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HOSTAGE

Zoonotic diseases are rapidly evolving
and widening their realm of spread



Vizag gas leak: the result of ignoring
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Female health workers: invisible,
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Migrants: Future of work and production

EVENTS ARE moving so fast in our world. It was just two weeks ago that I wrote how the economic collapse because of [COVID-19 had made the invisible, visible](#). I wrote about the images of migrant labourers that haunt us, who made their way from villages to cities for jobs and are now walking back home because of job loss—often dying and collapsing with hunger. Since then, the migrant crisis has made its way into our homes; into our living rooms; and, into our consciousness like never before. We have seen them; we have felt their pain; and, we have wept when we heard how tired migrants sleeping on train tracks were crushed to death by an incoming train. More and more of such cases have come to light—we are all traumatised. I know.

But it is also important to note that their pain has not gone unnoticed – government has started trains to bring migrants back home; it has done this knowing there is danger that the contagion might spread to villages. But it knows that there is also anguish to go home. It had to respond. I can say that as yet, all these efforts, including the move to provide free food to the returning people, is still too little—much more needs to be done to take them home with dignity and to provide them with wherewithal to survive in the coming months.

However, what we need to discuss now, is not just the returning migrants, but what this will mean for the future of work and the future of production—not just in India, but across the world. So, what happens to work now—workers have returned home; they may come back as things improve or they may not. Already in Indian cities, we are getting news about how essential municipal services are affected without this workforce. We are getting news about the panic of builders—industry is finding that even when lockdowns are lifted, production needs workers.

So, the value of their work—the worker who was until now dispensable and cheap—is being felt. These workers were kept in the worst conditions; sleeping and eating in hovels—inside the ‘sweat’ factory that the world has come to know. There is no government housing or transport or any other such facility for industrial areas—factories are supposed to produce and workers are supposed to find whatever means they can to survive. We know that people live cheek-to-jowl with industry – this makes them vulnerable to toxic gas leakages or pollution. But have we ever stopped to ask why these informal, illegal habitations are built – because there is no housing provided. But labour needs jobs; industry needs labour. But now labour has gone; some say they will never return.

Work needs to be reimaged. In areas where people will return, this is the great opportunity to renew rural economies and make them resilient. But this is not going to be easy. Just consider how, in the 1970s, when Maharashtra had the great famine looming and it feared massive unrest in its cities because of rural exodus, one man, V S Page, a Gandhian, had come up with the scheme to keep people employed at their place of residence. This was the start of the Employment Guarantee Scheme (EGS), which morphed into the Mahatma Gandhi National Rural Employment Guarantee Act (MNRGA) many years later. But what we forget as this programme took the avatar of government rules is that it was a contract—between the rural and urban. Professionals in cities paid a tax, which went into the scheme meant to provide employment at home for villages. It was a win-win for both. What we also forget is the opportunity that this work provides to rebuild nature’s capital—through real and tangible assets of water, forests, grazing lands, horticulture and investment in livelihoods. This is not to say that these words are not there in the government document. All this is said, but there is little understanding of the intent or the opportunity. It is a tired scheme, meant to provide work during distress.

We need new direction and leadership. We must stop seeing this as a scheme for breaking stones in the scorching sun. We must see this as the scheme for providing livelihoods for renewal—do all we can to build the rural economy, driven as it is through value addition in agriculture, dairy and forestry. It needs a new blueprint; a new compact between the rural and the urban.

But this then brings me to the question of production—India and all other countries of the world are desperate to re-start factories and re-build economies. The fact is that the global economy is built on cheap labour and by discounting environment protection—there is a cost to providing homes for workers; providing adequate living conditions and wages that would give people well-being. There is a cost to ensure that water and air and waste are not dumped, but treated and then disposed of. The rich did not want to pay this cost; they wanted cheap goods for consumption. That’s why production moved to our world. So, what happens now? I will discuss this in my third connected thread of this dialogue next fortnight. [DTE](#) [@sunitanar](#)

The opportunity is to re-build the local economy and to re-think production built on discounting labour and environment

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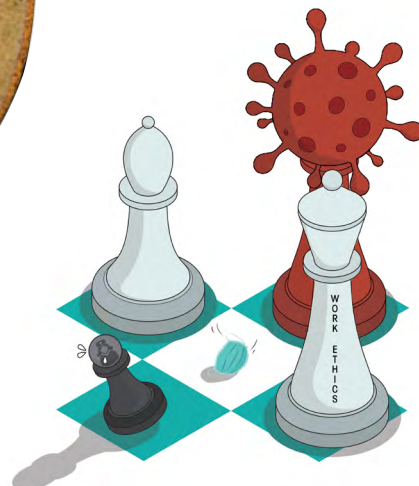
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Simply planting trees cannot replenish water. On the contrary, they can suck up more water and create scarcity



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Female health workers bear the brunt of a careless government and remain invisible

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Engage



Start of a new era

This is in reference to "Army cannot discriminate women on physiology: SC" (1-15 March, 2020). As the apex court's landmark judgement to maintain gender equality on command appointments in army comes as a whiff of fresh air to short service commission women officers, it also marks an end to the 14-year-old litigation for equality fought by the women officers in defence services. As women already serve in combat in more than a dozen countries, India joining the ranks of those countries is a proud moment for the nation because it is certain to give a fillip to other women combat aspirants waiting to be considered when their turn comes.

The fact that more and more woman entering the male domain, including defence services, are found to be performing admirably well, proves that they are in no way inferior to men. In the midst of questions raised in certain quarters on whether women are really capable and ready to serve combat units, the army chief exuding confidence in them and preparing a road map for granting permanent commission to eligible women officers is a welcome step. It would go a long way in not only lifting their spirits but also give them confidence to meet the challenges successfully. The historic ruling is a significant step and heralds a new era for women officers in the army.

K R SRINIVASAN
VIA EMAIL

Ensure food for all

This is in reference to "COVID-19: One nation, one ration card turns spotlight on 2017 govt report" published online on May 1, 2020. Why does our government always require a direction from the Supreme Court to act on any issue? The National Food Security Act, 2013, calls for food to every citizen of the nation without considering his or her living place. Had access to foodgrains through the public distribution system (PDS) been thought of, the problem of labourers' migration would not have occurred.

There should be a single card for every citizen of the country, perhaps in the form of a social security card. Some countries already have such a system. This will have multiple benefits in the long run. Citizens will not have to carry the different types of cards to prove their identity. These things are now possible, after the digitisation of all the data, and must be implemented. In most cases, state governments play a negative role because they believe such services will reduce their say over their residents.

CHAITANYA AGARWAL
VIA EMAIL

WHO needs to focus on virology

This refers to "Is COVID-19 disease X?" (1-15 April, 2020). The article states that humankind is still in the dark about the ill effects of more than 99 per cent of potential zoonotic viruses. To avoid the acrimony of claims and counterclaims by countries, it is advisable that the World Health Organization (WHO) creates a special fund for research in virology. The share of contributions can be decided by consensus. We can't undo



New rules for air travel after lockdown?

The Airport Authority of India issued post-lockdown guidelines for 100 airports which say that airlines will



operate only to and from state capitals, some Tier-I cities and major Tier-II cities. Both the source and destination of a flight will need to be in areas free of lockdown.

Most epidemics come from animals

Though it is yet to be proven that bats gave COVID-19 to humans, it is a fact that most recent epidemics have come from animals. The extremely fatal Ebola of 2014-16 was transmitted either from bats or non-human primates; the Severe Acute Respiratory Syndrome (SARS) epidemic of 2002-03 was caused by civet cats; and the Middle Eastern Respiratory Syndrome (MERS) came from camels. 60 cent of human disease-causing pathogens came from animals.

Pentagon saw UFOs

The US Department of Defence has released three videos of "unidentified aerial phenomena". The first video was shot by US Navy pilots in 2004 and the second and third videos in 2015.



the loss of lives and no monetary compensation can suffice the loss of lives. Does the International Court of Justice have jurisdiction to adjudicate on such debatable issues? Such matters should be on WHO's agenda.

SHREE KRISHNA PHADNIS
MUMBAI

Government must monitor CSR activities

The article "Spending responsibly" (16-29 February 2020) was very informative. It is good that the Union government has formulated guidelines on the subject of corporate social responsibility (CSR) and a Companies (Amendment) Bill is also in the pipeline. Still the implementation of CSR, which affects the masses, is mostly left to the whims of companies and business houses.

The funds accrued on account of corporate social responsibility need to be monitored and spent judiciously as per the priority of the affected populace and area. In fact, there is a need for a special cell under the commerce ministry for this purpose. Employment generation, drinking water, health and education are the sectors which should be given priority in CSR funding. Above all environmental concerns should be addressed.

L R SHARMA
SUNDER NAGAR

Fix responsibility for fall in dolphin numbers

This is in reference to "Dolphin population in Odisha's Gahirmatha halves: Annual census" published online on February 25, 2020. Despite much good work done by the government and people in the field, it seems that leaving the management of such important areas like Gahirmatha and Chilika solely in the hands of the government has many limitations. What's needed is, perhaps, to improve these sites and the plight of the endangered species they are home to. This is better achieved by roping in agencies, private and non-profit, and networking in a way to make authorities a lot more accountable than they presently are. Is anybody going to be answerable to the fact that the dolphin population has halved in the last couple of years or will we just have another sad story next year too?

VINAY
VIA EMAIL



Sell them online

This is in reference to "COVID-19: Tribal handicraft worth ₹100 or unsold" published online on April 23, 2020. And here I am in the US, looking for cotton washable shopping bags hoping I could support the makers instead of supporting Amazon. Could some of the products be sold online?

MEENAL
VIA EMAIL

Down To Earth welcomes letters, responses and other contributions from readers. Write to Sunita Narain, Editor, Down To Earth, 41, Tughlakabad Institutional Area, New Delhi - 110062 or send email to editor@downtoearth.org.in

DATA CENTRE

Over 3.7 mln cases globally

The number of people infected with COVID-19 in the world rose to 3,727,802 in 212 countries and territories, as of May 6, 2020. A total of 258,338 have died of the disease.

COVID-19 in India

The total number of COVID patients in India was 49,391 on May 6. There have been over 33,514 active cases, 14,183 cured/migrated patients and 1,694 deaths.

40% districts COVID-free

Forty per cent of India's districts have no COVID-19 cases, as of April 22, and the government can lift the lockdown from such areas to allow economic activities. Most of these are in forested areas, Himalayan regions and the Northeast.

Epidemiologists can map COVID-19's spread

Online databases have been collecting SARS-CoV-2 genomic nucleotide sequences since mid-December. When a patient tests positive for the virus, its genome can be sequenced.

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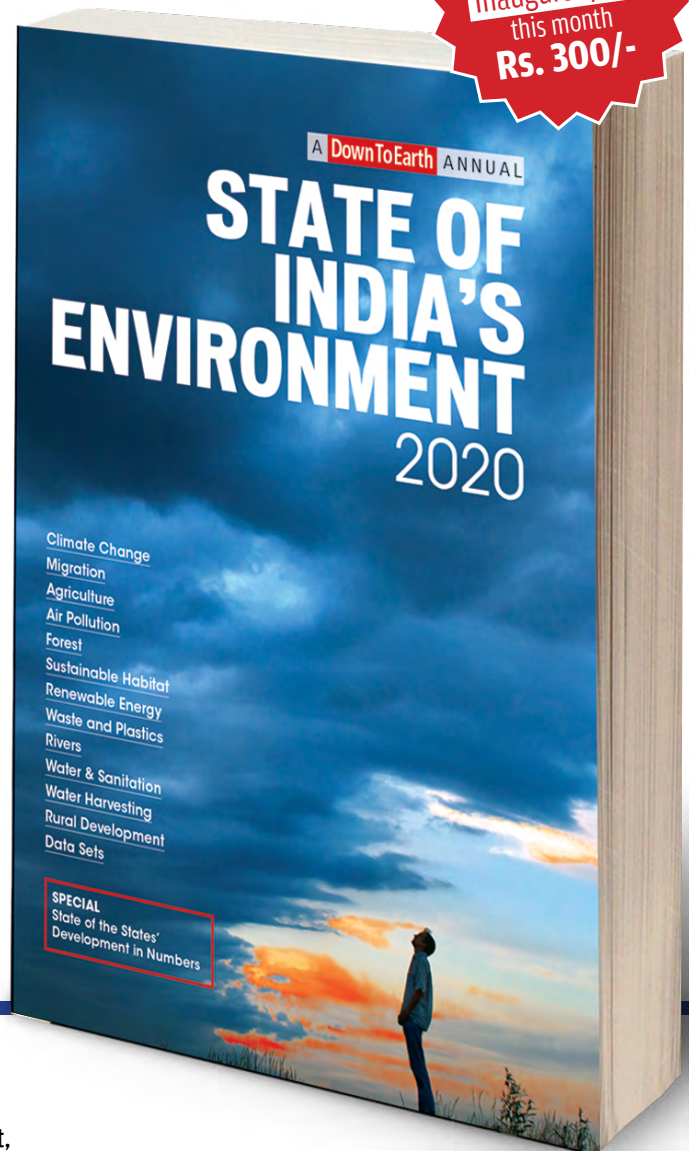
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Digest



