade in difficulty. It will lead to difficulties in finding non-veg dishes, which are at least one meal a day in these islands as there is no alternative.

(Author is state general secretary of Bharatiya Janata Party, Lakshadweep)

Draft Lakshadweep Panchayat Regulation, 2021

This draft regulation, also dated February 25, says a person with more than two children cannot contest Gram Panchayat elections. Lakshadweep has one district panchayat and 10 gram panchayats. Its population growth rate has seen a dramatic fall—from 17.19 per cent in 2001 to 6.1 per cent in 2011, which does not indicate a need to control population. The government's argument is the high population density of Lakshadweep —2,013 persons per sq km against the national average of 382 persons per sq km, as per Census 2011. Experts, however, say that the two-child norm are no guarantee of population control (see 'No evidence...' on *p*20). Lakshadweeps's population, as per Census 2011, is 64,473.

While the regulation is yet to be enforced, the administration diluted the powers of panchayats through an executive order on May 5. "In 2012, the Central Government had handed over five departments, directly connected to the people—Education, Animal Husbandry, Agriculture, Fisheries and Health Care—to Local Self Governments. A committee headed by S S Meenakshi Sundaram had recommended more powers to LSGs. However, the Administrator has taken back all these departments from the District Panchayath, through an ordinance dated May 5th, 2021," says Vikalp Sangam's statement. Fishery and coconut farming are the main occupations of the people here.

Draft Lakshadweep Development Authority Regulation, 2021

Also called Draft Lakshadweep Town and Country Planning Regulation, this regulation, dated

April 28, provides for constitution of a Planning and Development Authority with sweeping powers over the use of land and waters. The authority has the "permission to develop land and for other powers of control over the use of land; to confer additional powers in respect of the acquisition and development of land for planning; and for purposes connected with". Section 2(9) of the draft regulation defines development as "the carrying out of building, engineering, mining, quarrying or other operations in, on, over or under, land, the cutting of a hill or any portion there of or the making of any material change in any building or land, or in the use of any building or land, and includes sub-division of any land". These clauses vest the administrator with powers to acquire any piece of the island for development and remove or relocate islanders if their existence in the localities conflicts with the proposed town planning or developmental activities.

In a media interaction on May 28, the district collector S Asker Ali defended the laws proposed by the Union Territory Administrator Praful Khoda Patel and said the changes will help develop Lakshadweep like the neighbouring island country of the Maldives which is a global tourist hub (see 'Tourism will...' on *p*21). To this end, the administration has started developmental activities in four islands.

In Suheli and Cheriam, which are usually uninhabited but are frequented by fishers seasonally, the administration has demolished fishers' sheds and taken control of the land; while in Minicoy and Kadmat, both of which are inhabited, the plans are underway, says a source requesting anonymity. Of the Union Territory's 36 islands, only 10 are populated (see 'Trouble in archipelago').

"They are planning such mega projects in four of the islands where people live. This conflicts with the Raveendran panel's recommendations," says Nizamuddin K I, a panchayat member from Kavaratti, the capital city. Development in the island has to be as per the Integra-ted Islands Management Plan (IIMP), approved in 2015 by the Union Ministry of Environment, Forest and Climate Change.

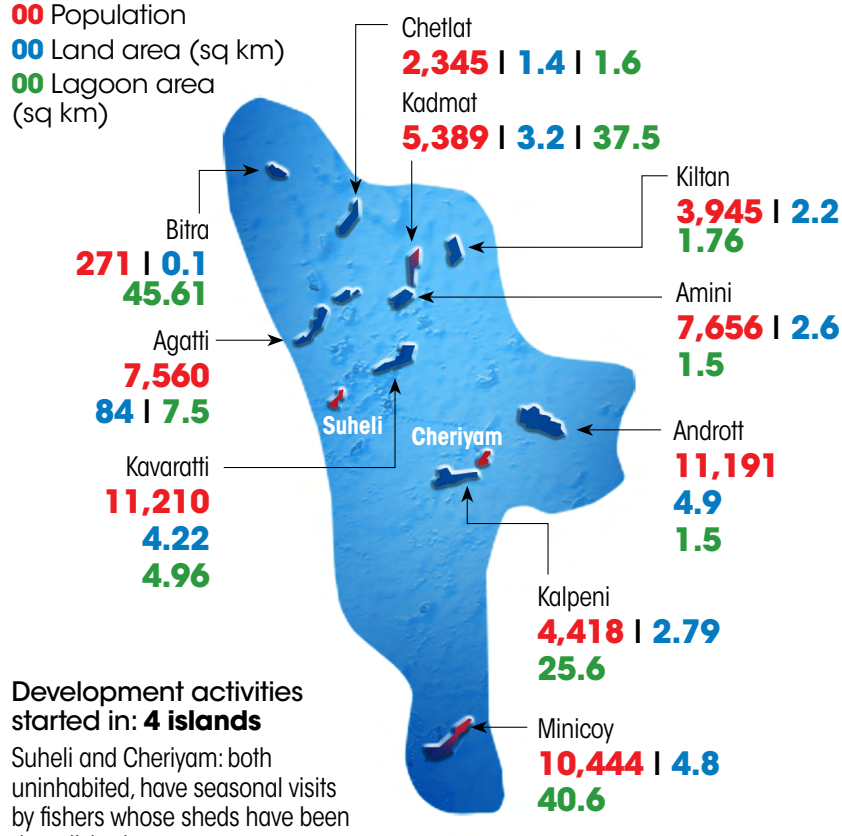
IIMP was made after incorporating recommendations of the Justice Raveendran Committee, appointed by the Supreme Court. "The reforms proposed are not in tune with IIMP. The actions of the administrator seem to be part of a three-pronged strategy—pave way for big players in tourism sector, restrict cultural-religious freedom, and cut off links with Kerala," says the Vikalp Sangam statement. "We cannot be the Maldives," says Nizamuddin.

Trouble in archipelago

While protesters demand that all new projects be undertaken in uninhabited islands, the administration has started activities in four islands, two of which are populated

Total islands: 36

Inhabited islands: 10
Kavaratti, Agatti, Amini, Kadmat, Kiltan, Chetlat, Bitra, Andrott, Kalpeni and Minicoy



Development activities started in: 4 islands

Suheli and Cheriyam: both uninhabited, have seasonal visits by fishers whose sheds have been demolished;
Minicoy and Kadmat: populated, with developmental plans underway

Sources: Census 2011; Save Lakshadweep Forum

'No evidence a two-child policy is effective'

POONAM MUTTREJA

THE PROPOSED regulation is suicidal and defies all logic. Lakshadweep has a total fertility rate (TFR) of 1.4, which is far less than the national average of 2.2, according to the National Health and Family Survey 2019-20 (NFHS-5). This is a cause for concern. The overall population growth rate for the Union territory (UT) has dropped to 6.3 per cent in 2001-2011 from 17.19 per cent in 1991-2001. There is no evidence that a two-child policy is effective even for states which have high fertility rates. Similar policies in other states have failed to bring down the fertility rates to the desired level. In the states that adopted a two-child policy, there was a rise in sex-selective and unsafe abortions; men divorced their wives to run for local body elections, and families gave up children for adoption to avoid disqualification, revealed a five-state study by Nirmala Buch, a former senior Indian Administrative Service officer. Lakshadweep will soon have an ageing population and experience labour shortage. This would increase the elderly dependency ratio and intensify the burden of non-communicable diseases, requiring significant financial resources to support the elderly and address their healthcare needs.

(Author is executive director of Public Health Foundation of India)

MAJOR DIFFERENCES

Scientists say there are significant differences between the Maldives and Lakshadweep, though both archipelagoes appear alike. The Maldives has a concentration of 26 atolls (ring-shaped coral reef islands) and each atoll has hundreds of islands. In total, the Maldives has more than 1,000 islands, while Lakshadweep has just 36. "Most of the tourism activities happen there on previously uninhabited islands. Even if you assume that Lakshadweep islands are ready, the plan does not favour the local economy significantly," says Nizamuddin. "In the Maldives, the resorts and tourism projects are run by big private companies and not the locals, which could not be the case with Lakshadweep," says a journalist in Kochi who has been tracking tourism in South Asia. "Patel seems to be favouring big corporates if the proposals in the draft are any indication," he adds.

The economic and infrastructural projects may introduce significant changes in the land-lagoon ratio of the islands, says the Save Lakshadweep Forum. Lagoons are necessary for reef recovery.

FRAGILE ECOLOGY

"Lakshadweep's ecology is very fragile. Any development plan for this region must consider this. As things stand, the proposed plans do not seem to be well thought-out," says K V Thomas, former chief scientist with the National Centre for Earth Science Studies. Thomas was part of the group of experts that prepared IIMP for Lakshadweep.

What is unique about Lakshadweep is that the fate of the people who make the islands their home are closely linked with the marine life, says Rohan Arthur, a marine biologist with the Mysuru-based Nature Conservation Foundation (NCF). "The health of Lakshadweep's coral reefs will, therefore, eventually determine the well-being of human communities in the archipelago and the habitability of the islands," says Arthur. Hence, protecting the coral reefs and the already emaciated natural habitats of the islands is paramount.

In Lakshadweep, land is a limited commodity. Every acre of the inhabited and uninhabited islands is used by local communities for livelihood activities. Diverting this land towards infrastructure development could only serve to intensify the ecological impacts on the land. The proposed plans to occupy the lagoons with floating constructions and solar panels are also misguided, given how vital the lagoons are, especially in the wake of climate disturbances and for local livelihoods. "Initiatives such as these would increase land and water pollution, strain the already stretched freshwater reserves,

and increase demand of commercial reef fish," comments Arthur.

ATOLLS ALREADY WEAK

Climate-related disturbances to Lakshadweep reefs over the past two decades have resulted in atoll reef frameworks being seriously compromised, calling into question the ability of these frameworks to continue to sustain human populations in Lakshadweep over the medium- to long-term, show studies done by NCF. Given that, the current plans for infrastructure-heavy development on the islands is "ill-advised, to say the least", Arthur adds. Any stress on the land, lagoon and reef, over and above what the system is already under, would push Lakshadweep over a critical boundary of ecological decline, from which recovery could be extremely difficult and protracted.

There is also the problem of waste management, say P Pookunhi Koya, former member of Parliament from Lakshadweep and convenor of the Save Lakshadweep Forum. "Massive-scale tourism, as being mooted by the administration, will introduce unforeseen levels of waste, and managing it is going to pose gargantuan challenges to the ecosystem," says Koya. "The proposals are silent on constructive solutions. They only focus on profit maximisation," he adds.

"Above anything, you cannot throw the people out in the name of development," says a source who does not want to be identified. "Lakshadweep is a 100 per cent rural area and doesn't have the concept of building plans or lay outs. But now the administrator says we will see whether the layout of your house is correct or not, and we will allow you to live in it if it is not a bad lay out," he says.

'Tourism will surely generate enormous amounts of waste'

ALI MANIKFAN

I AM from Minicoy. Here, people stay very close to the sea. In my childhood, during the monsoons, I would see the waves hitting the wall of my own house. Now there is a 100 m distance between the houses and the sea and people have planted coconuts on that land. The land area has been increasing over time. These are coral islands, which means they are made of the sand that coral reefs give way to when they decay. So it is important to take all these factors into consideration while making land-use plans for the islands.

Tourism will surely attract more people. More boats, more vehicles and more consumption. It will surely generate enormous amounts of waste. What works for Lakshadweep is sustainable tourism. Excessive flow of travellers can damage the ecology beyond repair. Lakshadweep is a precious asset for India. It is geopolitically important because it works as a border. The people also act as a kind of a border security force as they keep a close watch on intruders. So their importance must be understood. I request the administration to implement plans without hurting the environment in Lakshadweep.

(Author is an ecologist from Lakshadweep, now based in Kerala)

Activists also claim that when the administration says it will roll out villa projects in the islands, it is not in favour of inviting bids from local people for the projects. "We understand they are planning global tenders. Big players will bid for 100-200 projects together and we cannot outbid them. Clearly, this will not help the locals," says a resident of Andrott island, who is an entrepreneur and does not wish to be identified. The islanders say it is bizarre and shocking to see the administration going ahead with the plans unilaterally and with no significant move to take the community into confidence. "We are a population of Scheduled Tribes, and the Constitution guarantees us certain rights. All we demand is that the Constitutional values be upheld. Why is that a crime?" asks an activist. "We are not against sustainable development that can help the local economy as well as the environment," says Koya. "The administration can choose uninhabited islands for activities." DTE

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MAY GET LOST IN DETAILS

That's the concern among environmentalists as Uttarakhand sets the gross environmental product in motion

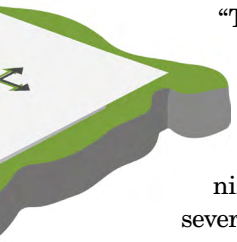
MEGHA PRAKASH
DEHRADUN

ON JUNE 5, the occasion of World Environment Day, when Chief Minister Tirath Singh Rawat announced Uttarakhand would be the first state to introduce the Gross Environmental Product (GEP) as a measure of progress, it was a historic moment for the Himalayan state, as well as for environmentalists who have been pushing for GEP for close to a decade now (see 'Making of GEP').

"GEP is all about periodically evaluating the status of environment by measuring the growth of natural resources," says Anil Prakash Joshi, an environmentalist based in Dehradun. Uttarakhand is an ecologically sensitive region. Yet, environmental degradation in the state has gone beyond the acceptable limit over the past few decades, making it prone to disasters and incurring huge losses to humanity. Hence there is an urgent need to monitor the growth of natural resources in parallel to the current development pattern, measured through economic growth, Joshi explains. Such a measure will also help assess the impact of developmental activities on the

ILLUSTRATION: RITIKA BOHRA / CSE

environment and analyse the extent to which it should be allowed. This will make the economy sustainable over time, he says. However, there is a fear that this concept of environmental growth may be seen and measured from the viewpoint of economic growth or gross domestic product (GDP).



"That will dilute the very idea my organisation Himalayan Environmental Studies and Conservation Organization (HESCO), and several other environmentalists have been striving for," Joshi adds (see 'Long road to...', *p*24). His fears are not unfounded.

Soon after the announcement on June 5, the state government has set in motion the process to identify indicators and develop a formula to implement GEP. Anand Bardhan, principal secretary of the forest and environment department of Uttarakhand, tells *Down To Earth* (DTE) the state is yet to develop norms to calculate GEP as it is a new concept. As of now, his department, which is in charge of implementing GEP, is in talks with institutions such as the National Environmental Engineering Research Institute (NEERI), Nagpur; the Wadia Institute of Himalayan Geology and the University of Petroleum Studies in Dehradun; the Indian Institute of Technology, Roorkee; and HESCO. "The institutional partners, once selected, will define the norms that will then be evaluated by a competent authority before being adopted," says Bardhan, adding that a preliminary report in this regard will be published around the end of the year. Bardhan, who also heads the five-member committee set up in March 2020 to develop a method to measure GEP, however, says it will be calculated on the line of GDP.

It appears that the government is developing the formula based on a 2018 report commissioned by the state's Directorate of Economics and Statistics, which provides economic estimates for as many as 21 ecosystem services from the forest area of Uttarakhand and their contribution to the state's GDP. The report was prepared by the Indian Institute of Forest Management (IIFM), Bhopal, and a Delhi-based advisory group, IORA Ecological Solutions. Forest areas account for almost 71 per cent of Uttarakhand's geography. Yet contribution of forestry in the state GDP (in 2015-16) was only 2.08 per cent, the report notes. It estimates that the monetary value of the flow benefits emanating from the Uttarakhand forest is about ₹95,112 crore annually. Since these benefits are not restricted to Uttarakhand and also flow to downstream states, the report argues that the state should be given a "green bonus" for meeting the expenditure for preserving and regenerating degraded natural forests and environmental resources. The IIFM-led study thus provides a framework of GEP that reflects the economic value of all the natural resources of the state and defines it as the "gross ecosystem product".

Speaking to DTE, Madhu Verma, the lead author of the report, who was formerly with IIFM and is now chief economist at the World Resources Institute-India, explains her idea of gross ecosystem product and how it can be implemented.

GDP is the sum of whatever we produce every year within a boundary of a state or a nation. This includes services like the railways and construction sector.

Making of GEP

WHAT IS GEP

Gross environment product is a measure that allows monitoring of ecological growth parallel to economic growth, measured using the gross domestic product or GDP

WHY GDP IS NOT SUFFICIENT

GDP is not adjusted for pollution costs. If two economies have the same GDP per capita, but one has polluted air and water, it will have disparate impact on people's well-being. Yet GDP won't capture it

HOW WILL GEP HELP

It will update us about the growth of forest, soil and water, and quality of air, in any given year, parallel to GDP. Therefore, it will help understand if development is happening at the cost of ecology. This will help maintain a balance between economy and ecology. Currently, we are unaware how long natural resources will support us.

GEP AND ITS FOUR PILLARS

Forests: Measure trees planted every year by quantity and quality, like tree density, highlight the value and addition to forest in a given year. It can be done by the forest department

Water: Enhance quality and quantity of water in waterbodies. Annual precipitation and water stored will be the criteria for measuring recharge. Quality can be assessed by measuring parameters like pH and turbidity. To be implemented by water supply or soil conservation agencies.

Soil: Its enrichment through various inputs in the form of organic values and mitigation of soil runoff due to heavy rain in a given year should be the quantified value. This can be done by agriculture and soil conservation department.

Air: Analyse air quality periodically and undertake efforts to improve the same. Such quantification will help analyse the efforts taken to check pollution through the use of CNG, encourage the use of public transport and take other control measures.

Long road to eco-history

Uttarakhand's GEP bid comes after years of legal and social interventions

2009-10
Anil Prakash Joshi of the Himalayan Environmental Studies & Conservation Organisation (HESCO) floats the idea of a Gross Environmental Product (GEP), which then Uttarakhand chief minister (CM) Ramesh Pokhriyal okays. Change in government halts plans.

2011
Joshi files a PIL with the Nainital high court. The court defers it after the state says it has no indicator to calculate GEP.

2014-15
Post the 2013 Kedarnath floods, then CM Vijay Bahuguna consults Joshi on GEP and forms a committee. Joshi files another PIL, to which the government responds positively. The Indian Institute of Forest Management (IIFM), Bhopal is commissioned to calculate how much soil, water and habitat is left in the state.

2018
The state's new principal secretary expresses interest in GEP. The director-general of the Council of Scientific and Industrial Research, Shekhar C Mande, connects HESCO with the National Environmental Engineering Research Institute (NEERI), Nagpur, to develop an equation to calculate GEP.

2019
Joshi and NEERI agree to sign a memorandum of understanding to develop the GEP equation, with the state government's involvement.

2020
A five-member committee under the chairmanship of then chief secretary Anand Bardhan meets at Dehradun-based Wildlife Institute of India (WII)

2021
The state becomes the first to announce GEP introduction; initiates identification of indicators and development of formula.

Likewise, gross ecosystem product is the total value of products and services that are produced within a functional living ecosystem and are essential for human welfare and sustainable development, Verma says. "These are naturally evolving and we may keep altering, augmenting them. For example, a tree is a source of oxygen, timber, shade, fodder, shelter, it regulates water, fixes nitrogen, controls flood, improves soil quality, and so on. All these are invisible services offered by the living ecosystems throughout the year and can be captured using specific indicators," she adds.

VALUE *V* VALUE

Joshi says GEP can simply be estimated using data from the existing agencies that oversee natural resources. Besides, GEP has nothing to do with ecosystem services. There is a thin line of difference between the gross environmental product and the gross ecosystem product. Joshi's GEP is an idea that can be defined as the volume of resources added in a particular year parallel to economic growth. "One can only have the service when they have a resource. Forests, for instance, cannot provide ecosystem services such as the flow benefits if they are in a poor state," Joshi explains.

Joshi's idea of GEP is, rather, related to ecosystem growth. For this, he has identified four natural resources as the pillar of GEP—water, forest, soil and air. "The others are their by-products," he says. For example, agriculture is dependent on water, good soil and a suitable environment. Joshi further explains how GEP can be calculated. More than 90 per cent of rainwater gets lost as run-off. By introducing GEP, the state can know how much water could be collected through various structures made to harvest the rainwater. "For instance," he says, "the HESCO rivulet, a part of the tributary of river Asan Ganga, was lying almost dead until we treated its 40-hectare catchment by making water holes. The forest department joined in to help us with digging water holes. At that time, the discharge of the river had become 90 litre per minute. Today it is 1,200 litre per minute. So this amount of water that we were able to add is GEP. The data collected will then help take informed policy decisions on planning conservation programmes. Any amount of water that we hold will certainly recharge a stream, a spring or underground water, and revitalise a dried or degraded patch of forest." In other words, once one indicator is improved, the entire ecosystem also improves, says Joshi, adding that GEP is all about inclusive growth.

Rakesh Kumar, director, NEERI, a Council of Scientific and Industrial Research institute based in Nagpur, who has been actively working with Joshi in developing GEP, cautions against comparing GEP with GDP. GEP, if implemented with right earnest, will help the government adequately allocate budget to safeguard all the natural resources. "When we have a repository of natural resources in terms of quality and quantity of the above parameters, this allows the government to take informed decisions at the policy level and know where exactly to divert the funds for environmental development," Kumar tells DTE.

The interesting aspect of GEP, as Kumar highlights, is that it will always be in the positive side of counting and not negative. DTE

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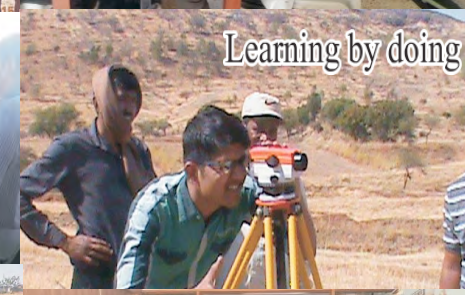

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A doctor checks a patient for mucormycosis symptoms at a hospital in Mumbai. Amid the second wave of COVID-19, more mucormycosis patients are suffering from aggressive eye infections

PHOTOGRAPH: REUTERS

CAUGHT UNAWARES

Even as India attempts to understand the sudden rise of COVID-related mucormycosis, its treatment throws up a different set of challenges

BANJOT KAUR
NEW DELHI

EVEN BEFORE India could sense a wane in the second wave of the pandemic that threw the public health infrastructure into chaos, doctors had another related crisis to handle: an outbreak of mucormycosis among COVID-19 patients. As on June 11, more than a month into the outbreak, cases of mucormycosis in the country crossed the 30,000-mark and reportedly resulted in 2,000 deaths.

The disease is caused by "Mucaroles" order of Zygomycota or Zygote fungi. Its spores, which are essentially microscopic particles that serve a purpose similar to that of seeds in plants, are found everywhere—soil, plants, manure and decaying fruits and vegetables to even in the nose and mucus of human beings. But human body is not known as the natural habitat for these fungi. To thrive here, it needs an enabling factor that weakens the human immune system. And once an immunocom-promised person inhales the spores, they get attacked by this "opportunistic infection". Mucormycosis is therefore typically reported by people suffering from immunocompromising conditions like diabetes. Symptoms include fever, skin lesions, blurred vision with eye pain, blackish or blood-filled nasal discharge, thrombosis (clot in blood vessels) and necrosis (death of body tissue due to lack of blood supply).

It spreads rapidly, sometimes 4-5 cm a day. If lesions turn severe and part of the tissue becomes necrotic, it has to be surgically removed. The infection can chew up

bones and spread to the brain when left inadequately treated. The US Centers for Disease Control and Prevention pegs the infection's mortality rate at 54 per cent.

Though on May 20, the Union government has asked all states to declare the infection an epidemic, the fact is India had been a hub for mucormycosis even before COVID-19. Globally, the disease is reported by nine other countries—with less than five cases in Brazil, Chile, Egypt, Honduras, Mexico, Russia, Uruguay and Iraq, and 10 in Nepal. What has shocked the medical fraternity this time is its widespread increase in cases, adding to the intensity of COVID-19 crisis. Shivaprakash M R, former president of the Indian Society of Medical Mycologists, says, "Doctors used to see around 100 cases of mucormycosis annually. Since the second wave, for three weeks preceding May 28, the number went up to 10-15 cases a day." Mycology is the study of fungi.

Research papers published since the outbreak of COVID-19, hypothesise a few factors that could have led to this sudden spurt. One, COVID-19 further suppresses the immunity of people suffering from diabetes. In a country that is home to the world's second-largest diabetic population, a lot of COVID-19 patients thus became vulnerable to mucormycosis. Two, use of steroids suppresses immunity. The second wave of the pandemic saw an overuse of steroids among COVID-19 patients to control falling oxygen saturation levels in the blood. Three, COVID-19 is known to increase glucose level in blood by damaging beta cells that produce insulin. It is also known to raise iron levels in the blood. Both the scenarios create an ideal environment for the fungus to overcome immune system.

Between September 1 and December 31, 2020, soon after the first wave of the pandemic, MucoCovi Network, a group of scientists, collected data from 295 patients suffering from mucormycosis, with and without COVID-19. An early version of their study, which will be released in September, points to a 2.1-fold rise in mucormycosis cases as against the same months in 2019. Diabetes was the underlying cause in 62.7 per cent of the cases. COVID-related hypoxemia (a fall in oxygen saturation level) and improper glucocorticoid use are independently linked to the infection.

Arunaloke Chakrabarti, among the few mycologists in India, who has spent 40 years studying fungal diseases, says, "All hypotheses, existing research and past studies point to these two factors—diabetes and the overuse of steroids—causing the infections. But I am not convinced. Those hypotheses have contributed to the understanding but I believe we are missing out on something." He adds, "We have just launched a few multi-centre studies. Till the results come out, we have to resist the temptation of reaching any conclusion."

A RECENT STUDY INVOLVING 16 HEALTH CENTRES ACROSS INDIA POINTS TO A 2.1-FOLD RISE IN MUCORMYCOSIS CASES IN SEPTEMBER-DECEMBER 2020 AS AGAINST 2019—MOST LIKELY DUE TO COVID

Chakrabarti heads the Centre of Advance Research in Medical Mycology at the Post Graduate Institute of Medical Education and Research, Chandigarh, which is collaborating with the World Health Organization (WHO) for mycology research in India. It has launched studies to determine if environmental factors had a role to play—specifically the spore count in environment. It has also launched "transcriptome studies" that would analyse genetic transcripts in a cell to determine the extent of COVID-19's impact on immunity.

Doctors say prior to the recent outbreak, mucormycosis patients would mostly see facial swelling, and treatment would prevent it from spreading to the eye and requiring surgical removal. But now, more patients show up with infected eyes, indicating aggressiveness of the infection. "We don't know the exact reason for this, but early diagnosis is imperative," says Shivaprakash. There is also a panic situation with mislabelling of the infection as black fungus,which is actually caused by an entirely different dematiaceous fungus. Similarly, the so-called "white fungus" infection is caused by candida and is common in all patients admitted in intensive care for a prolonged period, irrespective of the illness. The "yellow fungus" is most likely an infection by the greenish aspergillus, says Shivaprakash.

Sarman Singh, director, All India Institute of Medical Sciences-Bhopal, however, has another worry. He says mucormycosis could be spreading in rural areas without any diagnosis and treatment.

THERE IS A DRUG, BUT...

The key to treatment of mucormycosis is Liposomal Amphotericin B (LAMB)—a drug that is also heavily in demand for the treatment *Visceral leishmaniasis* or kala-azar,

Mucormycosis is caused by Zygomcetes or the Zygote fungi that are present everywhere in the environment

THE CENTRE HAS ASKED INDIAN FIRMS TO RAMP UP PRODUCTION OF LIPOSOMAL AMPHOTERICIN B. BUT STUDIES QUESTION THE QUALITY OF THE DRUG PRODUCED BY MANY MANUFACTURERS

a parasitic infection that can be fatal if left untreated. Kala-azar spreads through sandfly bites and mostly is reported from Jharkhand, Bihar, Uttar Pradesh and West Bengal. The government had initially targeted to eliminate the disease by 2010, but after multiple revisions the deadline now stands at 2022. Since LAMB was initially manufactured only by US-based Gilead Sciences Inc under the name Ambisome and is expensive, WHO procures it from Gilead and donates it to India for the treatment of kala-azar. Since 2014, several Indian manufacturers have also been producing it as LAMB is also used to treat infections by the fungus cryptoccus.

In May, following the surge in cases of mucormycosis, the Centre has asked five Indian LAMB makers to ramp up production. However, there are concerns about quality. The drug is prepared in two ways. The classic Amphotericin B (AMB) is toxic, especially for the kidney. So doctors prefer relatively lesser toxic liposomal form or LAMB. Here, AMB is incorporated in liposome, a lipid that ensures its delivery in a targeted manner to affected tissues. Leena Menghaney, a public health lawyer, points to a 2013 review by non-profit Médecins Sans Frontières that says some manufacturers (apart from Gilead) are not able to maintain the correct proportion of free AMB that will enter the patient's blood after the drug is administered. This is "an essential component for quality assurance of the drug," she says. This is echoed in a 2016 paper by scientists in France, US and UK in *Medical Mycology*. Drugs produced with different methods vary in size, toxicity and efficacy. To maintain drug quality, scientists recommend bioequivalence studies. The US and the EU have guidelines for such studies, but India does not. The Drugs Controller General of India did not respond to *Down To Earth's* (DTE) queries on this.

Then, there is the matter of cost. As per government guidelines, a mucormycosis patient requires 5 mg of LAMB per unit kg per day. A submission made by the Centre's department of pharmaceuticals to the Telangana high court on May 17, says LAMB costs ₹7,484 per 50 mg, excluding GST. So a mucormycosis patient weighing 60 kg would need 300 mg per day for three to six weeks, at a cost of ₹9-18 lakh. If LAMB is not available, 1-1.5 mg of the classical version is given, which costs ₹310 per 50 mg.

To further meet LAMB shortage for mucormycosis, the Centre has asked Bihar, Jharkhand, Uttar Pradesh and West Bengal to divert some WHO-donated drugs. Shyam Sundar Das, who is with the Banaras Hindu University's Institute of Health Sciences and is known for his work on single-dose LAMB for kala-azar, says, this is not possible. "The drugs are donated by WHO for a specific role and cannot be diverted." But DTE has a copy of a letter from the Union health ministry's joint secretary Rekha Shukla to the states on May 22, 2021, which reads: "Diversion of the above mentioned vials (state-wise) is being allowed purely on a loan basis, as the same [a]re supplied by WHO on donation basis for exclusive use of Kala-Azar Elimination Programme with their direct control on inventory management."