WHAT'S INSIDE

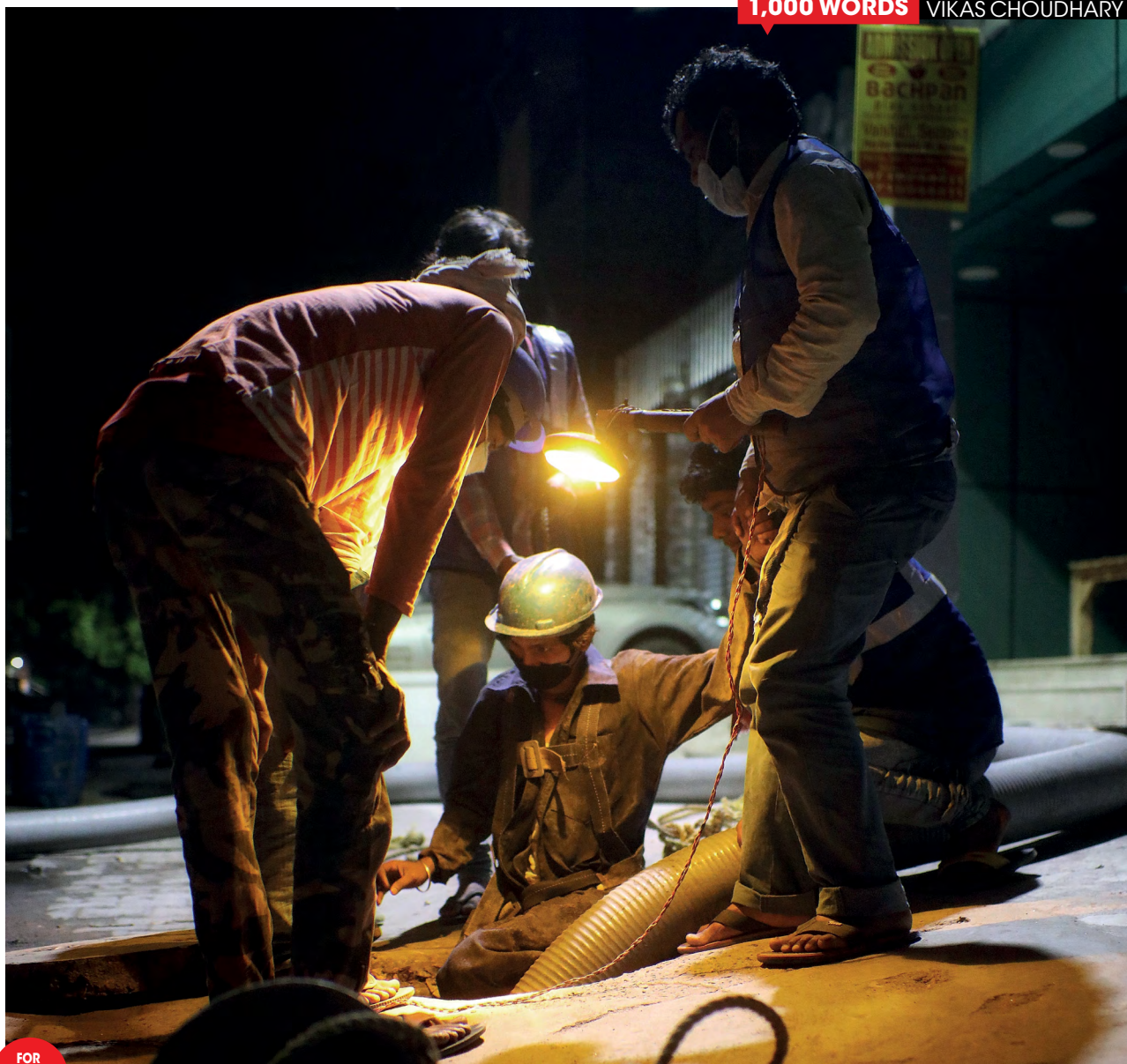
A Haryana farmer helps villages in India's most water-stressed region overcome the woes **P12**

Seven states have diluted labour laws to restart the economy post lockdown **P13**

A billion people will be displaced for every 1°C increase in global temperatures **P14**

1,000 WORDS

VIKAS CHOUDHARY



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MORE,
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Suresh Biswas of West Bengal's Malda district earns a living by cleaning manholes for the Ghaziabad Nagar Nigam. Despite being at the frontline in the fight against COVID-19, sanitation worker's associations allege the government has neglected their safety and that they should be provided with personal protective equipment

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Rain catcher

MY VILLAGE would remain water-stressed even in the years when we received good rains because of high surface water runoff in the region," says Haji Ibrahim of Haryana's Badola village in Nuh district, which is close to the Aravalli mountain range. The story is similar in almost all the villages in the district where the rich rely on private water tankers and others walk long distances to get potable water. Given the situation, government agencies have tried several water conservation attempts in the past, but none have made much difference.

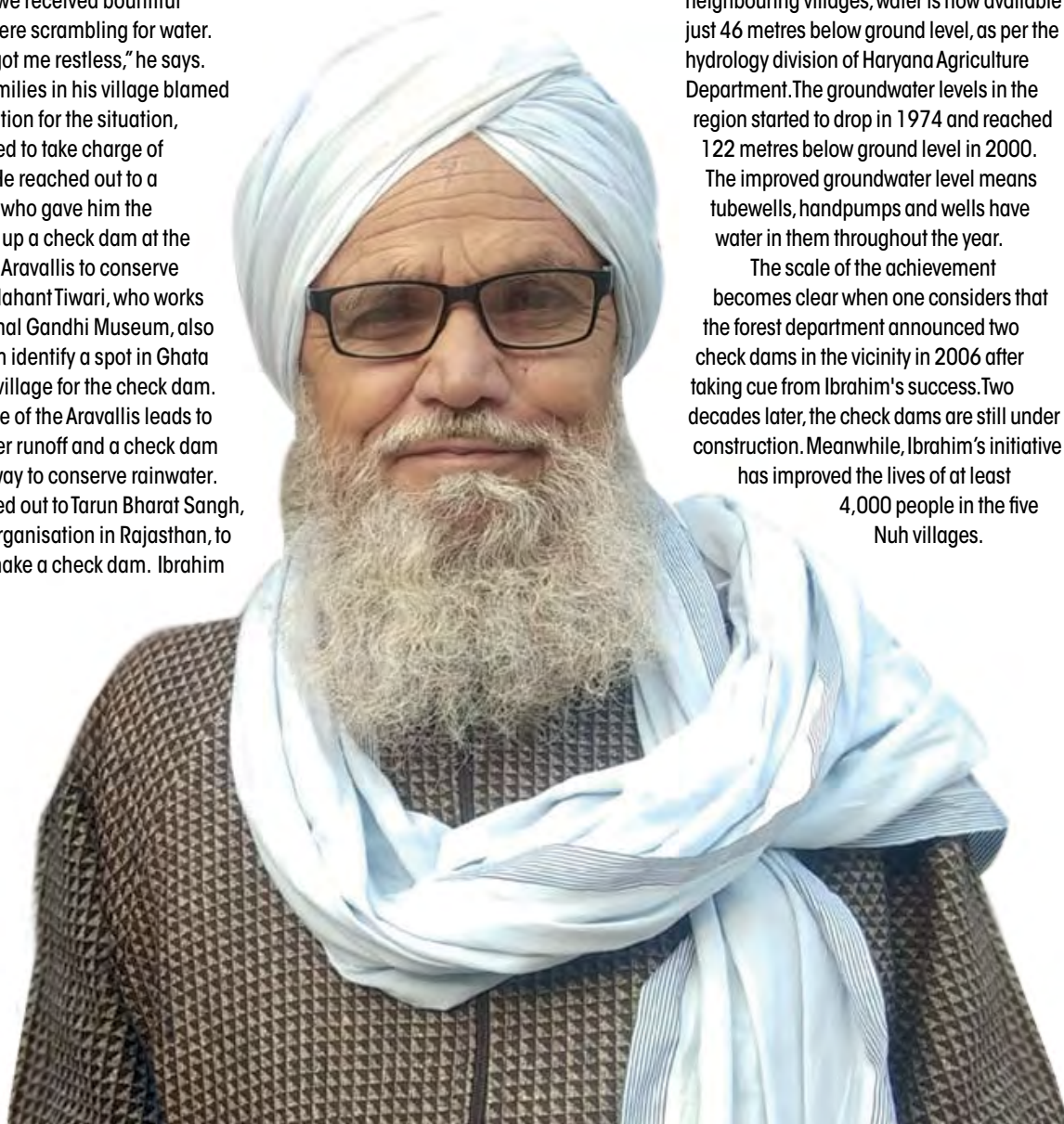
"In 2000, we received bountiful rains, yet we were scrambling for water. The situation got me restless," he says. While most families in his village blamed the administration for the situation, Ibrahim decided to take charge of the situation. He reached out to a friend in Delhi who gave him the idea of setting up a check dam at the foothills of the Aravallis to conserve runoff water. Mahant Tiwari, who works with the National Gandhi Museum, also helped Ibrahim identify a spot in Ghata Shamasabad village for the check dam. The steep slope of the Aravallis leads to excessive water runoff and a check dam is the logical way to conserve rainwater. Next he reached out to Tarun Bharat Sangh, a grassroots organisation in Rajasthan, to learn how to make a check dam. Ibrahim

This Haryana farmer
solved water crisis in
five villages
SHAHNAWAZ ALAM

initially used personal funds to build the check dam but was soon forced to reach out to others for financial support. "People realised its benefits and readily agreed to help. While some gave financial support, others agreed to work for free," he recalls. Four months later, Ibrahim and others built the region's first check dam, which was 45 metres tall and half-a-kilometre wide. They spent ₹2 lakh in the project.

Close to two decades later, the impact of the check dam can clearly be felt in the region. In Ghata Shamasabad and four neighbouring villages, water is now available just 46 metres below ground level, as per the hydrology division of Haryana Agriculture Department. The groundwater levels in the region started to drop in 1974 and reached 122 metres below ground level in 2000. The improved groundwater level means tubewells, handpumps and wells have water in them throughout the year.

The scale of the achievement becomes clear when one considers that the forest department announced two check dams in the vicinity in 2006 after taking cue from Ibrahim's success. Two decades later, the check dams are still under construction. Meanwhile, Ibrahim's initiative has improved the lives of at least 4,000 people in the five Nuh villages.



States dilute labour laws to excite investors

KUNDAN PANDEY

AS INDIA prepares to lift the lockdown, state governments are in a rush to dilute laws meant to safeguard labourers. The dilutions include exemption from labour laws for up to three years to making 12-hour shifts legal. Surprisingly, the states justify the dilutions claiming it will help the labourers in these trying times. The sentiment is also shared by the Union Ministry of Labour and Employment that has assured the industry relaxations in labour laws. Madhya Pradesh on May 5 amended four Central and three state labour laws.

Over the next few days, six more state

governments—Uttar Pradesh, Gujarat, Assam, Rajasthan, Punjab and Himachal Pradesh—followed suit.

In Madhya Pradesh, establishments now have to abide by only a few provisions of the Factories Act, 1948, such as safety and payments. The factories, however, are not legally bound to implement sections that ensure labourer's health and welfare. The state also assures that investors will get government nod in a single day, which could result in clearances without proper background checks. It has also repealed the Madhya Pradesh Industrial



Relations Act 1960 that deals with arbitration between employees and employers and extended a 1,000-day exemption from the Industrial Disputes Act, 1947 to ensure that “establishments will be able to keep the labourers in service as per their convenience”. New factories also do not have to pay ₹80 per labourer per year to the Madhya Pradesh Labour

Welfare Board for the next 1,000 days. It adds that establishments employing less than 50 workers can be inspected only after the permission of the Labour Commissioner. Uttar Pradesh has exempted all industries from labour laws for the next three years. In Gujarat, investors who can promise their project will run for over 1,200 days, will enjoy a three-year hiatus from labour laws as long as they ensure minimum wages, observe safety laws and provide compensation in case of a mishap. The state government has said the relaxation will help attract foreign investment from the US and Japan who are fed up with China. Rajasthan has not only raised the working hours from eight hours a day to 12 hours a day, but also amended the Industrial Disputes Act to increase the threshold for layoffs and retrenchment to 300 from 100. Companies also need to recognise the trade union only if 30 per cent workers are its members.

'THIS IS UNDEMOCRATIC AND BAD FOR ECONOMY'

Political and social activist **Aruna Roy** believes suppressing labour rights will lead to dissent and disruptions after lockdown

States are claiming the dilutions are being done to help labourers. Is it true?
This is a conspiracy hatched by governments that are not democratic in true sense. COVID-19 has, for the first time, forced people to stay indoors and governments are misusing this. They know people cannot come on the road and protest

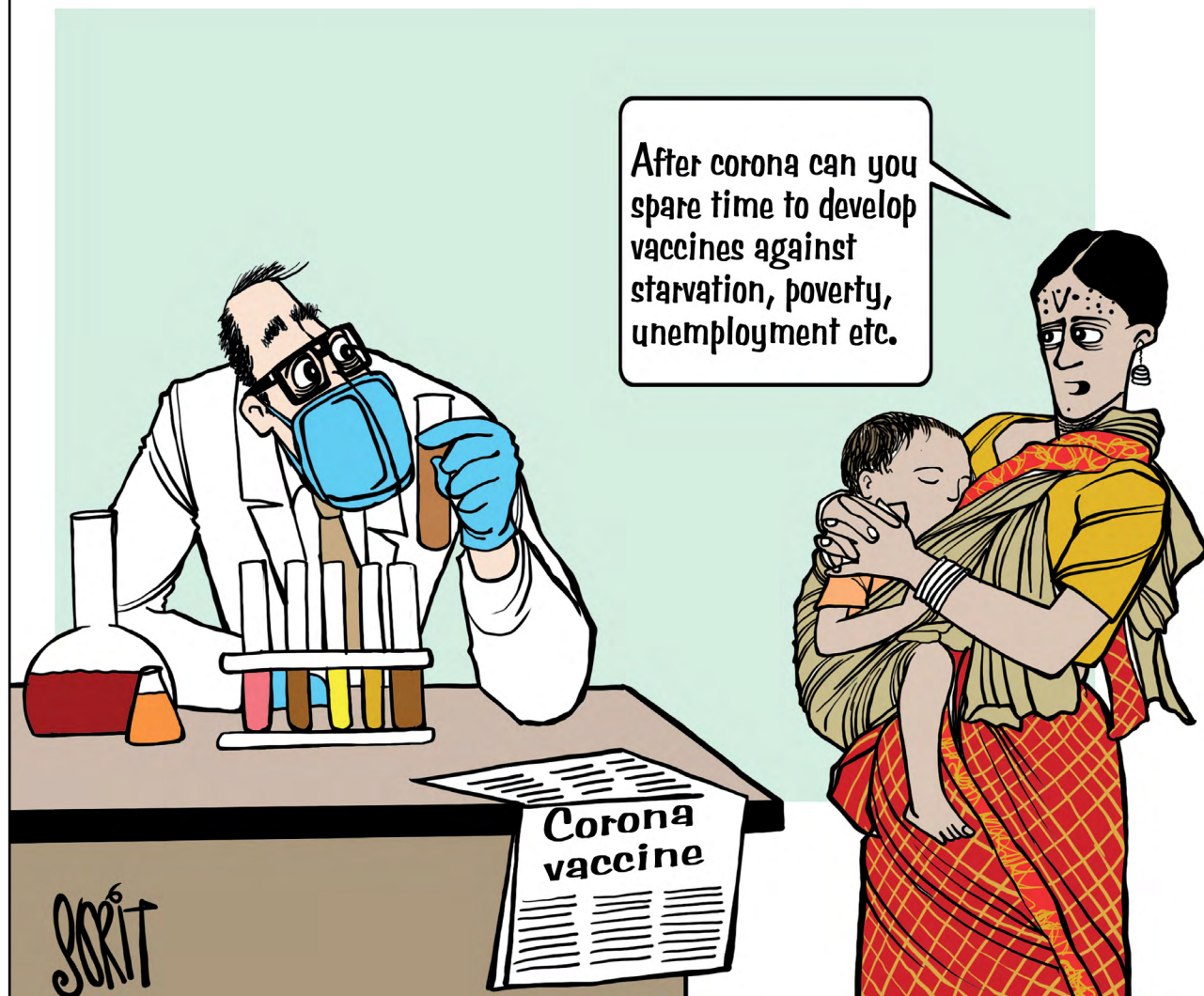


the decision. The dilutions are what corporates have always pushed for and they are now clearly succeeding. In a clean sweep, the government is undoing all the rights labourers have

fought and claimed over centuries.

Will the move help rejuvenate the economy?

I don't think governments can lure investment just by diluting labour laws. If they are really serious about attracting investment, they have to take care of the workers. Suppressing labour rights is bad for the industry. India is a democracy and people will eventually raise their voices against the wrongs. It will be tough for policymakers to handle the situation then.



FOR MORE CARTOONS, SCAN



1.2 bln people to live in extreme heat by 2070

FOR EVERY 1°C rise in global temperature, a billion people will either be displaced or forced to live in extreme heat, warns a new study that shows the world will see more changes in the next 50 years than in the past 6,000 years. This is likely to trigger mass migration in several parts of India, Latin America, Africa and Australia. Human populations have always lived in regions where the mean annual temperatures have remained around 11°C to 15°C, which is ideal for human health and food production. But climate change is fast shifting the world out of the climate niche and in the current scenario, many places

will become almost unlivable in the next 50 years. In the worst case scenario where emissions continue to rise, places that support a third of the world population will have mean annual temperatures as hot as 29°C, which is currently found in 0.8 per cent of the Earth's landmass, mostly concentrated in the Sahara. Even in the most optimistic outlook, 1.2 billion people will fall outside the comfortable "climate niche" in which humans have thrived for at least 6,000 years, says the report published on May 4 in the *Proceedings of the National Academy of Sciences*.

PROTOCOL IGNORED

The Visakhapatnam gas leak highlights the need for industries to be extra cautious while starting production after the lockdown

**SOUNDARAM RAMANATHAN, DIGVIJAY SINGH BISHT and
NIVIT KUMAR YADAV**



Women outside a mortuary to receive the body of a relative who died after the gas leak at the LG Polymers plant in Visakhapatnam on May 8

THE TOXIC gas leak incident at Visakhapatnam, Andhra Pradesh, in the early morning of May 7 was not the only industrial accident in the country that day. In the evening, two boilers exploded at NLC India Limited's thermal power station at Neyveli, Tamil Nadu, injuring eight people.

The previous day, on May 6, another gas leak accident had taken place at a paper mill in Raigarh, Chhattisgarh, after which seven workers were hospitalised. What's common to the three accidents is that they happened while the factories were being prepped for opening after the COVID-19

RELATED STORY

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PHOTOGRAPHS: REUTERS

lockdown. Poor operational and maintenance practices during the lockdown and shortage of skilled staff appear to be the common thread in all the incidents.

In its scope and damage, the styrene gas leak at Visakhapatnam was the worst of the three. It left 11 dead while hundreds had to be hospitalised due to difficulty in breathing, headache, fatigue and fainting. On May 8, the [National Green Tribunal](#) took *suo moto* cognisance and ordered the owner, LG Polymers India Pvt Ltd, to deposit ₹50 crore with the district magistrate as an interim penalty for the damage caused to life and

habitat. As per an assessment by Delhi-based non-profit Centre for Science and Environment (CSE), the accident can be attributed to the company's negligence and failure to adhere to the safety protocol.

THE ACCIDENT

The plant uses styrene monomer (C_8H_8) to produce expandable plastics. Styrene monomer must be stored at temperatures strictly below 17°C. There was a temporary partial shutdown of the plant owing to the COVID-19 pandemic, excluding maintenance activities, which were being carried out in the plant as per a predetermined schedule. Since

styrene was not being stored at the appropriate temperature, there was a pressure build up in the storage chamber which caused the valve to break, says an official with the Andhra Pradesh Pollution Control Board (APPCB), requesting anonymity. The result was leakage of 3 tonnes of the toxic gas (see 'What is styrene and how toxic it is'). Even a day after the leak, the levels of styrene in the air in the area were 500 times higher than the prescribed limit. Media reports said they were more than 2,500 parts per billion (PPB), while World Health Organization norms require them to be under 5 PPB. The Visakhapatnam facility is spread over 240 hectares (ha), including the nearby residential areas. There is also a revenue village nearby, which resulted in a higher rate of exposure.

CIRCUMVENTING RULES

Industries that process petrochemical-based products, such as styrene, require two levels of clearances—an Environmental Clearance (EC) from the Union Ministry of Environment, Forest and Climate Change (MOEFCC) and a Consent to Operate (CTO) from the State Pollution Control Board (SPCB), which needs to be renewed every five years. CTO documents give production limits on products that can be manufactured, limits on treated effluents and ambient air surrounding the factory compound. LG Polymers India has not adhered to rules at both these levels.

As the company has been operating since the 1960s, much before the legislation of the Environmental Impact Assessment Notification of 2006, it was not required to obtain EC unless it

WHAT IS STYRENE AND HOW TOXIC IS IT

STYRENE IS an organic compound used in the manufacture of polymers/plastic/resins. It is manufactured in petrochemical refineries and is a likely carcinogen. It can not only enter the body through respiration, but also through the skin and eyes. According to India's Manufacture, Storage and Import of Hazardous Chemical Rules, 1989, styrene is classified as a "hazardous and toxic chemical". Short-term exposure to styrene in humans can result in irritation in the mucous membrane and eye, and gastrointestinal problems. Long-term exposure can impact the central nervous system, leading to headaches, fatigue, weakness, depression, dysfunction, hearing loss and peripheral neuropathy. If the concentration of styrene goes beyond 800 ppm, then the person exposed to it can sink into a coma. Experts say that immediately after the leak, the levels could have crossed 1,000 ppm in nearby areas, which is why people started fainting.

The duration of the exposure and its relative concentration will determine toxicity—we currently know that roughly 3 tonnes of the gas leaked from its storage tank and the feeding line. We now need to determine exposure.

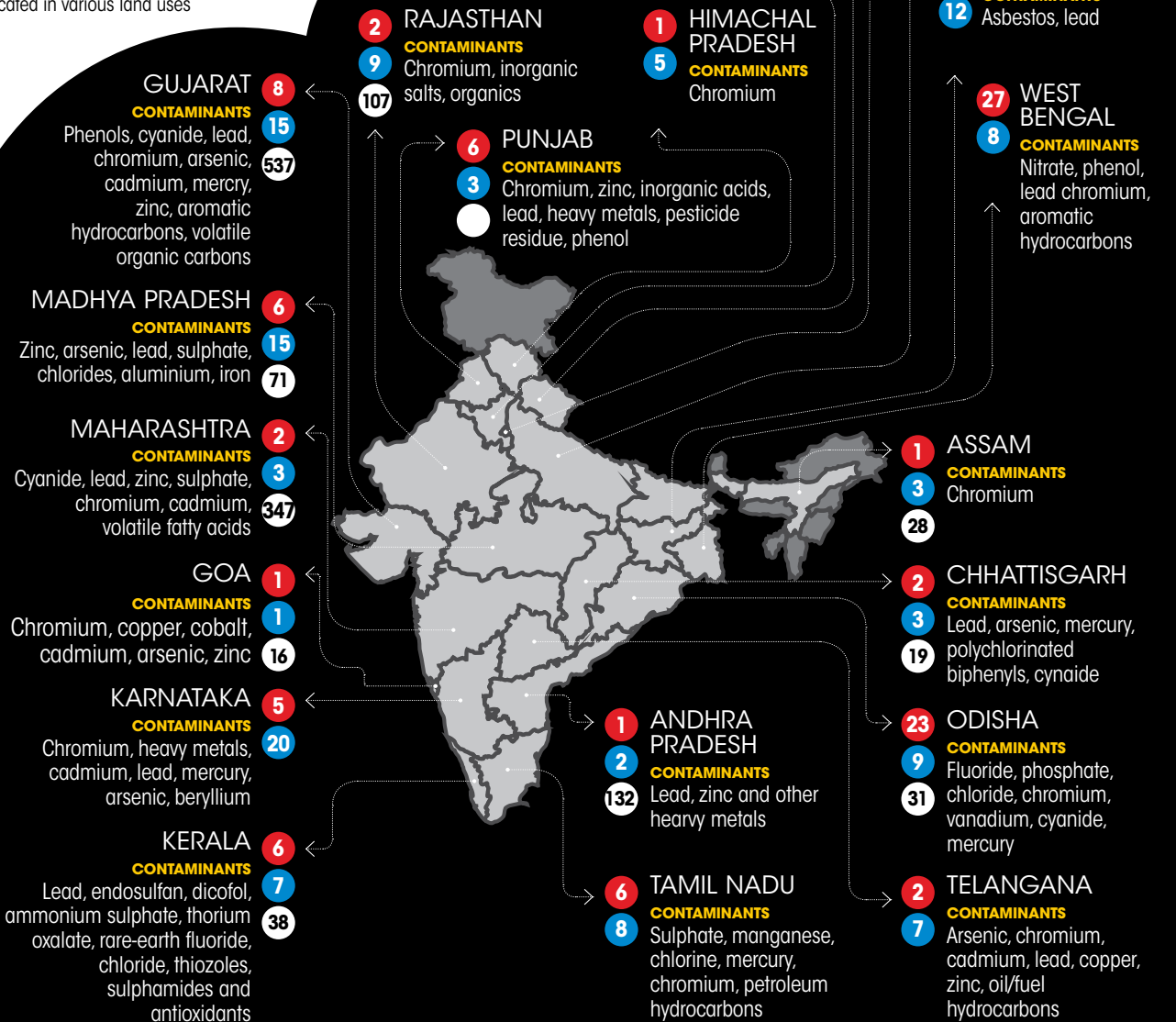
"Styrene can stay in the air for weeks. It is highly reactive, it can combine with oxygen to form styrene dioxide which is more lethal. The presence of other pollutants can also affect the reactivity. Operating one reactor in full load suddenly, can also lead to such disasters," says Thava Palanisami, a senior research scientist with the University of Newcastle, Australia.

The most important immediate treatment is to give oxygen to the affected people. The people in the zone also need to be evacuated as long-term exposure can be detrimental to their health. Also, as styrene reacts to form styrene dioxide, the air could remain contaminated for some time. However, the winds blowing from the sea could also help to disperse the gas.

DISASTERS IN THE PIPELINE

India has 128 contaminated hazardous sites and another 196 "probable" contaminated sites. It has over 1,400 hazardous chemical units

CONTAMINATED SITES are created when industrial hazardous wastes are disposed by occupiers in unscientific manner or in violation of the rules prescribed. They may include production areas, landfills, dumps, waste storage sites, treatment sites, mine tailings sites, spill sites, chemical waste handler and storage sites located in various land uses



- Confirmed contaminated hazardous sites
- Probable contaminated hazardous sites
- Hazardous chemical units

Note: Jammu and Kashmir has 11 hazardous chemical units, Puducherry and Nagaland have 3 each, Meghalaya and Tripura have 2 each. The list of contaminants is not exhaustive; Source: Central Pollution Control Board and Ministry of Health and Family Welfare

Residents speak with a local politician outside the LG Polymers plant following the gas leak in Visakhapatnam

expanded its production, changed raw material or modernised its units. However, the company has been increasing production and changing raw materials since 2004 and has not obtained EC. In 2004, the expandable polystyrene capacity of the plant was 45 TPD which increased to 65 TPD in 2009, 71.5 TPD in 2012 and 100 TPD in 2014, as per APPCB data. Similarly, its polystyrene production capacity increased from 235 TPD in 2014 to 315 TPD in 2017.

In 2017, APPCB warned the company about the need for an EC, saying it would otherwise not grant CTO. After this, the company filed a petition with MOEFCC seeking an EC. It also gave a proposal to APPCB saying it is importing plastic granules to prepare extended plastic, which may not require an EC. It succeeded in obtaining consent from APPCB, brushing impact assessments studies. In 2018, it withdrew its petition for EC from MOEFCC saying there were typo errors.

“By failing to seek EC, the plant has violated the norm to inform the competent authorities over two things: one, changing the product mix and related impacts, and, two, expansion and importing. Expansion means more storage, importing means risk associated with transportation, handling in port related to loading and unloading and the same in factory premises. It is an absolutely new dimension,” says D D Basu, advisor, CSE. “In fact, fresh application is required. Renewal CTO is not the only issue. Since the company has changed product mix and production process, the risks

associated with accidental release are more dominant,” he adds. It is pertinent to note that APPCB has been granting CTO to the company, despite the latter mentioning that it is changing its raw material and expanding capacity of final products without any EC.

In 2018, the company also submitted a ₹168 crore-proposal to MOEFCC to expand its production capacity by 250 tonnes per day (TPD)—from the current 415 TPD—but withdrew it later.

LG Polymers India has flouted general CTO requirements as well. One condition stipulated in CTO is maintaining a suitable system of leak detection and provisions to immediately repair any instances. Under Point 11 of the general conditions of CTO, the industry is required to maintain Volatile Organic Compound (voc) analysers with recording facility and maintain records, while Point 19 mandates installation of a system

of leak detection and repair of pump. LG Polymers did not adhere to both these rules.

The voc detection system at the plant was defunct, says an APPCB official, and there is no monitoring mechanism to specifically detect styrene. Even the container that was being used to store styrene gas was old and not properly maintained, the official says.

STORAGE AND HANDLING

After the [Bhopal gas disaster](#) of 1984, India enacted a plethora of laws to prevent such accidents and to issue clear guidelines on storage of hazardous chemicals in plants. The Environment (Protection) Act, 1986, is the omnibus Act that gives sweeping powers to the Central government to take all measures to protect the environment. There are clear rules on hazardous chemical storage under the Act. These include Hazardous Waste (Management





People sleep on a pavement after being evacuated from their homes following the gas leak at the LG Polymers plant

and Handling) Rules, 1989; Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989; and, Chemical Accidents (Emergency, Planning, Preparedness and Response) Rules, 1996.

That such an accident could happen despite these laws shows negligence on the part of all parties. The unit in question is also an ISO-certified facility, which means it has a protocol for everything. What seems to be the case is that the management, in its haste to restart the plant, ignored the protocol pertaining to maintenance of the plant before resuming operations.