In early June, kala-azar programme officers of Bihar, Jharkhand and West Bengal told DTE there was no shortage of LAMB for treating the parasitic infection. They did not rule out that stocks could be depleted. But there is little choice. "For mucormycosis, we get one-tenth the LAMB we demand. How do we not divert kala-azar stocks?" asks Jharkhand additional health secretary Arun Singh. Despite requests from health activists, the Centre has never been keen to procure more LAMB. "We petitioned the Centre several times, much before the pandemic, to look into availability of LAMB for those with twin infections of HIV and cryptococcal meningitis, but in vain," says Menghaney. The question is: had the Centre worked earlier to ensure availability of quality LAMB, would the mucormycosis epidemic have been less severe? DTE @Banjotkaur

PHOTOGRAPH: CREATIVE COMMONS

ONLINE TRAINING ON

EIA: A REQUIREMENT BEYOND CLEARANCE

COURSE DATE: July 1-10, 2021 | **LAST DATE TO APPLY:** June 27, 2021 | **COURSE FEES:** INR 2,500

In 1994, an Environmental Impact Assessment (EIA) Notification was brought in with an objective to minimize the adverse impacts of developmental projects. But it has become a mere clearance process. This is, in part, a result of weakening of the Notification through amendments. But another factor is also responsible for the enfeeblement of EIA.

There are three important stakeholders in an EIA study: project proponent, consultant and regulators. Each of them has a role to play in identifying and quantifying the impacts of a project and implementing appropriate mitigation measures. A good EIA study can actually prove beneficial to the project proponent and save them the cost incurred due to non-compliance. However, there is a lot of ignorance on the mechanism of EIA and this also leads to its non-optimal implementation.

In order to make the process of EIA substantial, clearer and deeper understanding is the need of the hour. To this end, Centre for Science and Environment, is organizing a 10 day-long online training course on the topic.

Course Objective: The online course has been designed to capacitate environmentalists and prospective environmentalists to develop a better understanding of the EIA process.

The course will be conducted through presentations, recorded videos, discussion with experts and reading material.

COURSE COORDINATOR

Ishita Garg
Progarmme Officer, Industrial Air Pollution
Email: ishita.garg@cseindia.org

Participants will be awarded a certificate of completion on successful completion of the programme

KEY TAKEAWAYS

- Consequences of poor EIA reporting
- Methodology for EIA preparation
- Methodology for data collection
- Analysis of socio-economic impacts
- Preparation of Environmental Management Plans
- Case studies on good environmental practices
- Review and evaluation of EIA reports
- EIA legislation: India and developed countries

WHO CAN APPLY?

- Industry professionals, environment consultants and environment engineers
- Researchers and academics
- Students aspiring to work in the field of environment

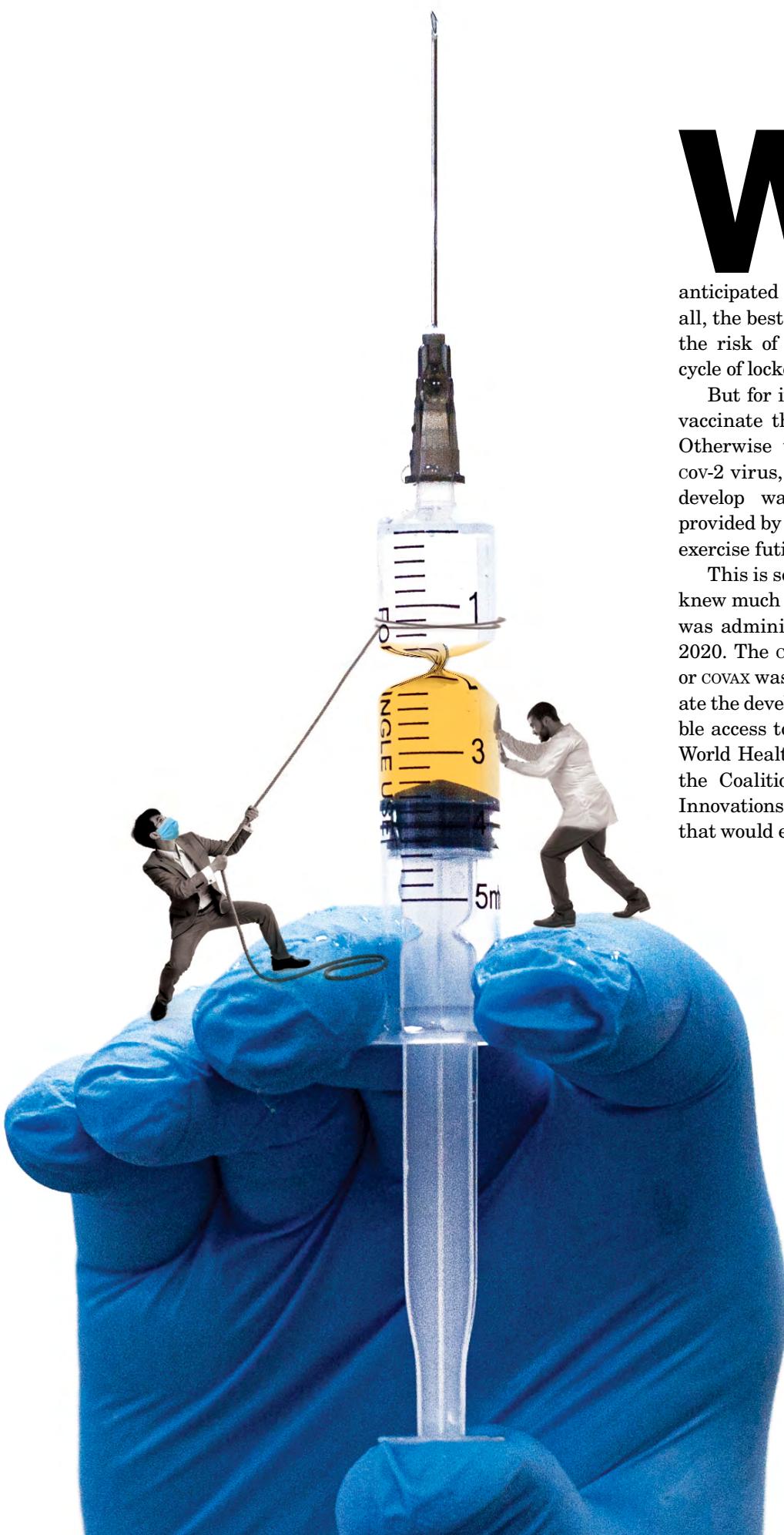
COVID-19

MAD SCRAMBLE

Inequitable distribution amid acute shortage has derailed the global vaccination drive against COVID-19. We need to act fast to win the race against emerging virus variants

VIBHA VARSHNEY | NEW DELHI

ILLUSTRATIONS: RITIKA BOHRA / CSE



With 177 million people already affected and almost 4 million dead, the vaccination drive to combat COVID-19 is perhaps the most anticipated event of our times. It is, after all, the best chance the world has to curtail the risk of new outbreaks and break the cycle of lockdowns and misery.

But for it to work, all countries need to vaccinate their people as fast as possible. Otherwise the constantly mutating SARS-CoV-2 virus, that causes the disease, might develop ways to escape the immunity provided by the vaccines, making the entire exercise futile.

This is something that the world leaders knew much before the first COVID-19 vaccine was administered in the UK in December 2020. The COVID-19 Vaccines Global Access or COVAX was set up in April 2020 to accelerate the development, production and equitable access to vaccines. The alliance, by the World Health Organization (WHO), GAVI and the Coalition for Epidemic Preparedness Innovations, hopes to deliver 2 billion doses that would ensure at least 20 per cent of the

population in each of its 190 member countries is fully vaccinated by 2021.

Yet six months later, shortages and inequitable distribution of doses threatens to derail the largest vaccination campaign the world has ever seen.

For one, COVAX has been facing acute shortfall since April 2021 after the major source of its vaccine, Serum Institute of India (SII), slipped on the delivery timeline because of a surge in COVID-19 cases in India. So far, the alliance has received only around 30 per cent of the 252 million doses it had hoped to by June 2021.

COVAX can procure only WHO-approved vaccines. The UN agency has given a nod to just six of the 17 vaccines that are being administered in different countries across the world. Of these, Covishield, manufactured by SII, is the cheapest at around US $3 a dose. The other vaccines cost anywhere between $1 and $40, as manufacturers are selling them at different prices to different countries to maximise profits. Sputnik V, developed by Russia, is the only other cheap vaccine selling at almost the same price as Covishield in at least some countries. WHO, however, is delaying its approval even though the manufacturer says it has submitted the necessary paperwork.

As a result, COVAX is now being forced to reach out to the expensive WHO-approved manufactures. This is a drain on funds that are already in short supply. Even if the alliance had the money, these manufacturers are not too keen on sharing their doses.

WHO gave approval to the vaccine produced by Moderna on March 12, 2021. On June 2, the company, after persuasion by UNICEF, agreed to deliver 34 million doses in the last quarter of 2021. A similar delay can also be seen in the case of Johnson & Johnson, which agreed to provide 200 million vaccines more than two months after receiving WHO approval. Pfizer, which was the first company to get WHO's nod, has supplied only 15.3 million doses to COVAX so far. While the delays by WHO in authorising new vaccines is leading to shortages, COVAX alone is to be blamed for the way it has so far distributed the vaccines.

COVAX allocates vaccines in proportion to population sizes, which is not the best public health metric

Of the 2.42 billion vaccine doses that had been administered globally till June 14, 2021, the low-income nations had received a negligible 0.3 per cent. In contrast, high and upper-middle income nations had administered a little over 85 per cent of the vaccines and low-middle income nations accounted for the remaining 14 per cent or so, as per *Our World in Data*.

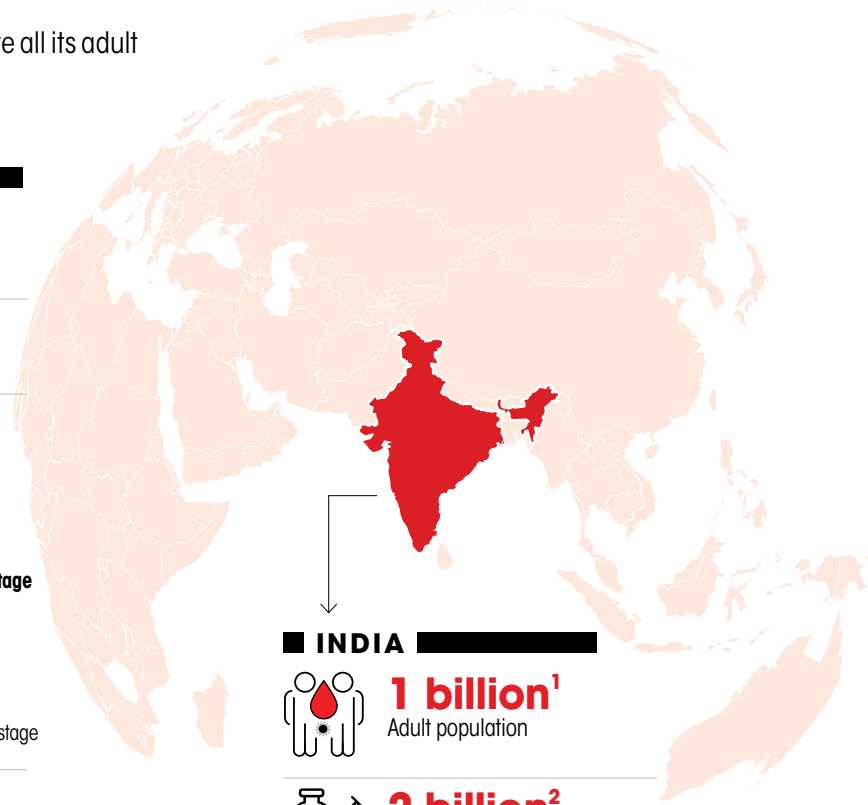
Monica de Bolle, professor at the Johns Hopkins University, US, has criticised COVAX for allocating vaccines in proportion to population sizes, which is not the best public health metric. As a result, it has short-changed nations in desperate need of vaccines, while providing it to others that have comparatively fewer cases. The alliance also does not consider countries' capacities to roll out massive immunisation campaigns.

COVAX hopes that vaccine donations from developed countries would help it deal with the shortfall. The G7 group, a consortium of seven high-income countries including the US, Japan and the UK, on June 11 announced plans to donate 870 million vaccines to low-income countries; only half of them will be delivered by the end of the year. However, developed countries are reluctant to route their surplus vaccines through COVAX because bilateral transfers allow them to increase their sphere of influence.

This approach of circumventing COVAX has further skewed distribution. Countries in East and South Asia have received 55.59 per cent of all pledged donations, despite having just 20.73 per cent of the confirmed cases since November 2020. In contrast, Latin America and Eastern Europe, which continue to suffer high case burdens and have struggled to secure vaccine access outside of

OUTNUMBERED

The world is unlikely to vaccinate all its adult population by the end of 2021



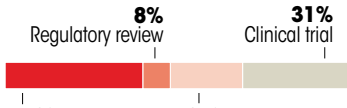
WORLD

5.5 billion[1]
Adult population

11 billion[2]
Doses of vaccine needed

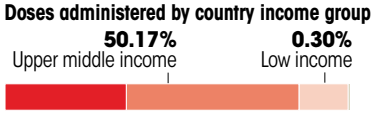
9 billion
Projected number of doses by end of 2021. Over 60% of this is expected to come from vaccines that are still in the pipeline

Projected doses by vaccine development stage



2.4 billion
The number of doses administered so far

Doses administered by country income group



1) 70 per cent of the total population that is above 18 years
2) if only double dose vaccines are used

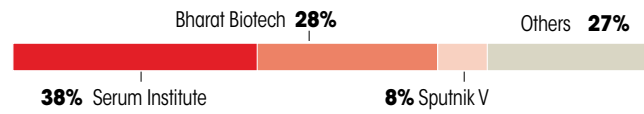
Source: UNICEF COVID-19 Vaccine Market Dashboard; Our World in Data; Press Information Bureau; Updated till June 14, 2021

INDIA

1 billion[1]
Adult population

2 billion[2]
Doses of vaccine needed. Of these only 12.5 per cent has so far been administered

Share of different vaccines in total doses by 2021



250 million
The average number of doses India needs each month to vaccinate its adult population by 2021

120 million
The number of vaccine doses sanctioned for June 2021

COVAX, are receiving far fewer donated doses than necessary, reads the June 4 analysis by Think Global Health, an initiative by think-tank Council on Foreign Relations and the Institute for Health Metrics and Evaluation.

Make-believe plans

UNICEF's COVID-19 Vaccine Market Dashboard estimates that the world would have 9 billion vaccine doses by the end of 2021. This should be enough to completely inoculate more than 90 per cent of the adult population. The concern is that only 38 per cent of these promised doses will come from the 17 vaccines that are currently in the market (see 'Outnumbered').

The industry seems to have promised overambitious production numbers without actually setting its house in order. The unavailability of enough raw materials is likely to make matters worse. "We have been issuing warnings since March this year that some crucial raw materials are

'Raw material scarcity, trade barriers to dent hopes of 10 bln doses by 2021'

Manufacturing teams worked in parallel with scientists to ensure the delivery of vaccines in record time | **THOMAS CUENI**

In March 2020, vaccine innovator companies started working on the process of manufacturing and establishing the supply chains for their vaccine candidates, even before they were approved. This arrangement of the production and supply teams working in parallel with the scientists in the laboratories is one of the reasons the world has been able to produce COVID-19 vaccines at such a fast rate.

By the end of June this year, three billion vaccine doses would have been manufactured by China, EU, US and India. By the end of 2021, an estimated 10 billion doses would have left the production lines.

As part of the manufacturing preparations, the first of today's 300 collaborations were drawn early on. Today, cooperation is taking place in many parts of the world: the US, China, EU and India, and also in South Africa, India, Brazil, Argentina, Malaysia, Turkey, Thailand, Egypt, Mexico, Indonesia and Iran.