NGT'S ACTION

In its order, NGT has issued notices to APPCB, district magistrate of Visakhapatnam, Central Pollution Control Board (CPCB), MOEFCC and LG Polymers India Pvt Limited for their response on the accident.

The court has also appointed a

five-member committee comprising B Seshasayana Reddy, former judge of the Andhra Pradesh High Court; V Ramachandra Murthy, former vice chancellor of Andhra University; Pulipati King, head of chemical engineering department at Andhra University; member secretary of CPCB, and, director of the Council for Scientific and Industrial Research-Indian Institute of Chemical Technology. The committee has to report its initial findings on what went wrong,

THE NATIONAL GREEN TRIBUNAL HAS FORMED A FIVE MEMBER COMMITTEE TO INVESTIGATE WHAT WENT WRONG, THE EXTENT OF DAMAGE AND REMEDIAL MEASURES TAKEN. THE COMMITTEE HAS TO FILE ITS REPORT IN 10 DAYS

extent of damage and remedial measures initiated within 10 days.

LESSONS FOR OTHERS

It remains to be seen whether NGT's order on the Visakhapatnam gas leak will set a precedent to discourage industrial disasters. But the order should not have been silent on the two other accidents. The order is also unclear on whether the district magistrate can use the ₹50 crore to initiate relief measures.

Though the cognisance of the Visakhapatnam accident is a welcome move, the court could have widened its scope and directed the government to ask industries to ensure safety while resuming operations. In case the lockdown continues, these safety precautions must not be forgotten. The accidents have shown that as the lockdown ends and industries start resuming activities, there is a need to be extra cautious. **DTE**

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UNCLEAR VERDICT

Lockdown has little impact on the Ganga, but cleans up Yamuna

SUSHMITA SENGUPTA

WHILE SOCIAL media platforms are flooded with videos that suggest the lockdown has drastically cleaned up the Ganga, the truth is that not much has changed. This becomes clear in the recently released report by the Central Pollution Control Board (CPCB) that analyses the water quality in the Ganga before (March 15-21) and during the lockdown (March 22-April 15). In contrast, the water quality in the Yamuna improved substantially during the lockdown, though the river remained polluted.

The report on the Ganga, which only shows overall trends and does not share the actual data, found that the biological oxygen demand (BOD) and chemical oxygen demand (COD) levels of the river remained almost unchanged throughout the study period, indicating that wastewater flow did not drop during the lockdown (see 'Little to show' on p21). There has been marginal increase in dissolved oxygen (DO) and decrease in nitrates "due to the absence of industrial wastewater discharge, agricultural runoff and increased freshwater flow," says the report. CPCB analysed water quality data from 18 real-time monitoring stations starting

from Bijnor in Uttar Pradesh to Howrah in West Bengal. The agency also studied samples from 18 sites along the tributaries (9) and drains (9) of the Ganga. The tributaries showed a trend similar to that of the main stem of the river, while the wastewater quality in the drains remained unchanged during the lockdown.

The findings might be disheartening, but are on the expected lines. The 97 towns near the Ganga generate around 3,500 million litres of wastewater per day (MLD) and just

that led to suspended solids and turbidity in the river. Of the 15 sites where DO levels were recorded throughout the study period, four sites in West Bengal saw a significant positive variation in the remaining three weeks of the lockdown, when compared to the pre-lockdown period. In the 11 sites in Uttar Pradesh, non-significant positive variations were found in the last three weeks.

Ujjwawl Mukherjee, former senior scientist with the pollution control board, says the high levels of DO in West Bengal only indicate eutrophication in the water and should not be confused as cleaner water. "CPCB has to check DO levels for 24 hours to get the real picture," he adds. West Bengal CPCB scientists did not comment on this claim.

UNTREATED WATER FROM DOMESTIC HOUSEHOLDS CONTINUED TO CHOKE THE GANGA DURING THE CORONAVIRUS LOCKDOWN

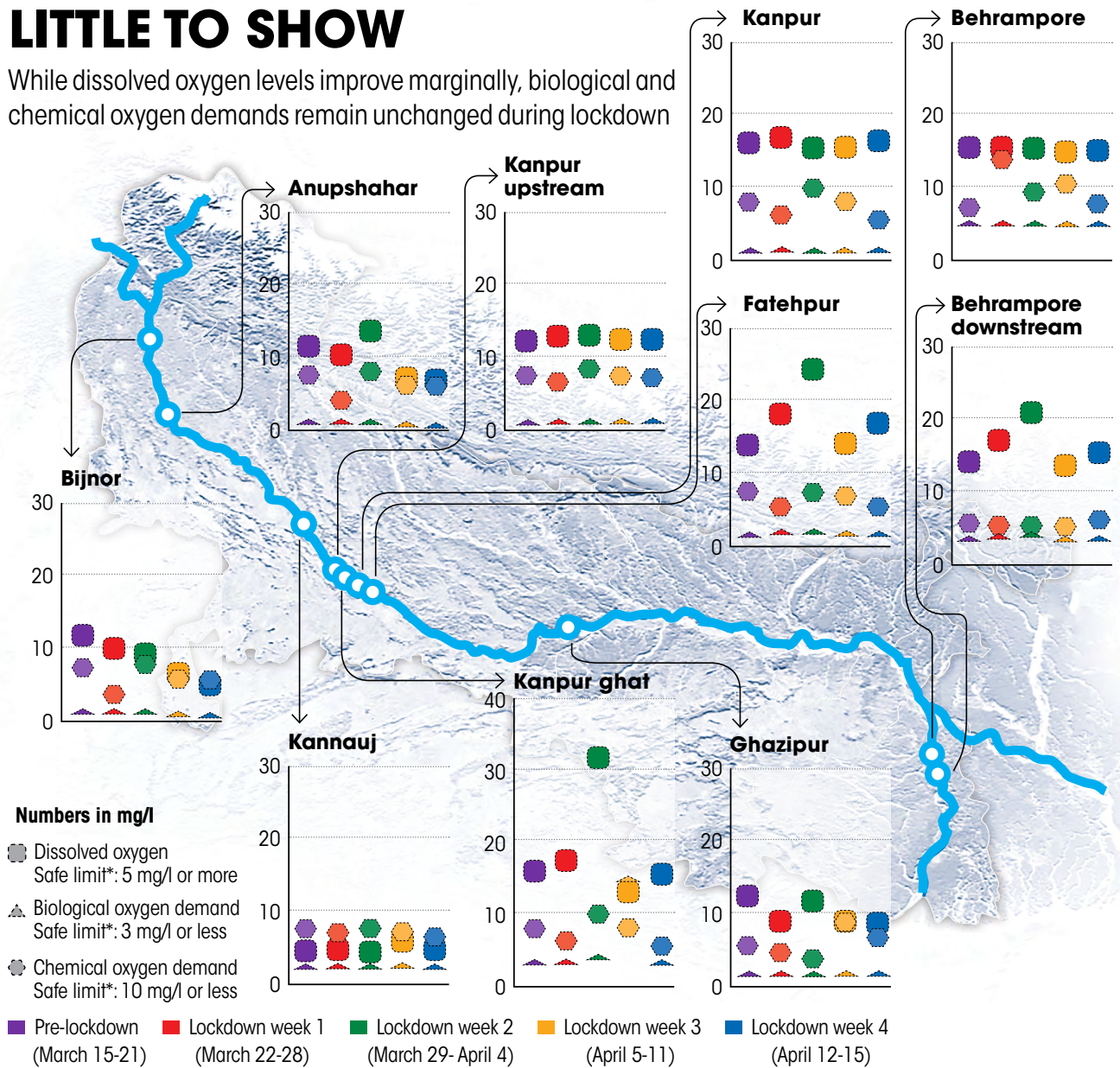
9 per cent of it (300 MLD) is industrial effluent. The bigger challenge is that the combined wastewater treatment capacity of these towns is just 1,100 MLD, which means 2,400 MLD of untreated sewerage is pumped into the Ganga every day.

The report, which has published week-by-week analysis, shows that DO levels in the Ganga decreased in the first week of the lockdown (March 22-28) due to heavy rains

The overall BOD levels of samples collected from 17 sites remained high during the lockdown, especially in West Bengal—Behrampore, Behrampore downstream and Sirampur. Barring Deoriaghat site in Kanpur, where BOD levels peaked to 15 milligrams per litre (mg/l) in the third week of the lockdown, sites in Uttar Pradesh recorded little BOD variation before and during the lockdown. "BOD value ranged between 1.13 mg/l and

LITTLE TO SHOW

While dissolved oxygen levels improve marginally, biological and chemical oxygen demands remain unchanged during lockdown



*Standards for outdoor bathing
Source: Report on impact of lockdown on water quality of river Ganga by Central Pollution Control Board, April 2020

5.56 mg/l during the lockdown period, more or less similar to pre-lockdown range of 1.37 mg/l to 5.58 mg/l,” says the report.

Also, the sites did not record significant reduction in COD levels during the lockdown. While some of the stations in the upper stretches of the river recorded marginal decrease through the four weeks, several sites downstream had

higher COD levels than before the lockdown. Ammoniacal Nitrogen levels also remained high in 11 of the 15 sites, which shows “increased discharge of untreated and partially treated sewage into the river,” admits the report. The nitrate levels came down (varying from 2 to 66 per cent) in most sites due to the shutting down of industrial and agricultural activities.

“The closing of industrial units improved the DO levels and closing of the ghats reduced the organic load. As a result, a marked difference can be seen in the colour of the river in Varanasi,” says Malika Singh, regional officer, Uttar Pradesh state pollution control board at Varanasi. He adds that the two monitoring sites in the city had cleaner water this April over the last year.

Both upstream and downstream Varanasi sites recorded 2.2 mg/l increase in DO levels in the past one year. A senior scientist at CPCB also claims that the shutting down of hotels and restaurants has reduced wastewater flow by 10-15 per cent during the lockdown. The report, however, does not reflect such a marked reduction.

CLEAR WATERS

The impact of the lockdown is more palpable in the 22-km stretch of the Yamuna that flows through Delhi (see 'Visible change'). A closer look, however, suggests that unseasonal rains in the city played a bigger role in improving the water quality than the lockdown. This is understandable because industrial effluent constitute a little more than 1 per cent of the total 3,026.24 wastewater in the river. Additionally, industrial effluent is completely treated before being released in the river.

The CPCB report on the river analysed samples from manual monitoring stations at Palla (Yamuna's entry point in Delhi), Nizamuddin bridge, Okhla barrage, along with Najafgarh and Shahdara drains. The BOD levels recorded marked improvement at Nizamuddin bridge (90 per cent) and Okhla upstream (77 per cent) between the two samples collected on March 4 (pre-lockdown) and April 6 (lockdown). Yet they remained unfit for outdoor bathing (5 mg/l or more).

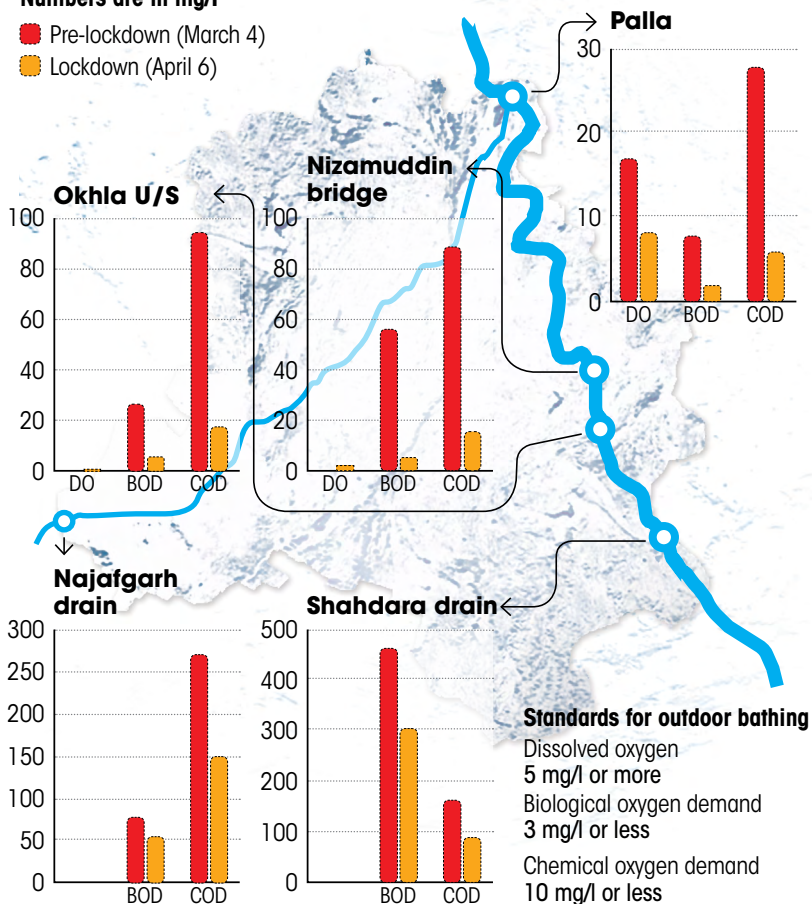
"The Wazirabad barrage had to be opened because of the heavy showers. The reduced agricultural activity also meant lower withdrawals during the lockdown. So the quality improved because of higher water levels," he says. The average daily release this April was 152,320 cusecs, which is five to six times the

VISIBLE CHANGE

Despite considerable improvement, the 22-km Delhi stretch of the Yamuna remains unfit for bathing

Numbers are in mg/l

■ Pre-lockdown (March 4)
■ Lockdown (April 6)



Source: Report on assessment of impact of lockdown on water quality of river Yamuna—Delhi stretch, Central Pollution Control Board

normal release, says the report.