Another early preoccupation involved checking the supplies of raw materials, equipment and finding the staff to ensure the smooth running and the necessary quality checks. The numbers are telling. It takes 280 components to make the Pfizer-BioNTech mRNA vaccine, involving 86 suppliers located in 19 different countries; these materials need to reach three different manufacturing plants, where the vaccines will go through a manufacturing process that involves 50,000 production steps and at least 70 quality checks. Now multiply that by the number of vaccines that have been approved.

Collaborations to make vaccines are not easy. We have seen that even seasoned partners experience difficulties. Emergent BioSolutions, which was helping with the production of Johnson & Johnson vaccines, threw away millions of doses because they did not meet the necessary quality control.

We have been warning since March this year that some crucial raw materials are in short supply. The late delivery of the bio-reactor giant plastic bags can set back production by weeks, delaying the delivery of millions of much needed vaccines. In other cases, there are difficulties in finding the skilled technicians needed to oversee the production and check the quality and safety through the process. In addition, trade barriers are hindering the flow of these goods, the vaccines themselves.

We are deeply concerned that despite our efforts, COVID-19 vaccines are not equally reaching all priority populations worldwide. We have laid out steps that urgently need to be addressed. We are calling for dose sharing. We commit to support by making any uncommitted doses available. We have backed up our words with action within days, with 3.5 billion extra doses pledged by major vaccine manufacturers at the G20 Health Summit in May. We will continue to optimise production.

For innovative bio-pharmaceutical companies the work is far from over. We have the work cut out for us. We continue to prioritise the development of new COVID-19 vaccines, including vaccines effective against new variants, looking for new formulations for easier and longer storage. For this work to continue, we urge governments to guarantee unhindered access to pathogens of any COVID-19 variants to support the development of new vaccines and treatments. If this does not run smoothly, it will impact booster development and it will hamper the WHO's ability to respond to the next seasonal influenza viruses. In the last couple of days, we have joined the G7 future pandemic preparedness partnership to achieve a moon-shot target of 100 days to develop a vaccine in the case of a future pandemic; cutting down from the already historic 326 days to bring a first COVID-19 vaccine.

(Cueni is director general of the International Federation of Pharmaceutical Manufacturers & Associations in Switzerland)

JALOTSAVA
MANE MANEGE GANGE

"WATER IN SCHOOL TAPS - SMILES ON CHILDREN'S FACE"

100 Days Campaign Jal Jeevan Mission - A case study of Karnataka

Har Ghar Jal
Jal Jeevan Mission

Department of Drinking Water and Sanitation, Ministry of Jal Shakti, Government of India had launched "100-days Campaign" to provide safe drinking water to anganawadis, schools and ashram schools under the "Jal Jeevan Mission (JJM)' on 2nd October 2020. Under this campaign piped water for drinking, washing hands and water for kitchen and toilets are being provided.

In Karnataka, the campaign is helmed by Rural Drinking Water and Sanitation Department (RDWSD) which is the nodal department for JJM implementation, in association with the Department of Women and Child Development and the Department of Primary and Secondary Education.

HOW DID WE ACHIEVE IT?

Karnataka has 53,568 schools and 54,795 anganwadis. Many schools did not have drinkable water connections.

RDWSD has gathered the information of schools and anganwadis which were lacking water connections through Gram Panchayaths, line departments, PARIHARA Call Center, Social Media channels etc. Subsequently, detailed estimates were prepared and work was executed. Each school was provided with Rs. 20,000 and each Anganwadi was provided with Rs. 15,000 for water supply. Water storage facilities were also provided. Any additional funding required was dovetailed under convergence.

Anganwadis
53,883

Schools
46,632

100 days campaign Tap Connection achievement

As on 26-05-2021

What Has Changed?

Head master of Government Higher Primary School in the Hegunji Gram Panchayat of Brahmavara Taluk in Udupi District says "Our school has 60 students and four teachers. Previously, parents were admitting the children to our School, but nowadays, the children are getting enrolled in private schools. The reason is our school has a toilet but no water. Parents were reluctant to enrol their children in schools where there is a lack of water and sanitation facilities. But this '100 days campaign' is providing water to our school. We are expecting more children enrolment in our school in the coming days".

In Anganwadi of Gowdgere Thanda, Gurumitkal Taluk in Yadgiri district, there are 73 children. Only 31 children were coming to Anganwadi. Remaining children were staying at home owing to lack of water. Now, Anganawadi Teacher shares that "Anganwadi helper used to travel for 30 minutes to fetch the water for preparation of food. Now under '100 days campaign', Anganwadi was provided with water tap connection. Clean water is available for drinking and preparation of meals, now we are expecting all children to attend Anganwadi".

There are 143 children and 6 teachers in The Govt. Higher Primary School of Kempana Palya, Kollegala Taluk, Chamarajanagara District. After this campaign, a teacher opined that earlier the children were not using toilets for urinals as there was no water facility in the school's toilets. Now they are accessing toilets without any hesitation and the school's attendance has also increased. This also helped increased attendance of girls especially during menstruation, even though the school is opened recently after COVID-19 lockdown.

This campaign is bringing 'Smile on every Child' when they return to the School/ Anganwadi Centre after reopening.

To know more stories from Karnataka, please follow us on
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in short supply," says Thomas Cueni, director general, International Federation of Pharmaceutical Manufacturers & Associations, which represents big pharmaceutical companies (see column, *p*34). The shortage of raw materials has already forced the Oswaldo Cruz Foundation and Butantan Institute in Brazil to suspend production of the AstraZeneca and CoronaVac vaccines in May.

Need to change

To ramp up the production of vaccines and raw materials, the developed countries and pharmaceutical companies have to break their monopolies and allow the vaccine technology to be freely shared with manufacturers around the world.

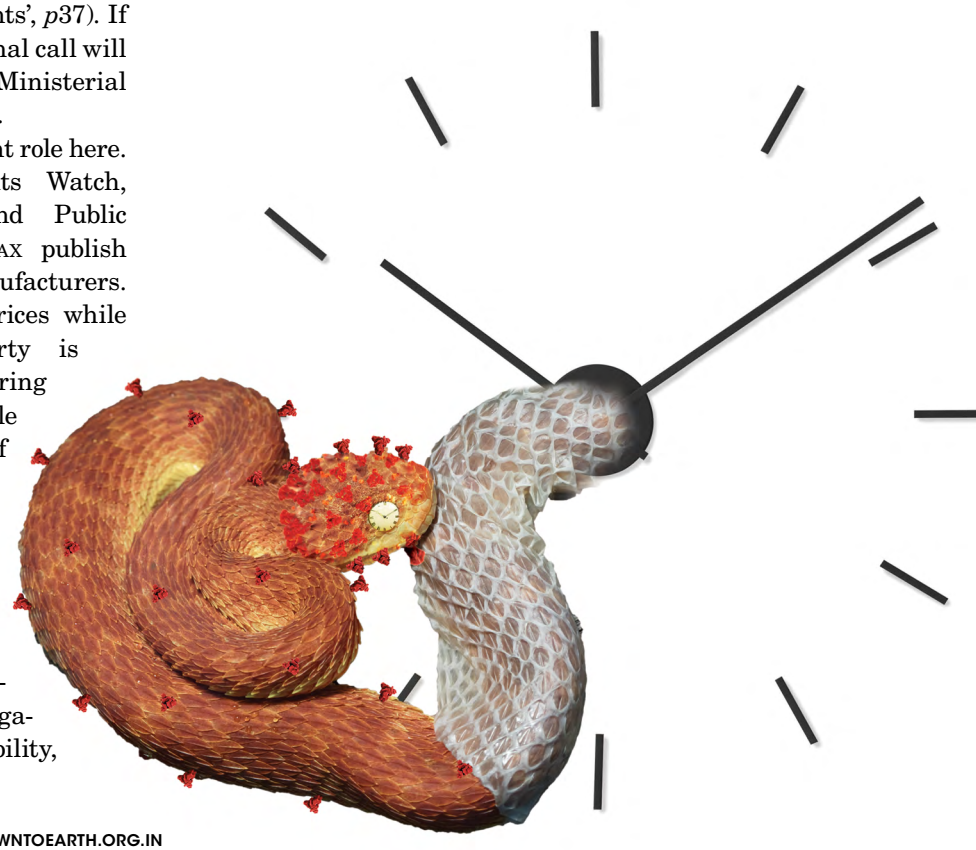
But they are not willing to do so. In October 2020, India and South Africa floated a proposal at the World Trade Organization (WTO) to suspend patents on products needed to control the pandemic, including vaccines. The proposal was on the back burner for almost eight months; finally, in June this year, member nations agreed to move ahead with text-based negotiations ('What India wants', *p*37). If everything goes smoothly, a final call will be taken at the WTO Ministerial Conference in November 2021.

COVAX can play an important role here. On May 6, Human Rights Watch, Amnesty International, and Public Citizen demanded that COVAX publish its contracts with vaccine manufacturers. "Publishing contracts and prices while sharing intellectual property is a good way to start ensuring that vaccines are affordable and available for billions of people who desperately need them," says Arvind Ganesan, business and human rights director at Human Rights Watch.

So far, the alliance has refused to disclose the deal details citing confidentiality obligations. For long-term sustainability, COVAX will also need to align its work with other UN programmes like the COVID-19 Technology Access Pool by WHO that encourages voluntary contribution of intellectual property, technology and data to increase availability of medical products.

Deliveries via COVAX will protect poor countries that are currently being bullied by vaccine manufacturers for immunity against lawsuits due to adverse effects

The alliance can also ensure compensation for people in poor countries who suffer from severe side effects after taking the vaccines. WHO has set up a programme that makes compensation available to individuals in 92 low- and middle-income countries without going to court. This is the first and only global no-fault compensation mechanism and it is funded by a small levy on each COVID-19 vaccine dose supported by the COVAX. Similar systems already exist in developed countries to protect consumers. For example, the UK has a Vaccine Damage Payments Scheme, which authorises one-time tax-free payments of up to £120,000 for individuals who have been disabled due to vaccine side-effects. The US has enacted the Countermeasures Injury



Compensation Program to deal with COVID-19 vaccine injuries. Japan too has a long-established compensation scheme set up in 1979 and financed by contributions from pharmaceutical companies.

Deliveries via COVAX will also protect poor countries that are currently being bullied by vaccine manufacturers for immunity against lawsuits due to adverse effects. Pfizer is negotiating with the Indian government for such immunity in return of its vaccines. The government has not taken a decision on this as yet. "The discussions lack transparency, the absence of which would be akin to trading away the rights of people who could be affected by serious adverse events and other acts of negligence of the pharmaceutical corporation in the future," says Amulya Nidhi of civil society group Jan Swasthya Abhiyan, who has written to the Prime Minister advising against such agreements. He says that India also needs to develop its own no-fault compensation mechanism.

Nidhi's concerns are valid because Pfizer is known for its arm-twisting methods. Even before its vaccine was approved, Pfizer had asked Argentina to pass a law which would provide the company protection from lawsuits related to adverse reactions. The country passed a law which absolved Pfizer of adverse reactions but still held the company liable for acts of negligence or malice. Unhappy, the company demanded sovereign assets to be handed over as collateral in return of vaccines. When Argentina rejected this, the company pressured the government to take international insurance to pay for potential future cases against the company. The country has refused to agree to the demands and as a result, it has failed to forge a deal with Pfizer till date. The company has supply agreements with nine countries in Latin America and the Caribbean: Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Mexico, Panama, Peru, and Uruguay. The terms of those deals are unknown.

Call for waivers

India and South Africa demand relaxations of patents on technologies needed to fight COVID-19

In October 2020, India and South Africa had floated a proposal to suspend the intellectual property rights on products such as medicines, diagnostics and materials needed to control the pandemic, including vaccines. Developed countries initially blocked the proposal and the discussions finally began on May 3, 2021, after it received partial support from the US. The proposal, which now has 63 co-sponsors, limits the period of waiver to three years, after which it can be suspended if the pandemic situation improves. "Legal obstacles, pressure from pharmaceutical corporations and red tape make it too cumbersome, slow and complicated to address pandemic-level challenges," says Leena Menghaney, regional head (South Asia) at the Access Campaign of Médecins Sans Frontières. The proposed waiver would provide developing countries with an effective and expeditious way to remove key intellectual property rights barriers in advance and ensure domestic production of supply of everything that they need to curb the pandemic. "If granted, the patent waiver with technology transfer may help to harness unutilised capacities for the production of vaccines in India," says Sudarshan Jain, secretary general, Indian Pharmaceutical Alliance, which represents research based pharmaceutical companies.

The narrative that the big pharmaceutical companies are now building is that the waiver is not going to help as the developing countries do not have the know-how to use the free technologies. This is not completely true, especially for India, which has been a global vaccine hub for decades. In 1986, Merck and GSK held patents for a type of hepatitis B vaccines which were sold at US $23 per dose. The company refused to share the technology with the poor nations. The technology was then developed by India-based Shantha Biotech and they managed to sell the vaccine at US $1, allowing it to be a part of the global vaccination drive led by UNICEF.

The central reason why private players are getting away with blatant malpractices and shady deals, while developed countries remain mute spectators, is because the world lacks a comprehensive vaccination plan, a point highlighted by UN director general Antonio Guterres recently while he criticised the recent G7 announcement.

In such a situation, COVAX has a crucial role to play, which goes much beyond vaccine distribution. It is still to be seen if the alliance can work against the industry which indirectly supports it through GAVI.

Too many hurdles, still

Even if India manages to procure enough doses to inoculate its adult population by 2021, poor distribution networks and lack of skilled personnel will hinder its vaccination drive

India is the global hub of vaccine production. It is also one of the very few countries that managed to develop an indigenous vaccine in record time. By last December, the country was all set with its COVID-19 operational guidelines to ensure a smooth rollout of the vaccines.

The government was so confident of its ability to meet domestic demand that it allowed more than 60 million doses to be exported or donated to other countries between January and March.

Yet when the devastating second wave engulfed the country in April, the vaccine drive failed (see "Undecided" *p*39).

While people across the country struggled to secure vaccination slots on the national *CoWin* dashboard, the Centre worsened the situation by deciding to extend the vaccination net to include all adults under the age of 18 years. It was decided that the additional vaccines will be procured by the state governments, which clearly failed because of the global shortage and the fact that states have never procured vaccines in the past. Some of the states even unsuccessfully tried to float global tenders to forge deals with vaccine manufacturers. When the desperation peaked, the Supreme Court had to step in to make some sense out of the chaos.

On June 7, amid criticism of the government's confused vaccine policy, the Centre announced universal vaccination. According to the latest policy, 75 per cent of the vaccines needed would be purchased by the Centre and provided to the states. 25 per cent of the vaccines would be available to private hospitals for which they would need to pay more and would be able to charge accordingly (₹150 over

the cost price). This universal rollout will begin from June 21.

India has the daunting task of vaccinating its entire adult population of nearly one billion by the end of this year. This will require almost two billion doses. In the first six months, the country has managed only 0.25 billion doses. To be able to deliver the 1.75 billion more doses in the remaining half of the year, the country needs at least 250 million doses a month. However, according to a Press Information Bureau release, only 120 million doses have been sanctioned for June, suggesting that the progress remains slow.

The Centre, though, is confident that the vaccine availability will shoot up in the coming months. It is relying on the SII and Bharat Biotech, the two major suppliers of vaccines in the country, to deliver 0.75 billion and 0.55 billion respectively by the year-end. The country is also hoping to import 0.16 billion Sputnik V vaccines, bringing the total to 1.5 million doses between August and December. The remaining shortfall is expected to be bridged by imports and newer vaccines (many of Indian origin). The Centre has in the past announced that Indian Immunologicals Limited will start producing Covaxin from September 2021 and Haffkine Institute and BIBCOL will start production of Covaxin from November 2021.

While the numbers add up, past experience suggests that the country must be ready for the slips between the cup and the lips. The delivery of Sputnik V vaccine has already been delayed from June to August.

The government also has the option of dose stretching to reduce the demand. For example, studies now show that people who have been infected by the virus might remain safe by taking a single dose. The government needs to take quick decisions on such aspects if it wants to help the people.

The other side of India's vaccination

Undecided

Policy flip-flops hurt India's ambitious vaccination drive

August 12, 2020
National Expert Group on Vaccine Administration for COVID-19 met for the first time

December 28, 2020
COVID-19 Vaccines Operational Guidelines released

January 9, 2021
Empowered Group on Vaccine Administration for COVID-19 constituted

January 16, 2021
National COVID Vaccination Program launched. All vaccines to be procured by the Centre and provided for free

February 2, 2021
COVID-19 frontline workers started receiving the vaccine

March 1, 2021
Vaccine rolled out for priority groups: people who are 60 years and above and people above 45 years with any of the 20 earmarked co-morbidities

April 1, 2021
Vaccine coverage extended to all people who are 45 years and above and adults below 45 years with co-morbidities

April 21, 2021
Liberalised Pricing and Accelerated National Covid-19 Vaccination Strategy released under which dual pricing for the vaccine was outlined. This allowed state governments to buy vaccines for people between 18-44 years at a higher price than the Centre

April 22, 2021
The Supreme Court directs the Centre to come up with a national plan for distribution of essential supplies and services, including vaccines, during the pandemic

April 30, 2021
The apex court, *suo moto*, asks the Centre to revisit its plans on pricing of vaccines

May 1, 2021
Vaccine coverage extended to all adults above the age of 18 years

May 9, 2021
The Centre files an affidavit in the apex court with information on availability of vaccines, pricing and distribution plan

May 31, 2021
The apex court asks the Centre to provide more information on the vaccine policy, including data on purchasing and the plan to vaccinate everyone. It calls the strategy of paid vaccination arbitrary and irrational. The next hearing is scheduled for June 30

June 7, 2021
India announces Revised Guidelines for implementation of National COVID Vaccination Program under which the Centre would purchase 75 per cent of the vaccines and distribute to states starting June 21. The remaining 25 per cent vaccines will be available for private players

challenge is ensuring speedy delivery of the doses, specially in the most peripheral places. Under the current universal immunisation programme, the country administers some 390 million doses to newborns and pregnant mothers in a year. For COVID-19 relief, the country will need to deliver an additional 250 million doses a month for the rest of 2021.

The country will need new infrastructure and more importantly skilled health personnel to deliver the extra doses. A vaccination centre needs at least five people, including a trained vaccinator.

It will also have to ramp up its rate of vaccine delivery. As on June 12, the country has 42,883 vaccination centres that have delivered 3.34 million doses, or 78 doses per centre per day. T Sundararaman, global coordinator of People's Health Movement, says rolling out COVID-19 vaccination without fixing the delivery challenges will lead to distinct problems: the vulnerable population will be left out and vaccine quality will take a hit due to limited availability of cold storage facilities and human resources.

As a virus jumps from one host to another and from one environment to another, it mutates. In the case of SARS-COV-2 virus, these mutations have resulted in variants which can extend the pandemic. Many of the mutations have occurred in the very proteins that have been used to cook up the vaccine.

WHO has so far identified four variants of concern (mutations linked to rapid spread in human population) and four variants of interest (mutations with genetic changes that can lead to rapid spread in the future).

The delta variant, which was predominant in India's second wave, is almost 40 per cent more transmissible than the alpha variant, first reported from the UK in November 2020. The alpha variant itself is around 50 per cent more transmissible than the original virus isolated from Wuhan in December 2019. So time is of essence.

What the world needs

The five pillars on which the global vaccination policy should rest

1 ENSURE ADEQUATE SUPPLY
- a) Free up technologies through TRIPS waiver[1], C-TAP[2]
- b) Increase production facilities
- c) Promote collaborations for raw materials

2 SET A SYSTEM FOR EQUITABLE DISTRIBUTION VIA COVAX
- a) Restrict hoarding
- b) Fund the facility
- c) Increase transparency on industry deals

3 PROTECT PEOPLE
- a) Increase transparency in trials
- b) Set up a system for monitoring adverse effects
- c) Set up a compensation system

4 IMPROVE DELIVERY
- a) Provide the vaccine free of cost
- b) Ensure access and increase rate of delivery
- c) Manage \issues around the digital divide

5 IMPROVE PANDEMIC PREPAREDNESS
- a) Monitor variants
- b) Provide rational treatment
- c) Promote pandemic-appropriate behaviour to control spread

1) India and South Africa have floated a proposal at WTO to suspend patents on products needed to control the pandemic

2)COVID-19 Technology Access Pool by WHO for sharing intellectual property, technology and data to increase access to medical products

"More infectious variants increase the percentage of population that needs to be vaccinated to achieve herd immunity. Variants that partially evade immune responses are able to cause re-infections and breakthrough infections. All this makes it harder to control the pandemic," says Shahid Jameel, director, Trivedi School of Biosciences, Ashoka University, Sonipat, Haryana. DTE

@vibhavarshney

Himalaya Joins the Fight Against COVID-19










The onset of COVID-19 has changed life as we know it. We have adopted the “new normal” wherever we go – work, school, home. Now, more than ever, the pandemic has highlighted the importance of partnering and collaborating with the government, non-government organizations, foundations, research institutions, and civil society bodies to ensure maximum outreach at the community level.

The Himalaya Drug Company has been actively supporting India’s fight against the pandemic. Underlining the brand ethos, ‘Himalaya Cares’, and with the help of our implementing partners, the Company has helped over 6,40,000 beneficiaries by providing hygiene and essential health products across different communities and locations. Powered by the vision to bring wellness and joy to every home through their herbal solutions, Himalaya has reached out to various sectors, including NGOs, schools, hospitals, BBMP workers, slum dwellers, doctors and chemists, transgender communities, construction workers, cancer patients, refugees, tribal, migrants, senior citizens, and many religious institutions.

In addition to this, we continue to extend our support to the longstanding partnerships while reshaping the methods of engagement. We have helped students continue their education at home by distributing tablets, online capacity building, and finding employment for PWDs, afforestation drives, and fostering sustainable communities in rural areas.

While we hope the current situation improves soon, we will continue to explore the potential of aligning our social goals with the ethos of our organization – “Wellness in every Home and Happiness in every Heart”.

Why is India afraid of compulsory licences?

While rich nations are discovering virtues of CLs, India has turned its back on this tool despite nudges from the court

TOWARDS THE end of May, Russia shipped nearly a quarter of a million packs of medicines to India as humanitarian assistance to fight the devastating second wave of the COVID-19 pandemic. The packs contained the Russian generic version of Gilead's experimental anti-viral drug remdesivir that is used to treat patients hospitalised with the deadly infection. The arrival of Remdeform, as the drug is called, highlighted the timidity of New Delhi in using its robust laws to make life-saving drugs accessible and inexpensive.

Remdeform is being manufactured in Russia using a compulsory licence (CL) which is a flexibility permitted under the World Trade Organization's (WTO) strict intellectual property (IP) rules. These rules, labelled TRIPS or the trade related aspects of IP rights, allow member-countries to override the rights of the patent holders in the case of a national emergency on health. In India, remdesivir is manufactured through voluntary licences (VLs) granted by Gilead, the patent holder, to generic-drug manufacturers that are allowed to make and export the drug according to the terms laid down by the originator company. Eight companies hold such licences.

VLs are considered less messy because they are quick and avoid the legal challenges that a CL invariably results in, although these are issued in special circumstances. VLs usually allow the firms to set their own prices even if the export markets are strictly circumscribed. Yet, remdesivir production by the Indian companies was not enough to meet the crisis in April-May as both demand and prices spiralled out of control, forcing India to seek assistance.

Russia said it had to perforce issue a CL in January this year after repeated requests to Gilead for a VL were ignored. One of the reasons cited by the Vladimir Putin government was a shortage of the drug and its steep pricing. Pharmasyntez has been allowed to override the patents owned by Gilead Sciences and Gilead Pharmasset for one year, but has to pay royalties to the firms. A legal challenge by the US multinational was rejected in May by Russia's highest court. Gilead describes the CL as "unnecessary and counterproductive", but Russians may not agree since the generic version costs just one-sixth of the full price.

The Narendra Modi regime, on the other hand, has been extremely reluctant to take on Big Pharma. Even while the pandemic was leaving a trail of death and suffering, the country publicly stated its preference for VLs despite the Supreme Court and Delhi High Court urging it to consider CLs to meet the shortage of remdesivir and other drugs to treat COVID-19. In affidavits to the court, the government claimed that the main constraint was a shortage of raw materials and essential inputs. It went so far as to state that "it

is presumptuous to assume that the patent holder will not agree to more voluntary licences…" What explains such a determination? Does it flow from the Modi regime's verbal assurance to the US-India Business Council in 2016 that it would not issue any CL for drugs?

Oddly enough, there has been a surprising turnaround in the US stance. Previously a rooted opposition to CL to protect corporate interests, Washington has now become a cheerleader for it. Over the past two decades, the US penalised or threatened with reprisals any country using the CL route to meet a public health emergency. Naturally, few dared to do so.

Now, however, Americans and Europeans are singing a different tune. With over 100 countries supporting the India-South proposal at WTO for waiver of TRIPS to ensure more equitable, or at least wider, access to therapies, vaccines and medical equipment to fight the pandemic, the US and the EU are assiduously promoting CLs as the best option in lieu of a full waiver. This, they claim, will overcome the patent blocks hampering the scaling-up of much needed medicines and vaccines.

Eight Indian firms hold a voluntary licence to make remdesivir. Yet production in April-May was not enough; demand and prices went out of control

The EU's counter-proposal submitted to WTO in early June is rather disingenuous. It maintains that voluntary solutions and public-private cooperation are the most effective way of ensuring equitable access to COVID treatments and vaccines. Since such voluntary agreements might not always be possible, "compulsory licensing is an important and perfectly legitimate fallback". These are extraordinary somersaults given their track record. India has issued only one CL in the TRIPS era in 2012 when Hyderabad-based Natco Pharma sought one for Bayer's overpriced cancer drug nexavar. It set off a global storm with the US and the EU assailing the action in strong terms. US trade lobbies have continued to portray India as a serial CL offender, although it has not approved any since then.

The pandemic has changed the perceptions of even diehard protectors of pharma IP rights. From viewing CL as a ploy to undermine monopolistic rights, rich countries are now embracing it as an important tool for accessing therapies and products to fight COVID-19. Starting early 2020, a dozen countries have amended their IP laws to facilitate speedier issuance of CLs. Among these are several EU members, including economic powerhouse Germany. Other countries were even quicker to issue CLs, the first being Israel. In March 2020, it lost no time in awarding a CL for an HIV-AIDS drug that was being repurposed to treat COVID-19 patients, when the patent holder could not provide adequate supplies.

Against this backdrop, India's diffidence is hard to fathom, specially when its laws on CL are among the most comprehensive and require no tweaking. What happened in April and May when Indians were scrambling for remdesivir was a black mark on functioning VLs. The Supreme Court was forced to remind the Modi government of the various sections of the IP law which facilitated CLs in a public health emergency. If any lesson has to be drawn from this, it is that a CL is superior to a VL.

CLs, for sure, are not the cure for all the challenges that the pandemic has thrown up. The IP landscape has changed dramatically and continues to do so as new products emerge. Patents are not being published and much of the technology remains out of scrutiny, under the guise of trade secrets. This is particularly true of the new MRNA vaccines being produced in the US and Europe, whose replication is extremely difficult.

The glory days of India's generic industry came from its skill in reverse engineering drugs developed from small molecules, basically chemical compounds. Surely remdesivir is not beyond its capabilities? Or is it that the revolutionary spirit of generic-drug makers has long died? Leading companies, including Cipla, the stormy petrel of the HIV-AIDS era, are now well ensconced in the VL landscape. Even feisty Natco Pharma, which had recently sought, yet again, a CL for baricitinib has been persuaded to accept a VL instead from the patent holder. Baricitinib is an arthritis drug, now used to treat COVID-19 patients. The era of CLs is clearly over. All hail VLs. DTE

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YOUNG ENVIRONMENTALIST

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- Air & Mobility
- Water
- Climate Change
- Waste
- Food
- Energy
- Biodiversity
- Etc

A website on Environment and Development for the Young and the Curious

Palette

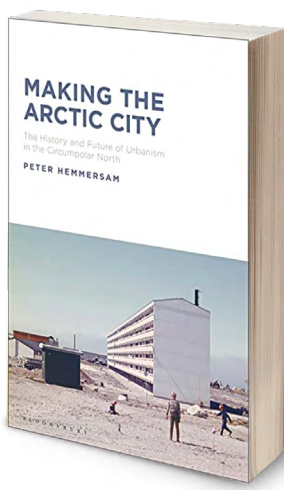
WHAT'S INSIDE

RECOMMENDATIONS

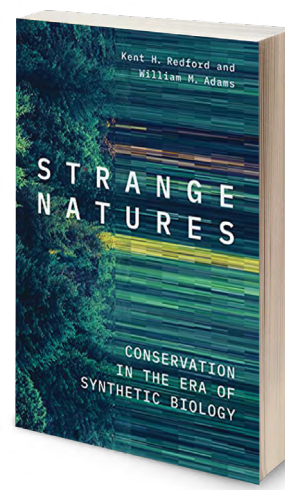
DOCUSERIES

British chef Gordon Ramsey is back with the third season of his food travel show, *Uncharted*. Since 2019, Ramsey has visited unexplored destinations across the world in search of delicious ingredients cherished by indigenous communities. This season, the chef will herd cattle on horseback in Texas, US, as he hunts for rattlesnake; brave the rough waves along Portugal's coasts for fresh barnacles; and free dive in the waters of Croatia to look for local molluscs. *Uncharted* premiered on National Geographic India on June 10, with new episodes available every Thursday and Friday.

BOOKS



With the rapid melting of the Arctic sea ice, countries are keen to explore previously inaccessible areas and tap into new opportunities for development. But development of Arctic cities has already been taking place for the 100 last years, reveals Norwegian architect and academic Peter Hemmersam in *Making the Arctic City: The History and Future of Urbanism in the Circumpolar North*. The book explores how historical and contemporary architectural designs of the Arctic adapt around its extreme climactic conditions and demographics.



"Synthetic biology"—the redesigning of biological parts or devices to enhance their abilities—is already gaining traction through gene editing in the agricultural and biotechnological industries. What if the same principles are applied to control pests, fight zoonotic diseases or even reverse the extinction of certain species? In *Strange Natures: Conservation in the Era of Synthetic Biology*, conservation scientist Kent Redford and geographer Bill Adams explore whether synthetic innovation is the way to protect nature.