The overall DO levels cannot be compared as data is unavailable for two of the three sites in the pre-lockdown period. Palla, however, recorded a drop in DO levels from 17.1 mg/l to 8.1 mg/l during the lockdown. This is surprising as the region does not have industries or solid waste dumping. "The improvement at Palla is marginal due to closure of industries upstream regions like Panipat and non-availability of enough dilution," says

Prashant Gargava, member secretary, CPCB. He adds that "in-depth analysis" of the report will bring out "newer dimensions that should help in future strategies," Mukherjee adds a word of caution. "The lockdown resulted in the closing down of small-scale industries around the Yamuna and this could have decreased 9 to 10 per cent of pollution load of the river. Such improvements in the river quality are not sustainable in the post-lockdown period." [DTE](#) [@down2earthindia](#)

DISTRESS DRAFT

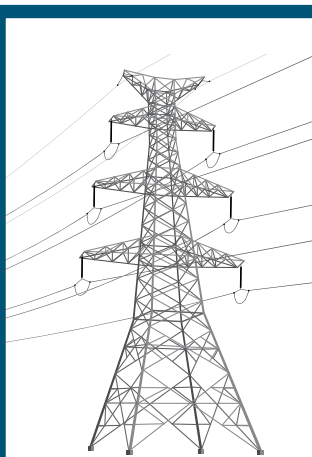
Centre is in a rush to amend power law. The draft bill takes away powers from state governments and gives them to private firms

KUNDAN PANDEY

AT A time when India is fighting the novel coronavirus pandemic, the Union Ministry of Power has hurriedly started the process of amending the Electricity Act, 2003. On April 17, when the crisis was peaking, the ministry floated the Draft Electricity (Amendment) Bill 2020, inviting suggestions from stakeholders, the extended deadline for which ends on June 5.

The draft makes three key proposals: abandon the existing subsidy and cross-subsidy model, allow private parties in power distribution as sub-licensee, and create Electricity Contract Enforcement Authority (ECEA). The intention is clear: centralise power and protect the interests of private players.

“The Centre has been pushing for privatising the power sector for long. The draft is a step in that direction,” says Shailendra Dubey, president of the All India Power Engineers Federation. The National Coordination Committee of Electricity Employees and Engineers has expressed concern over the rush to float the draft during lockdown. In 2018 and 2019, the opposition parties had forcefully rejected the draft. This could well be the reason for the Centre’s great hurry. The Telangana government has not only criticised the draft but said it



WHAT'S DISCONCERTING

Draft Electricity (Amendment) Bill puts an end to subsidy and cross-subsidy

Allows private players in electricity distribution by sub-licensing

Creates the Electricity Contract Enforcement Authority

would oppose the bill as it takes away states’ powers.

PROBLEM AREAS

As per the existing subsidy and cross-subsidy model, the state government charges more from rich power consumers like industrial units and provides subsidy to weaker sections. The draft proposes to fix one power tariff for all. The state government may later pass on the subsidy as Direct Benefit Transfer to the beneficiaries. This means, people would have to first pay up and then wait for the subsidy to reach them. “How many farmers have the money to give ₹4,000-5,000 in advance?” asks Dubey. They use electricity for irrigation and other farming purposes.

“What if the consumer does not get the subsidy amount on time?” asks Tejal Kanitkar, associate professor at the National Institute of Advanced Studies, Bengaluru. The authority may disconnect electricity while the consumer waits for the money. Once he gets it, he would again have to go to the authority for the restoration of connection. All this would lead to unnecessary chaos, she says.

Kanitkar says the elimination of cross-subsidy would put the burden on the already empty state coffers. “As it is, the states have not got



their dues from the Centre,” she adds. Till March, the Centre owes ₹30,000 crore to the states in GST compensation alone. The states now plan to move the Supreme Court to get their money back.

The draft introduces the concept of “distribution sub-licensee”. This gives discoms the power to authorise another company to distribute electricity in the state without a separate licence. Similarly, the existing “distribution franchisee” can distribute electricity without separate approval from the authorities. Experts say this is a gradual movement towards privatisation of distribution. It may begin from a public sector company like the National Thermal Power Corporation (NTPC) and gradually move towards the private sector.

Another big concern is the states losing control over the sector. Kanitkar says the effort to centralise is unprecedented. While a central committee would appoint even the state regulators, the crea-

tion of ECEA can disempower not only the state regulatory commissions but people engaged in legal battles as well. The power to settle disputes between the generation and distribution companies would vest in ECEA, which would have the status of a civil court. It would be the sole authority to adjudicate conflicts over power purchase and sale contracts. Its decisions can be challenged only at the appellate tribunal and, finally, at the Supreme Court.

This means that the aggrieved party would no longer have the right to approach the high courts for dispute settlement, explains Leo Saldanha of Bengaluru-based non-profit Environment Support Group. “At present, if we are not happy with the regulatory recommission, we can easily access the high court. This will not happen. The National Green Tribunal (NGT) is an example,” he says. If a person wants to litigate in Imphal, he or she would have to go to Kolkata. It takes

two days to reach Kolkata by road or a heavy expense by flight. This is why thousands of people do not get justice in environmental matters. People may again be deprived of justice in electricity disputes, says Saldanha. “I fear the new authority is being brought in with the single purpose of protecting the interests of licensees.” This is to ensure ease of business to the licensees and power generators, he adds.

REPEATING PAST MISTAKES

Kanitkar says the government is promoting the failed model of allowing private parties in power distribution as the distribution franchisee, refusing to learn from the past. On many occasions, the states have expressed reservation over engaging with private players in power distribution. On February 13, for instance, Bihar energy minister Bijendra Prasad wrote to Union power minister R K Singh, saying the state does not support privatisation of the sector as it has

not had good experience with private players. In 2013, Bihar had engaged private companies in Gaya, Muzaffarpur and Bhagalpur for electricity distribution.

Bihar is not an isolated case. In Madhya Pradesh too, the model was executed in three cities—Ujjain, Sagar and Gwalior—with Essel Vidyut Vitaran Private Limited as the distribution franchisee. Just before Simhastha Kumbh 2016, held every 12 years in Ujjain, the government had to terminate its contract with the company for inadequate maintenance work, poor complaint redressal and lack of adequate technical manpower. In fact, the company could not last in any state for long.

Government's experiment with the sub-licensee model started way

back in 2007 when the Maharashtra State Electricity Distribution Company Limited (MSEDCL) handed over distribution in the power-loom town of Bhiwandi to M/s Torrent Power Ltd. Though the contract with the company was extended up-till January 2027, Maharashtra has seen the model failing in two other cities. In Aurangabad, MSEDCL appointed GTL as the power franchisee in May 2011, but the contract was terminated in November 2014. Crompton Greaves was appointed the franchisee in Jalgaon in May 2011 and ousted in 2015. "There are similar examples in Ranchi and Jamshedpur in Jharkhand where regulatory commissions were compelled by hard evidence of failure to cancel the franchise," says K Ashok Rao, patron of All India Federation

of Power Engineers.

Initially, suggestion on the draft bill were to be submitted within 21 days. The government later extended the deadline to June 5. All India Federation of Power Diploma Engineers, All India Federation of Electricity Employees, Electricity Employees Federation of India, Indian Electricity Workers Association and All India Power Men's Federation have now demanded that the government should extend the submission date to September 30.

Be as it may, Dubey nurses no confusion. "The draft bill is highly problematic and the government must withdraw it." Kanitkar readily concurs. "The only way out now is for the Centre to take it back." **DTE**

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WARNING SIGNAL

Why does India fail to caution its farmers of weather changes despite a rich meteorological infrastructure?

AKSHIT SANGOMLA and **VIVEK MISHRA**



A farmer checks his wheat crop damaged in heavy rain, on the outskirts of Amritsar, Punjab. A large part of India lost ready wheat crop in March and April this year due to unseasonal rainfall

PHOTOGRAPH: PTI

BHAGWAN LAL Nitharwal is a big farmer in Gudaliya village of Chaimu tehsil in Jaipur, Rajasthan. This year he harvested 300 quintals (1 quintal equals 100 kg) of wheat and barley each from his 16-hectare (ha) farm. But before he could move the grains from the farm, a sudden hailstorm on April 25 night soaked all his produce. By the next day, the grains had turned dark. Watermelons he grew on 1.6 ha also got ruined.

That night, another farmer in Chaimu Mool Chand lost most of his green chilly, *kakdi*, cucumber, tomato and bottle gourd he had grown on 1.6 ha. “I had spent ₹2 lakh on the crop and could have brought home ₹5 lakh,” he says.

“I have not seen a hailstorm like this in my life,” says Ashok Yadav, 30, of Mauli Khas village in Siddharthnagar district of Uttar Pradesh. In the state’s Banda district, rabi crop is grown on 324,000 ha, says A K Singh, deputy director, agriculture department. Of this, black gram is grown on 100,010 ha; the rest is wheat. When sudden rains came, some of the wheat had been harvested and labourers were still threshing it. Though losses are not huge, it will affect the grain quality.

March and April were bad for farmers of 13 states and Union territories in northern, central and east-central India. The India Meteorological Department (IMD) recorded 77 per cent more than normal rainfall in the country between March 1 and March 19. Bihar received nine times the usual rainfall, while Jharkhand got eight times more. Uttar Pradesh and Delhi recorded 698 per cent and 621 per cent excess rains respectively. Chhattisgarh got excessive rains in 25 of

its 27 districts.

A large part of India lost a substantial amount of ready wheat crop. Bihar, the worst hit, also lost *masur* and mustard crops. The state grows pulses in 5 lakh ha, of which *masur* is grown in 1.5 ha. This year, *masur* production may drop by 30 to 50 per cent, says J S Mishra, head of the Indian Council of Agricultural Research, Patna. Muzaffarpur’s *shahi* litchi, known for its size, flavour and taste, may also suffer. Litchi is sensitive to variations in temperature, rainfall and humidity.

Bihar has sown corn in 278.437 ha. They are all drooping after the hailstorm. This will impact production. Honey may also slip by 25 to 40 per cent. During mustard season, honey boxes that gave 10 kg

western India,” he adds.

IMD, the country’s only public meteorological organisation, does well in predicting large-scale weather phenomena like high temperatures and heat waves. But it fails to predict smaller incidents like storms that bring rain, hail, dust and lightning such as those that occurred in March and April, says Murtugudde. Small wonder, despite India having one of the world’s best agrometeorological advisory systems, the farmers were left in the lurch.

RICH INFRASTRUCTURE

The country has about 13,000 automatic weather stations (AWSS) and 8,000 automatic rain gauges (ARGS), states Delhi-based non-profit Centre for Science and

IMD DOES WELL IN PREDICTING LARGE-SCALE WEATHER PHENOMENA LIKE HIGH TEMPERATURES AND HEAT WAVES, BUT FAILS TO PREDICT SMALLER INCIDENTS LIKE STORMS THAT BRING RAIN AND HAIL, SAYS RAGHU MURTUGUDDE, CLIMATE SCIENTIST AT THE UNIVERSITY OF MARYLAND, USA

per year, are giving only 2 to 6 kg.

Experts blame it all on the western disturbances—the extra tropical storms that originate in the Mediterranean and travel to India bringing sudden rainfall. “The unusually warm temperature over Eurasia and the warm-cool pattern over the Atlantic Ocean worked together to favour western disturbances during pre-monsoon,” says Raghu Murtugudde, climate scientist at the University of Maryland, US. “These would otherwise bring dust storm but they brought enough moisture to produce rain and thunderstorm when they met warm air over

Environment in its report, [“Agrometeorological Advisory Services in India—An Assessment”](#).

A network of observatories collects data focussing on agriculture (see ‘Centre’s data collection network’ on p30). Five meteorological satellites—Kalpana-1, INSAT-3A, INSAT-3D, INSAT-3DR and Megha-Tropiques—help IMD provide countrywide weather warning bulletins, with a five-day lead time. This apart, IMD uses Global Forecast System developed by the US National Centre for Environmental Prediction, which provides forecast for a minimum 144 sq km area.

TURN TO P30 ►

WHEN CLIMATE AND COVID-19 COLLIDE

South Asia has to ready itself for the double whammy

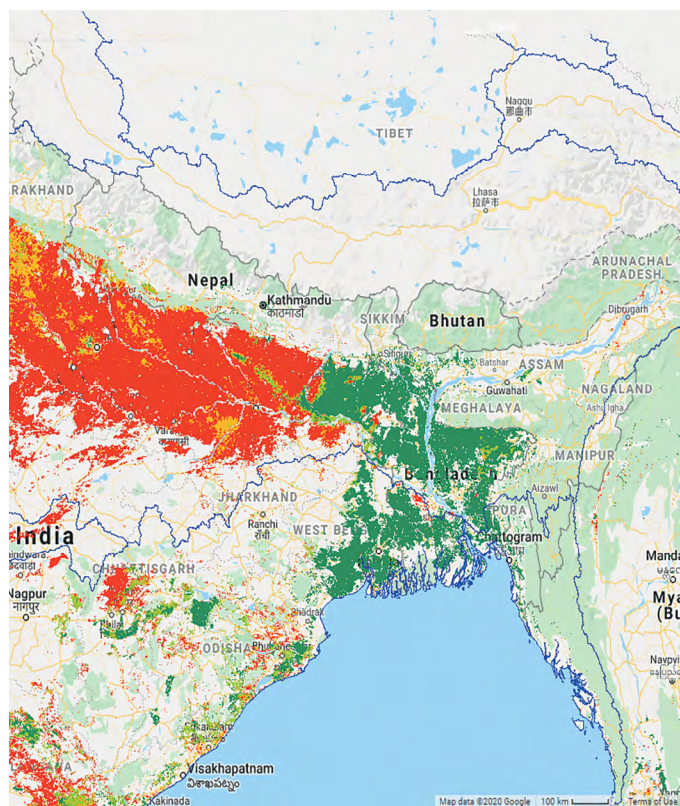
BY GIRIRAJ AMARNATH

AS IF managing the coronavirus pandemic was not enough, countries in South Asia now have to brace for an onslaught of climate disasters. This summer, central and southern India are forecast to heat up faster, making heatwaves more likely. And, normal to above average monsoon rainfall could flood parts of the country from June. Careful planning is needed to escape major damage to crops, homes and infrastructure, all amidst marshalling of resources towards limiting the spread of COVID-19.

Forecasts indicate that northeast India and Bangladesh are set to experience extremely high rainfall and thunderstorms around May 13-14. A cyclone forecast in the second week of May in southern Bangladesh is likely to have high impact in the coastal cities and inland too.

Shirish Ravan, who implements the United Nations Platform for Space-based Information for Disaster Management and Emergency Response, or UN-SPIDER, believes space-based technologies can provide critical information on the extent and scale of impacts ahead of crises. The map showing maturity of crops is an example. This, the coming extreme weather events, and the pandemic present a host of challenges for governments. In India, north and northwest states have already struggled to harvest and sell their wheat, fruit and vegetable crops because of lockdown. If the cyclone damages ripening crops in eastern parts, it will place even more pressure on the agricultural sector.

The number of COVID-19 cases in the parts of India and Bangladesh where the cyclone is set to



A map created by scientists at the International Water Management Institute and CGIAR Research Program of Water, Land and Ecosystems shows crops planted extensively fall within the path of forecast storms. The dark green areas indicate the place where crops will ripen after April 23

hit is relatively low. However, the number is high in places where other extreme events are forecast. Scientists at the International Water Management Institute (IWMI) compared a map showing the levels of risk from multiple natural hazards, such as landslide, cyclone, heatwaves,

floods and coastal inundation, drought, earthquake, extreme rainfall and forest fire, with the COVID-19 cases published by India's National Disaster Management Authority. They identified 411 districts in 22 states that have both higher risks from natural hazards and elevated COVID-19 cases.

Large parts of Maharashtra show a high level of risk for multiple hazards, including heatwaves. As of May 8, as many as 17,974 COVID-19 cases have been confirmed, with 698 deaths. A heatwave will most likely increase the number of people needing hospital treatment at a time when medical services are already stretched.

Similarly Bihar, India's most flood-prone state, will need a joint response to COVID-19 and flooding. Safely housing people whose homes are inundated, without risking contracting COVID-19, and providing financial assistance to smallholder farmers who have lost crops, will be necessary.

In Sri Lanka, where IWMI's headquarters is located, monsoon brings rain between May and July. It can sometimes unleash extreme events, including flooding and landslides. Where storm water is released into urban canals, the number of mosquito-borne dengue fever cases greatly increases. Worryingly, the western, southern and central regions that the monsoon affects are also forecast to be the most vulnerable to COVID-19. Anoja Seneviratne, director of Sri Lanka's Disaster Management Centre, has urged the country to prepare for the combined impacts of extreme events and the pandemic.

In the past two decades, more than 750 million people in South Asia have been affected by at least one natural disaster. Of late, the Disaster Risk Reduction sector has sought to shift disaster-prone countries' focus from "response preparedness", where action plans are simply put in place to deal with the aftermath of disasters, to "disaster risk reduction", where a greater level of resilience is built into communities to make them more able to endure disasters.

With time running out before new climate extremes arrive and collide with the pandemic,

IWMI and its partners have prepared 10 recommendations to guide South Asian nations. These are:

- Integrate multiple-hazard and COVID-19 hotspots to inform disaster preparedness and response strategies for monsoon planning;
- Minimise the burden on hospitals by treating COVID-19 patients separately;
- With the participation of communities, revise the standard operating procedures (SOPs) for managing cyclone shelters. Incorporate social distancing and provision of Personal Protective Equipment (PPE) in these SOPs;
- Strengthen capacities and resources for preparing for other hazards;
- Advise disaster response forces on protecting themselves from COVID-19. Establish protocols for their protection and provide personnel with appropriate PPE and psycho-social support;
- Establish support networks (with social distancing) for providing food and financial relief for the most vulnerable;
- Put in place provision for the elderly in disaster-preparedness mechanisms to eliminate their exposure to COVID-19;
- Strengthen hospital preparedness, including access to sanitation and quality water, to protect functionality when natural disasters like cyclones strike;
- Establish capability for rapid response mapping, incorporating GIS data for hospital and health centre locations, connectivity, schools and colleges, and other community facilities;
- Form multiple-hazard response teams with wide-ranging expertise and the capacity to respond rapidly to the combined impact of COVID-19 and natural disasters.

Countries need to get ahead of the coming crises by moving quickly and act on these recommendations. Only early action, heavy allocation of resources and smart planning will make sure we can avoid collapse of medical, economic and food systems.

(The author is research group leader, Water Risks and Development Resilience, International Water Management Institute, Sri Lanka)

In addition, IMD runs models specific to cyclones and hurricanes that generate forecasts with a lead time ranging from hours to days. Yet, why does IMD falter?

REASONS APLENTY

The main reason for IMD's failure is the poor density of observatories. The government contends that the country needs 40,000 AWS every 10 km in the plains and every 5 km in the hills. India has only a third of this, the report finds.

There is also a drastic difference in the scale of weather data collection infrastructure across the states. Kerala, for instance, has one AWS every 87 sq km but Chhattisgarh has one every 2,703 sq km. Assam has one AWS per 472 sq km, Karnataka one per 167 sq km, Odisha one per 281 sq km, Bihar one per 313 sq km and Uttar Pradesh one every 1,005 sq km. ARGs face a similar problem. Of the 8,000-odd ARGs in the country, 6,400 are in Karnataka alone.

This apart, IMD does not provide micro-level advisories. Its default scale for forecasts is the district level. This is insufficient with each district spanning hundreds to thousands of sq km, and significant weather variations found within short distances. No standard protocol for AWS on data collection worsens the situation. "Only a part of the AWS network collects soil and agriculture-specific data," says the CSE report. "This lack of standardisation arises from the fact that the recent and ongoing expansion in the AWS network has proceeded with minimal coordination and oversight," it says. A large number of AWS and ARGs were set up in "project mode", compromising on quality. The link between expansion and larger weather data

Agriculture in focus

The country has a strong network of observatories that collects farming-specific data


1,400
Automatic rain gauge


700
Automatic weather stations


219
Evaporation stations

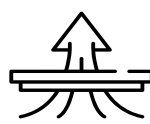

42
Evapo-transpiration stations


76
Dew fall recording stations


25*
Doppler weather radars


43
Soil moisture recording stations


48**
Lightning sensors#


62*** **39******
Upper air observational network

*Currently expanding to 55;

**To be expanded to over 65;

***Pilot balloon observation points;

**** Radiosonde observation points;

Indian Institute of Tropical Meteorology

Source: *Agrometeorological Advisory Services in India—An Assessment*, a report by Centre for Science and Environment, Delhi

system was not properly calibrated resulting in lack of good quality data. Weather stations are poorly managed and don't have quality control. There is no common platform for data collection. The problem escalates due to poor inspections.

In 2017, the Comptroller and Auditor General reviewed the functioning of weather stations and found Assam was not monitoring its stations. The reason it gave was non-receipt of funds. Rajasthan had a negligible number of stations installed on the ground. In Maharashtra, some weather stations officially listed as installed, were not there at all.

Agromet advisories should ideally provide weather information, and add value to it through advice on agricultural best practice. This is not always the case. In Assam, for instance, an advisory regarding wheat states, "As there is no possibilities of getting rainfall in the coming five days, farmers are advised to apply second irrigation in wheat crop." Such generalised recommendations are also visible in Gujarat. "Weather is clear so harvesting should be done at early morning," states one. Some advisories are outdated and recommend fertilisers or pesticides that are prohibited, out of production or not available.

"Changing climate has the potential to invalidate centuries of agricultural knowledge accumulated in rural India. A modern agromet system is key to building resilience against this challenge," says the CSE report. The base for such a system has been laid in India. Focus now has to be on the integration and coordination of technology and human resources, across fields, levels of government, and the private and public sectors, it adds. [DTE](#) [@down2earthindia](#)



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HAVE WE GIVEN IN?

Countries are taking a leap of faith to return to normalcy and get the economy going. India is desperately trying to follow suit. But can it do so without letting its guard down?

BANJOT KAUR



WE HAVE to live with the virus. These words have somewhat become like an anthem in this time of despair. There has not been a day since March 8, when the world, barring a few countries, has not reported record spike in COVID-19 cases. Yet, it has become ingrained in our collective consciousness that we have to live with this novel coronavirus, like over a thousand other pathogens, including HIV, Ebola, cholera and rabies, that are now part of our ecosystem and keep cropping up from time to time (see 'Bats spread viruses, so do humans', p38). This mood of resigned acceptance also reflects in the strategies of political leadership across countries, including India.

On May 8, while holding a press briefing, Lav Agarwal, India's official spokesperson on the COVID-19 crisis, said: "It is important that today when we are talking about relaxation, when we are talking about return of migrant workers, we have a great challenge and we need to understand that we have to learn to live with the virus." Earlier on May 4, as the Union government extended the nationwide lockdown, dubbed the biggest in world history, to 54 days, Chief Minister of Delhi Arvind Kejriwal also used "living with the virus" as a truism while urging the Union government for dilution of the lockdown rules. With 7,998 cases and 106 deaths as on May 11, Delhi is the third worst affected state in the country.



Looking at states like Kerala, Odisha and even the worst-affected Maharashtra, where activities have been kickstarted to bring the economy back on the rails, it seems we have come to terms with the worst pandemic of the century. Prime Minister Narendra Modi had set the tone for this in his address to the nation as early as on April 14, at the culmination of lockdown 1.0, when he said that “*jaan* (life)” and “*jahaan* (economy and livelihood)” both are equally important. By the first week of May, the country was divided into three zones—red, orange and green on the basis of the number of COVID-19 cases—and certain economic activities were allowed depending on the colour code. Though the government has not introduced any codified lockdown exit plan yet, the focus is fast shifting from managing the health emergency to reviving the economy.

In fact, this is a defining moment for the world. Several countries, despite being ravaged by the pandemic, are getting ready to take a leap of faith to return to normalcy—it’s another matter that no one knows if the pre-December-2019-world-normalcy still exists! And they are doing so wielding the certificate of “flattened curve”, a term that has not only become popular during the pandemic but has also assumed a positive connotation. In a pandemic, flattening the curve means reducing the number of new cases from one day to the next and then stabilising it before it becomes zero. So, since COVID-19 cases started appearing outside China, the country of origin, governments have been directing their efforts towards achieving this magical phase. Some efforts include imposing strict curbs on mobility through weeks of lockdowns, aggressive containment and quarantine strategies offering near-imprisonment experience, enforcement of social distancing up to the level of personal habits and aggressive screening regime. So, have these helped achieve the objective? Let’s examine.

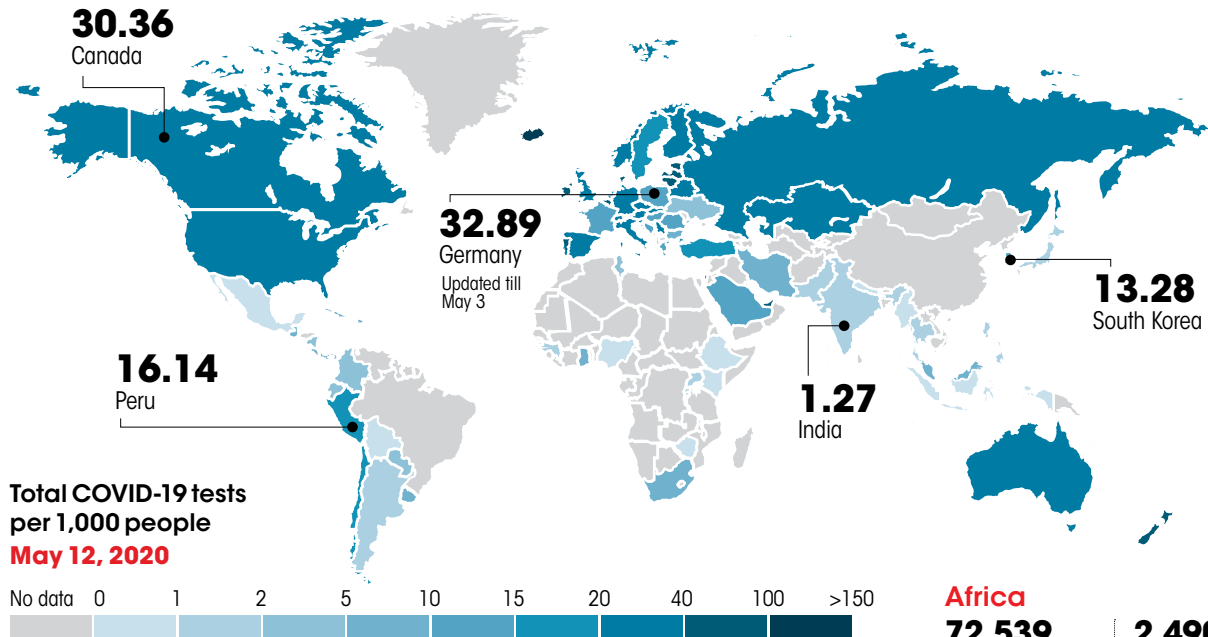
So far, China and South Korea have been able to flatten the curve of new infections. Several European countries have also claimed to have achieved it, implying that cases are on the sliding path now. Germany began levelling its curve about six weeks into the outbreak, while France started seeing results in seven weeks. In Italy, the curve has not flattened yet but there has been a slowdown in new cases. However, in the UK, experts don’t foresee it in the near future as cases continue to rise. The UK’s initial response to COVID-19 was marked by a series of missteps. The government pursued a controversial “herd immunity” strategy before finally ordering an Italy-style lockdown to regain control over the virus’s transmission. In the US, even though New York, the epicentre of coronavirus in the country, has not convincingly proclaimed this status, President Donald Trump on May 6 declared that the country has flattened the curve and is now in the next stage of the battle, which is a “very safe phased and gradual reopening”.