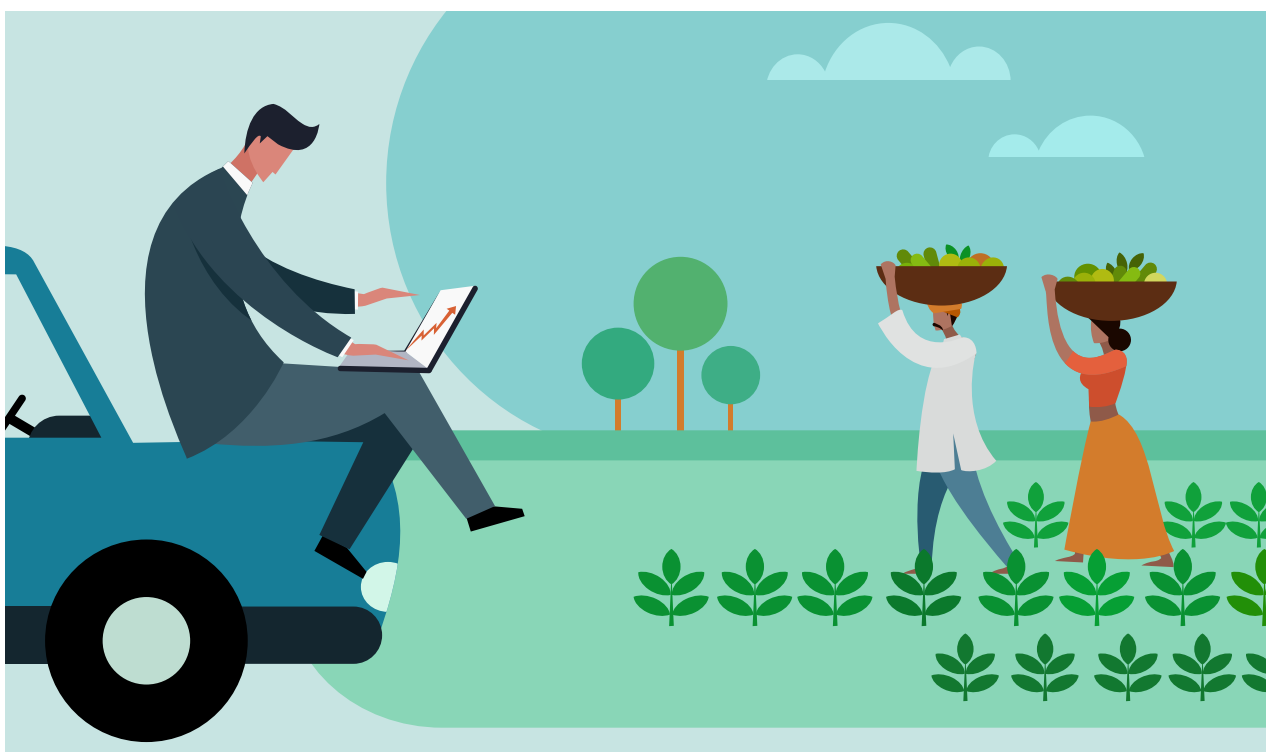
DIGITAL MINEFIELD

The Union agriculture ministry's partnerships with private companies to push for digitisation of agricultural data and operations raise a stink

THE UNION government's ambitious digital "AgriStack" is one of the world's largest data crunching exercises related to agriculture. It would set up a database of over 150 million farmers on the basis of personal details, crops, landholding and benefits availed under various schemes. Advanced technologies like the Internet of Things, blockchain and artificial intelligence will be deployed to analyse this data. Each farmer would be given a unique digital identification, which will be linked to their Aadhaar number and bring in other personal data embedded in it. Meaning, the database will help access all the details of every farmer, from their biometric data to land records and bank transactions, just at the click of a button. The government says it is the most powerful tool to transfer benefits to farmers and direct traders for procurement.

Ever since Prime Minister Narendra Modi made the promise of doubling farmers' income by 2022, there has been a push for digitisation of the entire agriculture cycle. It was recommended in 2018 by a report by the Committee on Doubling Farmers' Income. That year government think-tank NITI Aayog in its proposed National Strategy for Artificial Intelligence, pursued commoditisation of agriculture through massive data-centric evaluation. The Farmers' Produce Trade and Commerce (Promotion and Facilitation) Act, 2020—one of the three farm laws farmers have been protesting over the past six months—also has provisions for digitisation in agriculture, including electronic registration of farmers and traders.

On April 13, 2021, the Department of Agriculture, Cooperation and Farmers Welfare entered into a Memorandum of Understanding (MOU) with Microsoft Corporation to start a pilot project in this regard in 100 villages of Uttar Pradesh, Madhya Pradesh, Gujarat, Haryana, Rajasthan and Andhra Pradesh. The MOU aims to "develop a farmer interface for smart and well organised agriculture, including post-harvest management and distribution". On the face of it, the experiment looks similar to AgriStack. Microsoft will collect all the data related to farmers, their practices, businesses and land-



soil characteristics to build post-harvest management solutions and capture datasets for crop yields, weather, market demand and prices. On May 5, some 55 organisations including farmer representatives and privacy protectors wrote a letter to the government, demanding to make public the details of the MOU and hold a public consultation on the digital push in agriculture. On June 1, the agriculture department uploaded on its website a policy paper titled, India Digital Ecosystem of Agriculture (IDEA), for public consultation till June 30. But the same day, it signed MOUs with four institutions for experiments on various aspects of farming trade.

While the paper lays out a proposed framework for AgriStack, the MOUs are with Patanjali Organic Research Institute, Haridwar, for agricultural management and services in Uttarakhand, Uttar Pradesh and Madhya Pradesh; with Amazon Web Services for creation of digital services and innovation ecosystems in agricultural value chain; with ESRI India, a supplier of geographic information software, to set up a national hub for geo-mapping; and with Agribazaar India, an online trading platform, for setting up pilot projects in three states.

The rush for agricultural digitisation has raised concerns among analysts, particularly those about privacy. A farmer's land is a repository of information and there are concerns that they may no longer have control over that data, and agri-businesses would become its real users.

SHAGUN KAPIL curates a conversation to make sense of India's first steps towards digitisation in agriculture. Despite repeated attempts, the government's Digital Agriculture Division, Microsoft, Patanjali Organic Research Institute, Amazon Web Services, ESRI India and Agribazaar India did not respond to *Down To Earth*'s questions till the magazine went to press

"There is no transparency"

NACHIKET UDUPA

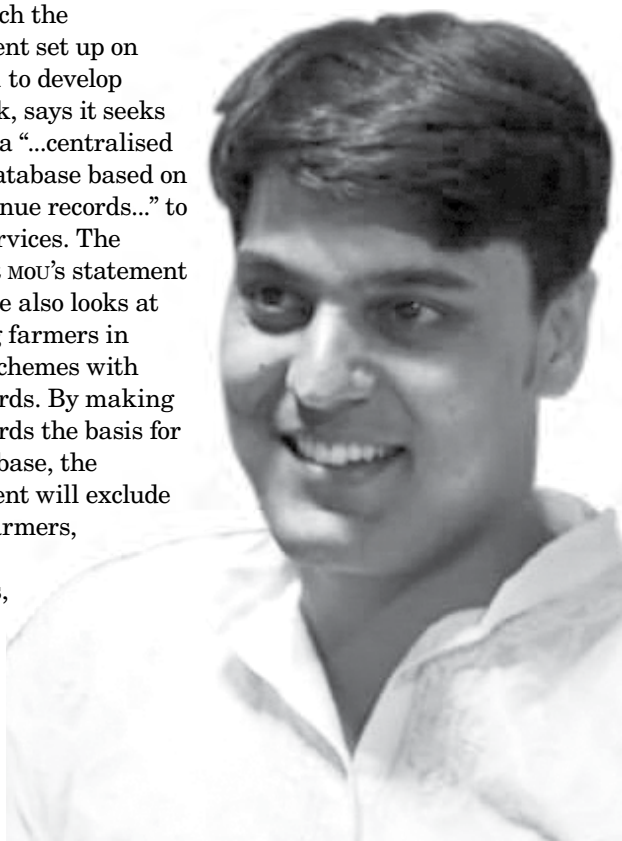
STEERING GROUP MEMBER, ALLIANCE FOR SUSTAINABLE AND HOLISTIC AGRICULTURE -KISAN SWARAJ NETWORK

The government seems to have put the cart before the horse by starting implementation of AgriStack in April through the MOU with Microsoft, much before it initiated the consultation process in June. The MOU says the government will provide "required data sets" of farmers' personal information to Microsoft. This will happen at a time when there is no data protection law in place. Although the there is a non-disclosure agreement in the MOU, it also has a clause on "limitation of liability" that essentially provides indemnity for breach of contract. The other four MOUs also have similar provisions.

The Microsoft MOU also sets in motion the creation of AgriStack on the Azure platform, Microsoft's proprietary technology for cloud services, to create an underlying digital infrastructure (unified farmer service interface) on which everything else will be built. We do not know if Microsoft was chosen via a tendering process, as it is providing this service *pro bono*.

If this interface is deemed successful, the entire digital infrastructure of agriculture will get locked into a Microsoft platform and the government may have to pay Microsoft to maintain this system.

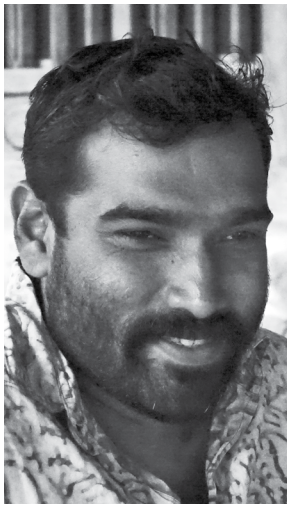
The office memorandum on the task, which the government set up on March 11 to develop AgriStack, says it seeks to create a "...centralised farmer database based on land revenue records..." to access services. The Microsoft MOU's statement of purpose also looks at matching farmers in various schemes with land records. By making land records the basis for this database, the government will exclude women farmers, farm labourers, sharecroppers, tenant farmers and those in allied activities like fishing and animal husbandry from accessing services on the digital platform.



"Past exercises have not met objectives"

RAJESH KRISHNAN,
ORGANIC FARMER, CHIEF EXECUTIVE OFFICER, THIRUNELLY AGRI PRODUCER COMPANY LIMITED, WAYANAD, KERALA

As a farmer producer organisation (FPO) for organic paddy farmers in Wayanad district, we have been exploring digitisation at various fronts—from collecting farm data for organic certification to estimating yield, arranging funds for procurement, market analysis and soil sampling. Farmers avail the data to manage their crops and soil, while the FPO uses it to plan its extension and marketing efforts. Here the flow of information is a two-way street, rather than a faceless interaction. It would be naive to compare



this with AgriStack.

But in such initiatives, conventional or digital, there is a gross asymmetry in data flow from the market to the consumer, in this case the farmer. AgriStack does not seem to do much about this asymmetry. Rather, it could widen the gap by providing all data to corporations who look at farmers as consumers, be it the seed sector, fertiliser and pesticide firms or equipment makers. The same applies for those who see farmers as suppliers, like food and garment sectors.

The MOUs signed with Microsoft, Amazon, ESRI, Patanjali and Agribazaar indicate centralisation of agriculture policy and law-making (as seen in the farm laws last year). They also point to the failure of public sector agencies in agriculture research and extension.

Given our experience with data collection, digitisation for Aadhaar and their failure in solving identity duplication and pilferage of welfare benefits, there is hardly any confidence that this new exercise will deliver on its promises. So, it is important to involve FPOs that are perceived as the new engines of growth for farm incomes.

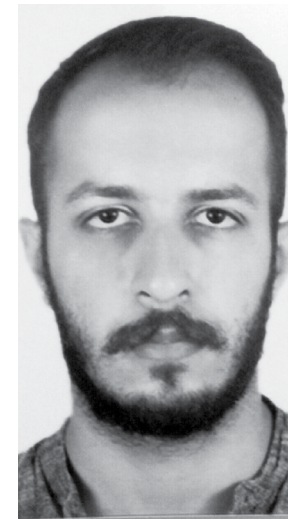
AgriStack is simply a continuation of the belief in applying techno-centric solutions to complex problems that arise from political and economic policies.

"Data privacy is a concern"

ROHIN GARG
ASSOCIATE POLICY COUNSEL, INTERNET FREEDOM FOUNDATION, NEW DELHI

AgriStack poses some serious questions about data privacy and consent. The entire project is being implemented in the absence of a data protection law—the Personal Data Protection Bill, 2019, is still with the Joint Parliamentary Committee. Despite its shortcomings, the bill provides protections such as basic user rights to correction, deletion and erasure; consent-based mechanisms for data processing; and purpose-limitation obligations. Without such safeguards, private entities would be able to exploit farmers' data to any extent.

One of the other worries is the threat of financial exploitation. We have already seen how microfinance firms have wreaked financial havoc in rural hinterlands. Now, once companies are able to collect granular data about farmers' operations, they may offer them usurious rates of interest precisely when they would have the



direst need for credit.

Additionally, the incomplete and muddled nature of land records in India may result in further land grabs and dispossession.

The proposed farmer digital ID will be linked to the Aadhaar; several researchers have demonstrated the vulnerability of the Aadhaar database to breaches and leaks and Aadhaar-based exclusion in welfare delivery.

The implementation of algorithmic governance is also a cause for concern: if algorithms decide the quantity and price of inputs farmers receive, who is to blame when something goes wrong?

The problems AgriStack seeks to address cannot solely be solved by new technology. Instead, technology must genuinely cater to farmers' needs. DTE

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(For complete story, log on to www.downtoearth.org.in*)*

SCHOOL OF WATER AND WASTE

AAETI

2ND ONLINE IMPACT WORKSHOP CUM MASTER CLASS ON

CAPACITY BUILDING INITIATIVE FOR CITYWIDE WATER AND SANITATION MANAGEMENT

Date: August 11-13, 2021 I **Platform:** Zoom

School of Water and Waste (SWW) is organizing its second 'Impact Workshop cum Master Class' of the two-part series events to re-connect with alumni and resource persons for evaluation and assessment as core strategy to achieve higher outcomes of capacity building interventions. The 3-day workshop aims to bring together the SWW alumni, institutional programme partners, key resource persons – participants of various short-term trainings (including residential, online trainings/ webinar), workshops, knowledge conclaves, field exposure visits to identify the 'change agents'

– water manager and leaders.

CLICK HERE TO REGISTER

PROGRAMME DESIGN

Date: 11th August 2021 (9.30AM – 1.30PM)
Theme: Sustainable Water Management
Water Sensitive Urban Design and Planning, Rainwater harvesting, Green Infrastructure and Nature Based Solutions, Urban Lake Management, Water and Communication, Tools and Approaches for Citywide Water management, Mainstreaming Water-Energy Nexus in Wake of Climate Change, Green Infrastructure Knowledge Conclave 2020

Date: 12th August 2021 (9.30AM – 1.30PM)
Theme: Sanitation, Wastewater and Faecal Sludge / Septage Management
Tools and Approaches for Citywide Sanitation, Citywide Inclusive Sanitation, City Sanitation Plans & Faecal Sludge Management, Excreta Flow Mapping – Shit Flow Diagrams, Decentralised Wastewater Treatment including Local Reuse, SaniPath, Water and Sanitation Safety Plan, SFD Week Knowledge Conclave-2019

Date: 13th August 2021: Aspirational Talks by Invited Global and National Experts

First Session: 10AM – 12.30PM
Theme: Sustainable Water Management and Technical Session

Dr John Cherry - Distinguished Professor Emeritus, University of Waterloo, Canada
Dr Veena Srinivasan - Senior Fellow- ATREE, Bangalore, India
Anusha Shah - Director Resilient Cities, Arcadis, UK
Tony Wong, Professor - Monash University, Australia
K. Madhavan - Chief Executive Officer, WaterAid, India
Aloka Majumdar - Head CSR HSBC, India
Dr Kala Vairvamoorthy - Executive Director, IWA, India

Second Session: 3PM – 5.30PM
Theme: Sanitation, Wastewater and Faecal Sludge/ Septage Management

Dr Kate Medicott - Team Leader - Sanitation, WHO, Switzerland
Juliet Willetts, Professor - University of Technology, Sydney, Australia
Christoph Luthi, Professor - EAWAG SANDEC, Switzerland
Dorai Narayana - International Consultant FSM, Malaysia
Arne Panesar - Head Sanitation Programme - GIZ & Sustainable Sanitation Alliance (SuSanA), Germany

If you are an Alumni of CSE – SWW or CSE institutional partner and interested to be a speaker at the Impact workshop to share your experience on above mentioned objectives, kindly submit a short abstract (max 500 words) of your presentation before 18th July, 2021 to the undersigned coordinators.