In India, as lockdown 3.0 began on May 4, Agarwal, also the joint-secretary at the Union Ministry of Health and Family Welfare, said: “The COVID-19 curve in India is relatively flat as of now and if work is done collectively, the peak may never come.” That day India recorded the



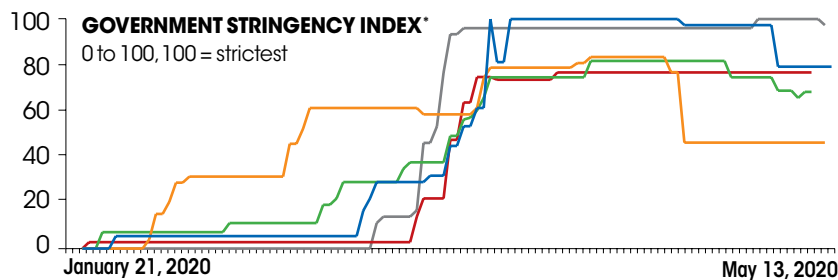
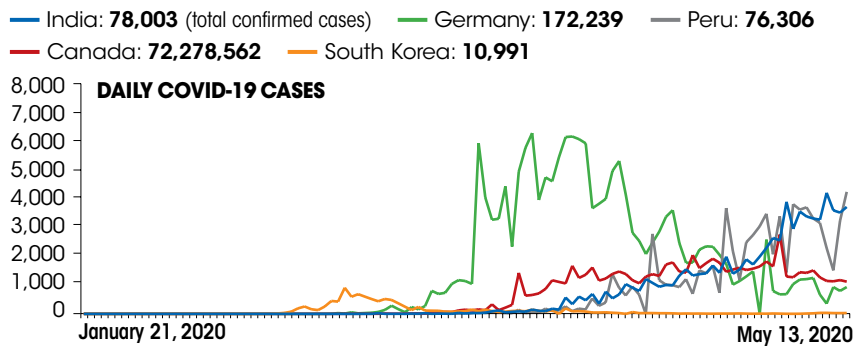
TEST SCORE

India has one of the lowest testing rates in the world, which means little is known about the spread. This is the reason the country's case count is going up despite a strict lockdown



STRICTNESS UNDERMINED

Countries that are fairing better against the pandemic have managed to keep a strict response till the time they flattened the curve. India, on the other hand, is relaxing lockdown despite an upward march in daily cases



Sources: Oxford University, European Center for Disease Control and Prevention

Africa

72,539
cases

2,490
deaths

Asia

713,740
cases

23,165
deaths

America

1,889,851
cases

113,827
deaths

Europe

1,623,586
cases

151,749
deaths

Oceania

8,394
cases

126
deaths

696 cases and **7** deaths have been reported from an international conveyance in Japan
(Updated till May 13, 2020)

*Government Stringency Response Index is based on nine indicators: school closing, workplace closing, cancel public events, restrictions on gatherings, close public transport, stay at home requirements, restrictions on internal movement, international travel controls and public information campaigns

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REALITY CHECK

A DTE analysis shows India has been adding nearly 5,000 new cases every 2 days since April 30

JAN 30: 3 CASES

Days **67** / APRIL 6
5,000

Days **7** / APRIL 13
10,454

Days **5** / APRIL 18
15,725

Days **3** / APRIL 21
20,082

Days **3** / APRIL 24
24,448

Days **3** / APRIL 27
29,458

Days **3** / APRIL 30
34,866

Days **2** / MAY 2
39,826

Days **2** / MAY 4
46,434

Days **2** / MAY 6
52,987

Days **3** / MAY 9
62,808

Days **1** / MAY 10
67,176

Days **2** / MAY 12
74,330

Source: Ministry of Health and Family Welfare;
00: Cumulative cases on that day

highest spike of 3,900 new cases and 200 COVID-19 deaths. It, in fact, broke the previous record spike of 2,293 new cases, documented just two days ago. On March 24, the day the nationwide lockdown was announced, India had only 571 cases. By May 13, the country had 78,003 cases, or 136 times hike in cases.

Government officials, however, claim that significant achievements have been made. One of the most significant gains, they say, is cutting the chain of transmission by achieving a long doubling rate—this rate denotes the number of days in which cases double, indicating a slow spread of infection. On the face of it, this is a prologue to the still elusive objective of “flattened curve”. Agarwal, who holds daily pressers, has claimed several times over the past month that doubling rate, which was three days when lockdown began, has increased beyond 12 days; on May 10, he lowered the figure to 10.

But several experts do not think that it is a valid indicator. “You have to look at the baseline figure,” T Sundararaman, former head of the Union health ministry’s National Health Systems Resource Centre, tells *Down To Earth* (DTE). Cases, when in hundreds, would take fewer days to double as compared to cases that are in thousands. Now, saying that the 45,000 cases have taken more than three days to reach the 90,000-mark and calling it an achievement is nothing but a farce, he says, adding that counting the number of days it takes for every 5,000 or 6,000 new cases to appear would offer a more realistic scenario.

Using 5,000 new cases as the base, DTE did an analysis to understand how the pandemic has progressed in the country and found that 5,000 new cases are being reported every two days since April 30 (see ‘Reality check’). This indicates that the spread is far from slowing down.

Another tool that epidemiologists often employ for assessing progression of a pandemic involves comparing three-day rolling average, or the average number of new cases reported every three days. Worldometer, a private COVID-19 tracker, shows that the three-day average was 76 for India at the beginning of the lockdown; as on May 5, it was 3,060. Worse, when compared with 10 countries that ranked just above India in terms of higher COVID-19 cases that day, all of them had fewer three-day averages, with the exception of Brazil and Russia.

Explains T Jacob John, senior clinical virologist and emeritus professor at Christian Medical College, Vellore: there were 571 total COVID-19 cases in the country when the lockdown was announced. Forty days later, on May 5, the number of cases increased by 80 times to 45,000. If the government says the situation is better compared to its fear of a 200-time rise, then this is a manufactured good news, he says. India incidentally remains the only country, as per daily situation updates given by the World Health Organization, which does not report community transmission despite more than 60,000 cases. All countries that have reached this threshold or have fewer cases have accepted that the infection is spreading in new communities with no clear source of origin.

Another indicator of the progression of a pandemic is recovery rate, which according to the Union health ministry’s official briefing on May

5, stood at 27.41 per cent. The global average is 32 per cent. Peru, a close cousin of India in terms of cases, has a recovery rate of 30 per cent.

By now, it is a cliché to say that lockdowns only help buy time so that there is no sudden pressure on the limited health infrastructure while preparing for the post-lockdown situation when the infection could spiral out of control. Ramping up testing was one of the most important fronts in which preparation was needed. The Union government did increase it to more than 60,000 samples a day in the first few days of May from a few thousands in the beginning of the lockdown. And with 1.27 tests per 1,000 populations, India now stands at the base of the testing spectrum in the world, above only to Bolivia, Kenya, Ethiopia, Nigeria, Nepal, Myanmar, Indonesia and Mexico (see 'Test score'. Even countries like Senegal, Uganda, Zimbabwe and neighbouring Pakistan fare better than India, according to Our World In Data, an online publication based at the University of Oxford that tracks the number of covid-19 tests among others.

Government officials, however, refuse to accept that they were testing inadequately. Only 5.7 per cent people tested were found positive to SARS-COV-2 before the lockdown, says C K Mishra, who chairs one of the 11 COVID-19 groups empowered by the Prime Minister's Office, in a presentation on April 23. On April 22, the proportion was nearly the same, at 4.5 per cent, despite an increase in testing. This, he claimed, indicated that the government was not missing out on cases.

Testing has increased significantly in India. While the government still needs to increase its scope, the strategy needs to change, says epidemiologist and economist Ramanan Laxminarayan, who heads the Center for Disease Dynamics, Economics & Policy (CDDEP) at the University of Washington, US. India has so far tested to identify individual cases for containment and to observe growth of the outbreak. Going forward, the purpose would be to identify the elderly population who are at risk and to bring them in for treatment. India will probably need about half a million tests a day at that point," he tells DTE. India has so far picked up only about 10 per cent of all infections and half of all symptomatic infections, says Laxminarayan, citing CDDEP's estimates.

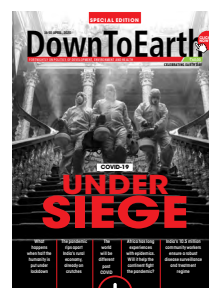
All public health experts DTE spoke to agreed that it was inappropriate to test only those with travel or contact histories and symptoms of influenza-like illnesses. Tests should be offered to anybody with fever and cough, especially once the lockdown is phased out.

The fact is, the pandemic is yet to reach its peak in India. A group of researchers who studied the landscape of the epidemic in India, write in medRxiv, a preprint server for research papers, that the country's COVID-19 curve is likely to peak around mid-July and early August. India, thus, still has around two months to prepare for its worst phase. It must not let its guard down in the rush to return to normalcy. **DTE**

[@Banjotkaur](#)

PREVIOUS EDITIONS ON COVID-19

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BATS SPREAD VIRUSES, SO DO HUMANS

Pathogens that trigger infectious zoonotic diseases are fast learning how to expand their realm. The COVID-19 pandemic is a costly wake-up call for the world to get its act together

ISHAN KUKRETI

BACK TO CONTENT



IF VIRUSES were capable of emotion, they would commemorate the day the World Health Organization (WHO) declared coronavirus 2019 (COVID-19) a pandemic, and celebrated each time a country announced a lockdown to contain the spread of the respiratory illness. For what SARS-CoV-2, or severe acute respiratory syndrome coronavirus 2, has achieved is no mean feat for its family.

Yes, there exist hundreds of coronaviruses out there. Till the early 21st century, they were mostly known to circulate among pigs, camels, bats and cats and caused mild forms of common cold in humans. They caught the attention of virologists in 2002, when one member jumped from a horseshoe bat to a human, possibly via a civet cat, and went on to cause severe acute respiratory syndrome (SARS) among 8,500 people and killed 900. Just like COVID-19, symptoms included fever, sore throat, shortness of breath and pneumonia. A decade later, another coronavirus, believed to have originated from bats but transmitted to humans via camels, caused a similar outbreak in Saudi Arabia. It was named the Middle

East Respiratory Syndrome (MERS). Despite high fatality rates—9.5 per cent in case the of SARS and 34 per cent for MERS—none of these coronaviruses managed to cause large-scale outbreaks. While SARS-cov appears to have disappeared in 2004, MERS-cov causes limited outbreaks. Now, call it a third time lucky or the outcome of an evolutionary strategy, SARS-COV-2, despite a low fatality rate of 2-5 per cent, has emerged as the most devastating pandemic since the 1918 Spanish flu.

The success of SARS-COV-2 is no mean achievement, when compared with other thousands of pathogens that naturally get transmitted between animals and humans but more often than not fail to establish a disease in human populations, let alone cause epidemics (see 'Pathogen load').

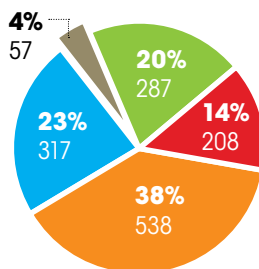
Most of these zoonotic pathogens, be it a virus, bacterium, fungus or parasites (protozoa and helminths), are believed to be host-specific. This means they usually restrict themselves to a limited number of species, such as bats, pigs, rats and chimpanzees, and prefer residing in them by creating a life cycle reservoir. This trait of pathogens is due to species barriers. Along with the human body's resilience system against diseases, species barriers help us most of the times lead a life free from infections, despite the fact that we live in a pathogen-filled world. Crossing it is not easy as these barriers are determined by the level of human exposure to pathogens—directly through faeces or body fluids like saliva, blood and urine, of an infected animal, or indirectly through areas where they live and roam, or contaminated surfaces—and the ability of pathogens to infect a human and cope with the new host's immune response. It thus requires the pathogen to undergo specific changes through mutation or genetic exchanges with the host.

However, these mutations are not always successful. Thus, a vast majority of animal-to-human spillover most likely results in a dead-end for the virus (and other pathogens), says Abi Tamim Vanak,

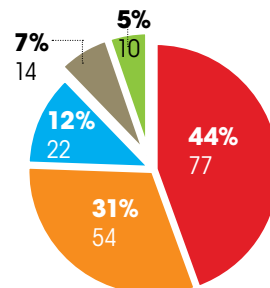
Pathogen load

Viruses form just 14% of the total human pathogens. But among new and emerging pathogens, they account for 44%

TOTAL PATHOGENS
1,407



EMERGING PATHOGENS
177



00 : pathogens in number and %

Source: US Centers for Disease Control and Prevention

EPIDEMIC, PANDEMIC PRONE DISEASES

ANTHRAX

TYPE
Zoonotic Bacteria
DEADLINESS*
Very High
80%
Vaccine available

PLAGUE (pneumonic, untreated)

TYPE
Zoonotic Bacteria
DEADLINESS*
Very high
100%
Spreads from human to human

*Case Fatality Rate

a disease ecologist at the Ashoka Trust with the Research in Ecology and the Environment (ATREE), a Bengaluru-based non-profit. This means the pathogen does not get transmitted beyond the infected person, he adds.

There have been instances when the pathogen has managed to hop on to humans, but did not cause mortality or morbidity. Early this year, researchers in the Brazilian states of Tocantins and Amapa identified one Ambidensovirus in patients with symptoms similar to dengue or Zika. “Viral species in this genus have been described only in insects, shellfish and other invertebrates; never in mammals,” the researchers wrote in the [March issue of journal PLOS ONE](#). They are, however, not sure if Ambidensovirus is responsible for the patients’ morbidity.

THEN WHO AILS AND WHY
The US Centres for Disease Control and Prevention [recognises 1,407 human pathogens](#); 60 per cent of them are zoonotic.

These pathogens have managed to cross species barriers and establish diseases in human population. However, most of these pathogens maintain their life cycle

Invincible mutant

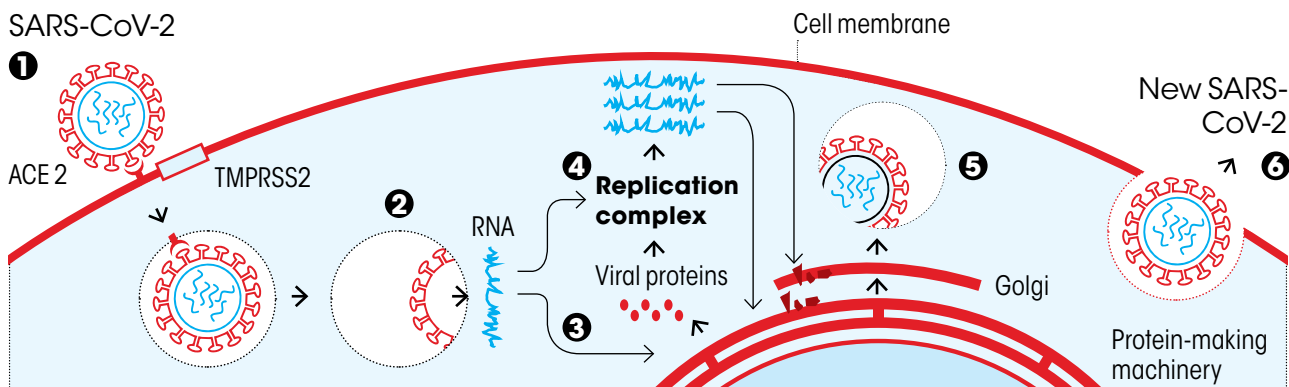
In its journey from a bat to a pangolin or a snake and then to humans, SARS-CoV-2 mutated to iron out any glitches

Angiotensin-converting enzyme 2 (ACE2) is an enzyme attached to the outer surface of human cells in the lungs, arteries, heart, kidney, and intestines. Both SARS CoV and SARS CoV2 use these cells as receptors to infect humans

But SARS-CoV-2 went through mutations which has enabled it to **bind with ACE2 more efficiently**, making it more successful at human-to-human transmission

This invisible feature on the crown of SARS-CoV-2 is the reason why it has a death toll of **265,000, compared to 914 by its cousin, SARS-CoV**

SARS-CoV-2



Source: "The spike glycoprotein of the new coronavirus 2019-nCoV contains a furin-like cleavage site absent in CoV of the same clade", published in *Antiviral Research* in April, 2020

reservoir in an animal and infect humans when they get a chance. For instance, avian influenza virus (H5N1) caused the bird flu outbreaks in humans when people came in direct contact with infected poultry or surfaces and objects contaminated by droppings or during slaughter, de-feathering and butchering. While the World Health Organization (WHO) maintains that the virus does not transmit efficiently from person-to-person, experts worry. "Animal-human interfaces where humans frequently get in contact with wild animals allow viruses to evolve and jump into humans leading to the emergence of a new virus," says Pranav Pandit, a veterinary epidemiologist at the University of California, USA. H5N1 is considered endemic in poultry in six countries and at least 15 countries have reported human infections since 2003. It might not be long before the virus mutates to establish a life cycle reservoir in humans and spreads from person to person, infecting even those who have

EPIDEMIC, PANDEMIC PRONE DISEASES

AVIAN INFLUENZA

TYPE
Zoonotic virus

DEADLINESS*

High

60%

CONTAGIOUSNESS**
1.2

Spreads from
human-to-human;
vaccine available

*Case Fatality Rate

**Number of people an infected person will infect

never come in contact with poultry. That would result in a catastrophe as H5N1 can kill 60 per cent of those infected.