- Top 10 impactful alumni will be awarded a Certificate as "Water Champion"
- Top 10 impactful alumni stories will get a full fellowship to attend a 3-day residential training cum knowledge conclave at AAETI.

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'Vapour on Venus will tell us if it's alive'

More than two-and-a-half decades after its last missions to Venus, NASA has planned a trip to Earth's nearest neighbour. On June 2, the US space agency announced DAVINCI+ and VERITAS missions to the planet in 2028-30 under its Discovery Program, going on since 1992. Space agencies have explored Venus since the 1960s, but focus shifted around mid 1990s. Venus regained interest after researchers from the UK detected phosphine, a gas released through organic processes, in the Venusian atmosphere. A week after NASA, the European Space Agency announced a Venus mission later this decade. India and Russia, too, have been planning Venus probes. Described as Earth's twin due to its similar size and density, Venus's atmosphere is full of carbon dioxide and clouds of sulphuric acid with a surface temperature hot enough to melt lead. NASA's DAVINCI+ (Deep Atmosphere Venus Investigation of Noble gases, Chemistry, and Imaging) will drop a descent sphere to measure the gases in Venus' air, while VERITAS (Venus Emissivity, Radio Science, InSAR, Topography, and Spectroscopy) will orbit the planet to map its geological features. We'll also learn about phosphine, **THOMAS P WAGNER**, who leads the Discovery Program, tells **DAKSHIANI PALICHA** in an interview. Excerpts:

NASA's last mission to Venus, Magellan, ended in 1994. What renewed your interest in the planet after 27 years?

The Venus missions had been proposed primarily for NASA's New Frontiers programme, and then for Discovery, but they did not get picked. This is not because there wasn't a desire to go back to Venus, it's just that other proposals—for example, the Juno mission to Jupiter or the Osiris Rex, Lucy and Psyche missions aimed for asteroids—beat them. Venus was also not as big a priority as Mars, where people were eager to detect signs of life.

However, between Magellan and now, there has been amazing technological development. Radars are more sophisticated, as are the radiometers that will map the composition of Venus's surface and measure the light it emits into space. The chemical instrumentation to measure the composition of the atmosphere is phenomenal; we can now measure components that are present in minute amounts, like noble gases, which are important in understanding the history of the atmosphere. This is why we picked missions to Venus now.

What scientific return do you expect from DAVINCI+ and VERITAS?

The missions we pick face strict competition. The process began two years ago; we had 18 proposals and we evaluated their science and implementation plans. We then narrowed them down to four. These teams then planned their missions at an even higher level of detail. We looked at their implementability, cost, NASA's budget, among other things. So while evaluating their scientific return, we do not just consider the science, but also how it would fit with our portfolio. Right now, we do not have other missions to Venus; we are also going to launch the James Webb Space Telescope to study exoplanets [planets that exist outside the solar system] soon. These missions would help with that.

How will the two missions help scientists understand exoplanets?

We think some exoplanets may be like Venus; hot and giving off a lot of light that we are going to able to see around other stars. And so studying Venus is going to be directly applicable to exoplanet research.

Venus's dense atmosphere and hot surface temperature throws up many challenges, which have contributed to failures of earlier missions. How do DAVINCI+ and VERITAS plan to overcome that?

Venus is a really tough place to work. These missions have done a couple of things differently to get around that. For example, the DAVINCI+ team spent a lot of time working on the probe [the descent sphere] itself and on keeping it cool enough to last about an hour in the atmosphere and make all the measurements it needs. They also worked on the design of the chemical instrumentation, to ensure that they do not get blocked by sulphurous droplets.

For VERITAS, the team has refined its radar and aims to use wavelengths that can pass through the challenging Venus atmosphere. They also have the Venus Emissivity Mapper (VEM) that is going to measure the infrared light that comes off the surface.

THERE ARE THEORIES THAT VENUS MAY HAVE BEEN HABITABLE WITH LIQUID OCEANS AND AN ATMOSPHERE, LIKE THE EARTH. THE QUESTION IS: WHAT HAPPENED TO THEM? MAYBE VENUS LOST ITS MAGNETIC FIELD AND THE SUN BLEW AWAY THE LIGHTER PARTS OF ITS ATMOSPHERE, AND SO THE PLANET LOST ITS WATER

Is there any technology being developed from scratch for these missions?

There is a lot of new development that has not been used before. But when we build new missions, we generally take the best of what's been done before and improve it slightly for the next generation. A lot of the technologies associated with chemical analyses on DAVINCI+ have also been tried on the Mars rover missions, so they have heritage from that. The radar for VERITAS has heritage from other missions that have been used on the Earth and on other planets. VEM has heritage from other sensors that have flown around Mars and Mercury.

The primary goal of DAVINCI+ is to study Venus's atmosphere, which is 96 per cent carbon dioxide. Is there scope to compare the effect it has on Venus with the Earth's own rising carbon emissions?

The Earth is in such a different state than Venus that it is hard to simply extrapolate where we are

NASA's DAVINCI+mission will send a descent sphere into Venus's atmosphere to measures the gases present

headed in the next few years, apart from just saying Venus got hotter because of more carbon dioxide on its surface. Comparing the planetology of both over a long term—several million years—could tell us if the Earth can become like Venus. But in terms of the climate change that we face now, we need to try and understand the Earth itself at this point.

Comparative studies also say that in its initial days, Venus may have been just like the Earth. Could it have also undergone some kind of climate change?

There are theories that Venus may have been habitable with liquid oceans and an atmosphere, like the Earth. The question is: what happened to them? Maybe Venus lost its magnetic field and the Sun blew away the lighter parts of its atmosphere, and so the planet lost its water. Its state now could also be related to how the planet resurfaced itself; one theory says it has plate tectonics and massive volcanic eruptions, like the Deccan traps [a large volcanic province of igneous rocks] in India. The huge outpouring of lava from these traps probably changed the Earth's climate system. Maybe Venus is dominated by phenomena like that. Through these missions, we want to understand how climate change happened on Venus and use that data to understand climate change on the Earth, over a long period of time.

One of VERITAS' objectives is to detect the presence of water vapour in volcanic eruptions on Venus. How will it do that?

One of the exciting things about VERITAS is that its VEM has a wavelength that is sensitive to water vapour in the atmosphere. And if it finds vapour, that means there is a source of water, probably a volcano. So the presence of vapour would indicate active volcanism on Venus, which means the planet is alive. On top of that, the radar on VERITAS is going to map surface topography on Venus and tell us if there are changes since the Magellan era; if a volcano has erupted or there has been lava flow since then. The radar is also going to do repeat pass interferometry, which is a way of mapping a surface so we can see the deformations on the ground and detect faults or volcanic eruptions.

If Venus is confirmed to have had the conditions to sustain life in the past, is there any possibility that it may still be habitable?

There is some scientific literature recently that reported finding phosphine [a gas formed by the break down of organic matter] in the atmosphere of Venus, and so some people speculate that maybe life could not survive on the planet's surface, but could on its atmosphere. There is a lot of scientific debate in literature. So when we go to Venus, we're going to learn a lot more and figure out whether phosphine can be generated by non-biological processes, we'll measure it if there is an abundant amount present. It's one of the things that makes going there so exciting; it is pure exploration. DTE @dakshipalicha

PHOTOGRAPH: NASA

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WAGING CHANGE

Guaranteed employment is an effective poverty alleviation tool. But it works only when governments know how to use it

A AMARENDER REDDY

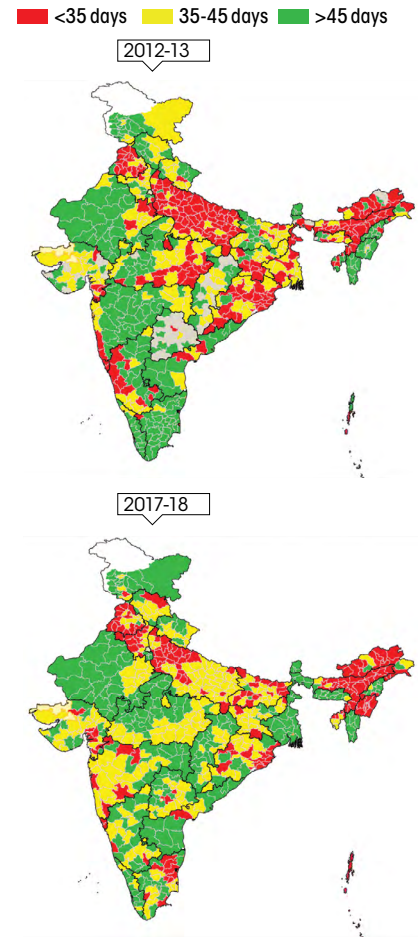
LAST YEAR, when the Union government announced that it will pump an additional ₹40,000 crore into the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) for the financial year 2020-21 as part of its COVID-19 relief package, it was hailed as a well-thought-out move. After all, the anti-poverty scheme helps create durable assets like check dams and farm ponds; and improve agricultural productivity capacity of the poorest households. The additional amount the government announced was more than half of the ₹61,500 crore budget allocated for the scheme that year, and it did play a role in reducing the economic shock induced by the pandemic and the nationwide lockdown. As many as 110 million people benefitted from works under MGNREGA that year. By comparison, 78.8 million people benefitted in 2019-20 and 77.7 million in 2018-19.

Yet, recent surveys show that MGNREGA has failed to make much of a dent in the deteriorating poverty and

Caught in a conundrum

Implementation of MGNREGA has been poor in states, where poverty rates have shown a sharp increase between 2011-12 and 2017-18

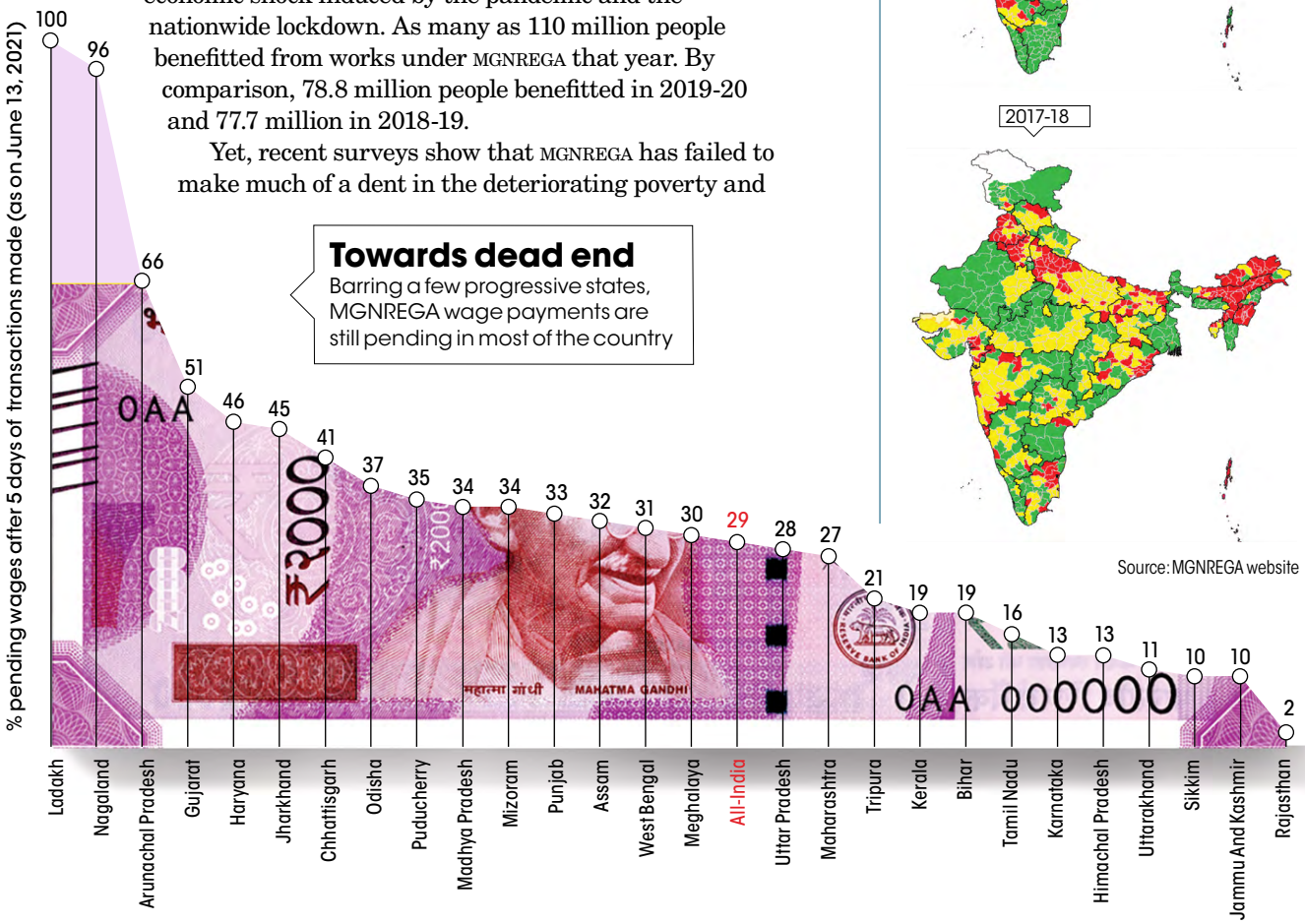
Person-days of work generated per household at each district



Source: MGNREGA website

Towards dead end

Barring a few progressive states, MGNREGA wage payments are still pending in most of the country



unemployment levels in rural India during the pandemic. A study by the Centre for Monitoring Indian Economy (CMIE), an economic think-tank and business information company, estimates that during the first six months of the pandemic—March to August 2020—the average household earned 17 per cent less than what it earned during the corresponding period the previous year. This is equivalent to losing 36 days of income. Moreover, 10 per cent of the households at the bottom of the income ladder lost three months of income during this period. By the second wave this year, unemployment levels moved into double digits. CMIE's latest estimate shows that unemployment in rural India crossed 14 per cent as on the week ending May 23, 2021. Also, those seeking employment under MGNREGA did not always get it. The *State of Working India 2021*, a report by Azim Premji University, Bengaluru, covering 12 states, notes that 45 per cent of MGNREGA job-card holders were unable to get work during April-November 2020, despite a willingness to participate.

So why did the scheme falter despite being well financed?

This can be understood by analysing how MGNREGA has fared in economically backward as well as progressive parts of the country.

Since India has not counted its poor since 2011, a hushed up report by the National Statistical Office suggests that rural poverty rose to 30 per cent in 2017-18, nearly 4 percentage points up from 2011-12. This rise has been particularly sharp in Bihar, Odisha, Jharkhand, Uttarakhand, Manipur, Nagaland and Assam. When compared with MGNREGA data for the six-year period since 2012-13—the year when the government started keeping records of the work done by a person (person-day) under the programme—it becomes clear that these northern, eastern and northeastern states did not show any perceptible increase in the "guaranteed" work under MGNREGA, with most districts there generating less than 35 days of work per household during the period (see 'Caught in a conundrum'). On the other hand, in progressive states like Andhra Pradesh, Tamil Nadu, Karnataka, Kerala, Himachal Pradesh, Rajasthan and Maharashtra, works done under MGNREGA have been impressive, with most districts providing upwards of 45 person-days of work per household since 2012-13.

Another key performance indicator of MGNREGA is "pending settlements as percentage of total transactions". While most of the progressive states have fared well on this indicator, most others have underperformed even in 2021 (see 'Towards dead end'), indicating why MGNREGA might have failed to have the desired impact on households hit by the pandemic crises.

PROGRESSIVE DISTRICTS HAVE BENEFITTED FROM MGNREGA BECAUSE OF TRAINED HUMAN POWER, STRONG GOVERNANCE AND BACK-OFFICE TOOLS

There have also been instances where payments have been delayed, diverted, blocked or even rejected; in 2019-20, some ₹1,600 crore in wage payments was rejected because of issues related to direct money transfer infrastructure such as incorrect account number or incorrect linking of Aadhaar with bank accounts, diverted payments (money being sent to the wrong account) and blocked payments (money being inaccessible for lack of electronic authentication). Such problems are particularly common in poorer and backward districts.

This is concerning, as MGNREGA is often the only source of supplementary income to households in backward districts. As most workers here live hand to mouth, even a two-to-three-day delay in wage payment can be debilitating for them. Such inefficiency can also discourage them from opting for MGNREGA works, derailing its objective.

In progressive states, people have managed to benefit from more number of person-days of work under MGNREGA and timely payment because of trained human-power, local government capabilities and adoption of a GPS-enabled tracking system that enables real-time monitoring of works. States like Karnataka and Tamil Nadu implement MGNREGA efficiently as they have well-connected digital administrations even in villages and trained human-power, while Kerala's success is due to a strong local governance system.

Hence, there is an urgent need for governments to focus on backward districts and improve their capability to implement MGNREGA. They must invest heavily in back-office infrastructure for the real-time monitoring of works, for electronic transfer of funds at the block level and for immediate transfer of wages by leveraging JAM (Jan Dhan-Aadhar-Mobile)-based direct cash transfer infrastructure.

All these are imperative to avoid the rural economic crisis that is deepening further by COVID-19. DTE

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(A Amarender Reddy is principal scientist [agricultural economics], Indian Council of Agricultural Research-Central Research Institute for Dryland Agriculture, Hyderabad)

Talking, thinking trees

Can trees communicate, have consciousness or memories? German forester **PETER WOHLLEBEN'S** new book explores the latest research in the field. Excerpts from the book:

CAN PEOPLE communicate with trees? In order to answer this question, we first have to take a closer look at what we mean by "communicate." It is not enough that we consciously or subconsciously eavesdrop, so to speak, on the scents trees use to communicate among themselves. We have a physical reaction when we breathe them in, but for communication to happen, the trees also need to react to our signals. In the past, I have categorically refused to admit that this might be possible...

...Let's take a moment to consider tree communication using the methods of modern science. Trees transpire chemical compounds. We are subconsciously aware of these compounds and we respond with changes in blood pressure. The tree, for its part, is unaware of our response—after all, we are not in contact with the tree in any way. And even if we hug the tree and talk of electric fields, which is one way we could mutually affect each other (because plants, like us, function partially by transmitting electric signals), there is still one huge obstacle: time. Trees, as we all know, are awfully slow. You can multiply the time it takes you to make contact with the tree by ten thousand to find out when you can expect a response.

If electrical impulses within the tree travel at a maximum speed of less than half an inch (1 centimeter) per second, and you make contact with the bark as you hug the tree, you could indeed get an answer right away. At least you could if the signal is processed at the point of contact, but that is something we do not know.

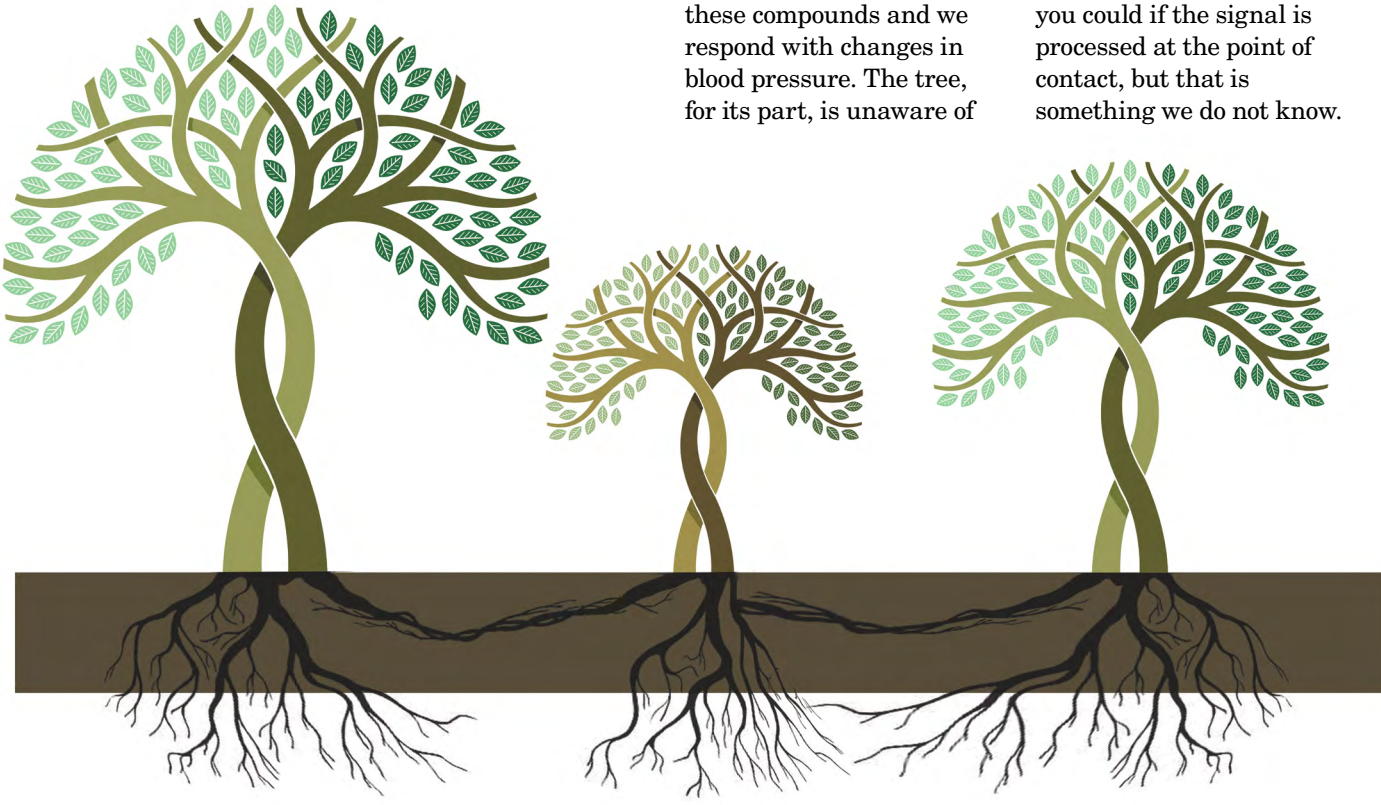


ILLUSTRATION: RITIKA BOHRA / CSE

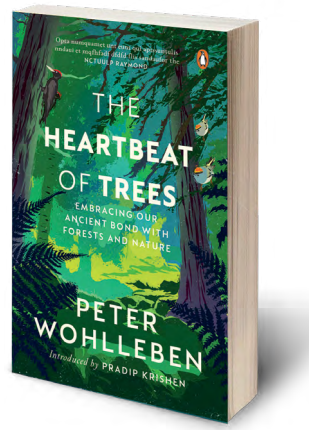
Certain processes are regulated in the roots—how much water the leaves can use, for example—and the distance from the canopy to the roots and back to the canopy (or to your hands) varies from tree to tree, but it is a long way. And now we are approaching one of the central questions about what it is to be a tree. Trees store memories, respond to attacks, and transfer sugar solution, and perhaps even memories, to their offspring. All these abilities suggest that they must also have a brain. But no one has yet found any such thing.

Many parts of a living tree, like most parts of its trunk, are not even active anymore. With the exception of the outermost growth ring, none of the interior is still in use. You could even say it was dead. Nothing happens here apart from a few purely physical reactions, which are the same as the reactions you see in wood after a tree has been cut down. There's the swelling and shrinking caused by getting wet or drying out, for example, as well as resistance to fungal decay thanks to tannins the tree stored earlier in its life that now act as a sort of waterproofing.

The vessels that transport water are found on the outermost growth rings. And that's why it's especially damp, even wet, there, which has the added advantage that most fungi can't grow in these rings. Fungi like damp conditions, but (with a few exceptions) if they get too wet, they drown. And because many species of fungi like to make life difficult for trees, it's a good idea for the tree to have a zone running around the outer part of its trunk that repels most attackers. But, let's get back to the brain. Even in the outer parts of the trunk, most of the cells are dead wood. And so, we can confidently discard any speculation that important information is being processed here.

I'm using the term "brain" deliberately in this context, because I'm convinced that qualitatively valuable communication requires consciousness. If that were not the case, every computer would be a good communicator. After all, even a cheap electronic machine is capable of generating a response to your input. And this brings us to the question of whether plants possess something resembling consciousness.

Professor František Baluška at the University of Bonn has recently been looking into this. For some time now, he has been of the opinion that plants are intelligent—after all, they can process information and make decisions—but consciousness takes the discussion to a whole different level. If we could prove that plants have consciousness, we would have to radically change the way we interact with them, because we'd find ourselves facing the same kinds of issues that we face with factory farming in conventional agriculture.



The Heartbeat of Trees: Embracing Our Ancient Bond with Forests and Nature

By Peter Wohlleben

Publisher: Penguin Random House

Pages: 264; **Price:** ₹599

Baluška, together with colleagues from around the world, including Professor Stefano Mancuso from the University of Florence, has come a little closer to answering the question about plant consciousness. To do this, Baluška and his colleagues sedated plants that feature moving parts, such as Venus flytraps. These plants catch their prey in a trap that snaps shut as soon as insects touch trigger hairs on the inner side of their double-lobed leaves. The two sides of the leaf fold together in a flash, capturing the insect between them, and the plant then digests its prey. The anesthetics the scientists used, which included some that are used on people, deactivated electric activity in the plants so that the traps no longer reacted when they were touched. Sedated peas showed similar changes in behavior. Their tendrils, which usually move in all directions as they slowly feel their way through their surroundings to find supporting structures to grow on, stopped searching and started to spiral on the spot. After the plants broke the narcotics down, they resumed their normal behavior.

Did the plants wake up as we do when we come to after a general anesthetic? This is the critical question, because in order to wake up, you need one thing above all others: consciousness. And it was exactly this question that a reporter from the *New York Times* posed to Baluška. I really liked his answer: "No one can answer this because you cannot ask [the plants]." DTE

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(Excerpted with permission from Penguin Random House from the book titled The Heartbeat of Trees: Embracing Our Ancient Bond with Forests and Nature*, authored by Peter Wohlleben)*

Vaccine poverty

VACCINATION AGAINST COVID-19 is emerging as an antidote to underdevelopment. Over 90 per cent of the world's countries have reported an economic slowdown due to the pandemic. But access to COVID-19 vaccines and their deployment seem to have become a critical precondition for fast economic recovery. In the global discourse on post-pandemic development, access to the vaccine is now akin to obtaining financial capital after any recession or big economic meltdown.

The *Global Economic Prospects 2021* published recently by the World Bank estimates that the world economy is on the path to an "unexceptionally strong" recovery. In 2021, the global economy will grow by 5.6 per cent, which is the strongest post-recession rate in 80 years. But, this unbelievably good news has one typical footnote: the growth will primarily come from a handful of developed countries. Developing countries, including India, may take many years to recover from their economic losses before registering any growth over the 2019 levels. "While about 90 per cent of advanced economies are expected to regain their pre-pandemic per capita income levels by 2022, only about one-third of EMDEs (Emerging Markets and Developing Economies) are expected to do so," says the World Bank report.

The international financial institution's analysis shows that countries vaccinating faster are also reporting quicker economic recovery. In other words, access to vaccines decides recovery. In developed countries crests of the pandemic wave have passed and they are vaccinating aggressively. But in developing countries, the pandemic is still raging, and there are fears of fresh waves hitting them again.

"Vaccine inequity between countries and regions is posing a significant risk to an already uneven and fragile global recovery," says Elliott Harris, chief economist of the UN. For instance, Africa as a continent has the lowest vaccine coverage—less than 2 per cent of Africa's population have received the first dose of COVID-19 vaccine, compared to 11 per cent globally—and inoculation drives might stop due to non-availability of doses. It is, thus, not unexpected that the African continent is reporting the slowest economic recovery, and in the near future might witness fresh waves of the pandemic. Similarly, India, which has faltered in its vaccine campaign, is also reporting the slowest recovery among emerging economies. "Growth in low-income economies this year is anticipated to be the slowest in the past 20 years other than 2020, partly reflecting the very slow pace of vaccination," says the World Bank.

Countries vaccinating faster are also reporting quicker economic recovery. In other words, access to vaccines decides recovery

Recently, the World Health Organization and the World Bank have calculated the rate of return on investment in pandemic-related infrastructure, including vaccines. They say that an investment of US $50 billion would result in the generation of some $9 trillion in additional global output by 2025. This makes access to vaccines a pivotal condition for the world to not just recover to the pre-pandemic levels of development but also to continue growing. In fact, access to vaccines can be added to the list of all decisive factors for better economic performance, like the availability of financial and natural capital, human resources and favourable socio-political environment. DTE

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BACKGROUND

Installation of Continuous Emission Monitoring System (CEMS) and Continuous Effluent Quality Monitoring System (CEQMS) were mandated by Central Pollution Control Board (CPCB) in 17 categories of highly polluting industries (classified under highly polluting industries) and for common pollution treatment facilities. The purpose of mandating real-time monitoring is to strengthen the monitoring and compliance mechanism in the industries and also to promote the measurement of real-time data, which is to become the basis for regulators to check compliance by the industries in near future. In addition to this, these systems can also help industrial sectors/regulators in process optimization and taking timely corrective measures. Since CEMS and CEQMS are complex and expensive technologies, there are significant challenges and risks associated with their implementation. Therefore, appropriate knowledge and skill development for CEMS and CEQMS becomes most crucial factor for industries, regulators and other stakeholders.

Furthermore, in order to ensure proper implementation, auditing of these real-time technologies is an essential factor in improving the systems already installed in the industries. So this programme will also lay focus on audit methodology, which ensures correct implementation of the real time monitoring of emissions and effluent in an industry, to check whether stated standards and other regulatory requirements are being followed, status of facility's compliance, certification, verification, accreditation of the system, technical acceptance through calibration, quality assurance, generating accurate, reliable and traceable data and other related aspects.

Centre for Science and Environment (CSE) recognizes this need and announces an online course on **"Continuous Emission and Effluent Quality monitoring System and its Audit Methodology"** for environment professionals.

This course will be conducted online through technological learning tools such as technical discussion with experts, recorded sessions from experts, presentations, videos and reading material.

THE KEY TAKEAWAYS

- Pollution monitoring regulations in India and developed countries like US, Europe.
- PM CEMS Technologies and its suitability and limitations
- Gaseous CEMS Technologies and its suitability and limitations.
- CEQMS Technologies and its suitability and limitations.
- Correct installation, operation & maintenance of CEMS and CEQMS.
- Requirement and procedures of calibration for CEMS and CEQMS.
- Data acquisition, handling and reporting.
- Data interpretation, compliance check and improvement.
- CEMS and CEQMS- Audit Methodology.
- Assessment of monitoring technologies, installation, calibration and maintenance practices while conducting audit.
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