Most human pathogens that have caused epidemics like measles, smallpox, tuberculosis, flu and whooping cough have actually had a low-key beginning like H5N1. Initially, they stayed relatively contained by restricting their jumps to humans from animal hosts like cattle, pigs, ducks and dogs. Their virulence increased as they eventually created a life cycle reservoir in humans.

What's worrying is that more and more zoonotic pathogens are now establishing themselves in human populations. In the past 30 years, they have been responsible for 75 per cent of the 177 emerging or re-emerging infections that the world is now grappling with. In fact, of the 23 infectious diseases that WHO lists as "epidemic and pandemic-prone", as many as 17 are capable of human-to-human transfer; no treatment or vaccine is available for nine of these diseases.

HIV1, which is responsible for a majority of HIV infections worldwide, is one such virus. It made the jump from African primates to humans as a result of bush-meat eating in the 1970s. Subsequently, it has established a life cycle reservoir in humans. The Ebola virus, which causes a severe haemorrhagic fever with a fatality rate of up to 90 per cent, however, shows what a virus is capable of to ensure its transmission. Since its first detection in 1976 in Sudan and the Democratic Republic of Congo, the virus has managed to cause outbreaks without establishing a natural reservoir in humans. It has rather mutated to develop the ability to transmit from human-to-human. This newfound ability of Ebola came to light during the 2013 outbreak when it spilled over, possibly from a bat to a 18-month-old boy in Guinea. Within months, it became a global epidemic.

But the ongoing pandemic by SARS-cov-2 shows how zoonotic pathogens are constantly honing their genome to expand their realm. A [study published in Antiviral Research in April this year](#), throws some light on this. Despite a genome sequence highly similar to that of other SARS-like coronaviruses, SARS-cov-2 differs from SARS-cov in its interaction with ACE2 (angiotensin-converting enzyme 2), a crucial enzyme that remains attached to the outer surface of human cells in the lungs, arteries, heart, kidney and intestines. Both SARS-cov and SARS-cov-2 use these cells as receptors to infect humans. As per the study, somewhere in its journey from a bat to a pangolin or a snake and finally to humans—the pathway still remains shrouded in mystery—the SARS-cov-2 went through mutations which has enabled it to bind with ACE2 more efficiently, making it more successful to infect a person and ensure human-to-human transmission, despite a low reproduction rate of 2 and fatality of 2-5 per cent (see 'Invincible mutant' on p40). By comparison, SARS-cov had a reproduction rate of 2.8 and fatality rate of 9.5 per

EPIDEMIC, PANDEMIC PRONE DISEASES

EBOLA

TYPE
Zoonotic virus

DEADLINESS*

High

50%

CONTAGIOUSNESS**

1.9

Spreads from
human-to-human



AIDS/HIV

TYPE
Zoonotic virus

DEADLINESS*

High

53%

CONTAGIOUSNESS**

6.0

Spreads from
human-to-human

*Case Fatality Rate

**Number of people an infected
person can infect

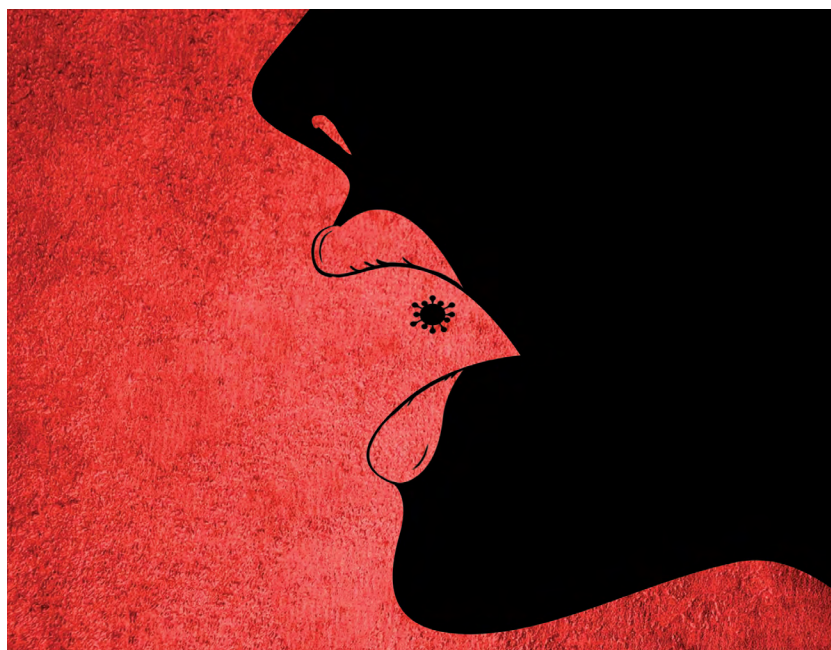
cent. In many ways, these mutations are the reason SARS-cov-2 has had a death toll of over 265,000 in just five months till the first week of May compared to its older cousin that killed 914 over two years.

Emergence of such robust and intelligent pathogens are worrying for another reason. This global coup is largely led by viruses, particularly RNA viruses that can exploit all known mechanisms of genetic variation to cause epidemic spread.

VIRUSES LEAD THE COUP

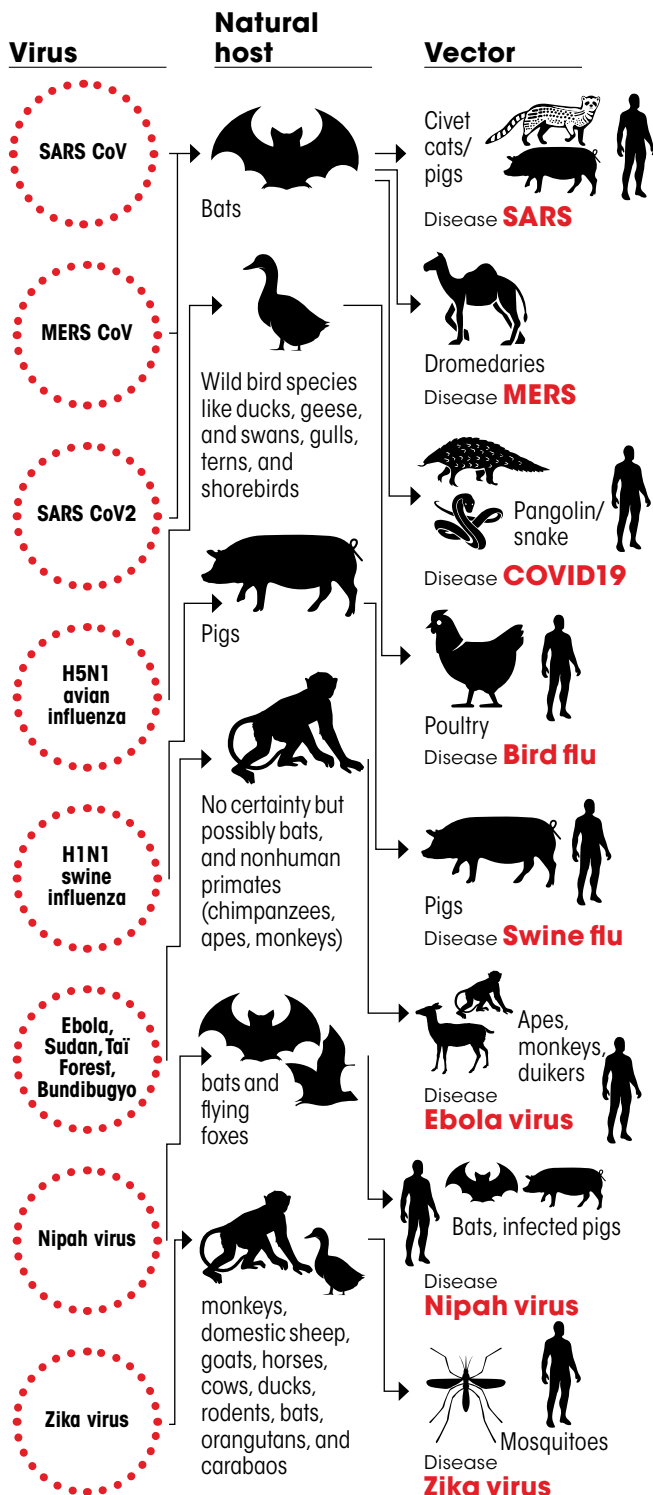
Considered often a non-living entity, viruses can infect all life forms, including microbes like bacteria.

This is probably because this submicroscopic particle, made either of RNA or DNA as its genetic material, can replicate or produce multiple copies of itself only when inside a living host cell. Most of the jumps to humans are, however, made by RNA viruses that account for some 37 per cent of emerging infectious diseases, says a [study published in ILAR Journal in 2017](#). In fact, some of the biggest zoonoses like chikungunya, dengue, Zika, avian influenza, Lassa fever, Ebolavirus, MERS and



SOME DANGEROUS NEXUS

Of the 23 infectious diseases WHO lists as “epidemic and pandemic-prone”, 17 can spread from human to humans



Source: World Health Organization



SARS are all caused by RNA viruses (see 'Some dangerous nexus').

These RNA viruses are considered recent evolutionary origins. Their mutation rate can be 100,000 times higher than DNA viruses. “RNA viruses show remarkable ability to adapt to new environments and confront different selective pressures they encounter. This not only include the host’s immune system and defense mechanisms, but also the current artificial challenges devised by the biomedical community,” notes the *ILAR Journal* study. This high rate of mutation of a RNA virus is because of the way it replicates. In DNA viruses, several proteins correct themselves if there is any faulty genome replication. But RNA viruses replicate without this proofreading process and this increases their mutation rates. But this has a downside too: any undesirable mutation can negatively impact the fitness of the virus.

Among the RNA virus group, coronaviruses have been found to have overcome this tradeoff between mutation rate and incorrect replication. A [study published in PLOS Pathogens in May 2010](#) says SARS-COV had mutated to produce an enzyme that diminishes the number of mutations. “The viruses might switch the proofreading mechanisms on or off depending on the context, allowing them to rapidly adapt to new environments without losing replicative fidelity,” the study says.

OUR TRANSGRESSION

Ultimately, it’s about humans and their interactions with other species, whether in the wild or in farming.

It’s also about how we transgress into the habitat of wild species or “manufacture” food from domesticated animals. For instance, villages in the eastern foothills of the Western Ghats in India regularly experience outbreaks of the Kyasanur forest disease (KFD), a viral haemorrhagic fever similar to Ebola and dengue that is spread by ticks (*Hemaphysalis*

spinigera) living on monkeys. Here, people mostly depend on forests for a living (see 'Forest fever' on p47). SARS and COVID-19 outbreaks have also been linked to exposure to the viruses in Chinese wet markets. Interconnectedness of the world has only made the spread massive and instantaneous.

It's not just the interface with wildlife, livestock also plays a role. In the case of Spanish flu, it is widely held that the avian influenza virus jumped from a pig on a military farm in Kansas, USA, to the first known human case. Though there are other theories about where the "jump" took place, from Europe to China, what's clear is that the virus mutated from animals and was taken across the world by the movement of soldiers during the World War I. Ultimately, the Spanish flu killed more people than the war.

So, it is a combination of factors—movement of people, living conditions, population density and, of course, eating habits—that makes the virus more deadly in its new host. Ebola, for instance, was not new to parts of Africa even though outbreaks were reported way back in 1976. What changed between then and the outbreaks of 2013-14 was the demography in the affected countries, says Sanath Muliya, a scientist with the Wildlife Institute of India, Dehradun. Between the 1960s and early 2010s, population density increased by 223 per cent in Guinea, 178 per cent in Sierra Leone and by 275 per cent in Liberia, particularly in the urban parts that experienced high rural-to-urban migration. All major outbreaks occurred in such urbanised set-ups with high human densities, says Muliya.

A similar development in Indonesia in 1998-1999 led to the first outbreak of the Nipah virus infection, but in neighbouring Malaysia. The virus is naturally harboured by pteropid fruit bats. But in the months before the outbreak, large-scale deforestation was going on in Indonesia for pulpwood. Palm

DIPHTHERIA

TYPE

Non zoonotic
bacteria

DEADLINESS*

Low

11.3%

CONTAGIOUSNESS**

2.5

Spreads from
human-to-human



POLIOMYELITIS

TYPE

Non zoonotic
bacteria

DEADLINESS*

Low

11.3%

CONTAGIOUSNESS**

2.5

Vaccine available



MENINGITIS

TYPE

Zoonotic Bacteria

DEADLINESS*

Low

11.5%

CONTAGIOUSNESS**

1.3

Spreads from
human-to-human,
vaccine available



MERS

TYPE

Zoonotic virus

DEADLINESS*

Low

35%

CONTAGIOUSNESS**

0.5

Spreads from
human-to-human

*Case Fatality Rate

**Number of people an infected
person can infect

oil industries had also prompted slash-and-burn of forests for setting up industrial plantations. While deforestation destroyed the bat's habitat, the haze reduced flowering and fruiting of forest trees. Reduced rainfall caused by the severe [1997-1998 El Niño conditions exacerbated the situation](#), resulting in mass migration of pteropid bats to Malaysia, which was experiencing an upsurge of large-scale piggeries with fruit orchards on their edges. A combination of factors led to the spillover of a novel virus from the bat to the domestic pig and then to pig farmers.

The scope and scale of deforestation and the opening of new interfaces with forests and wildlife increase the chances of spillovers, says Prashanth N S, public health expert at the Institute of Public Health, Bengaluru, adding, "The way in which we interact with our environment has increased the exposure to newer pathogens that would have otherwise not come into contact with large populations."

INDUSTRIAL CHURNING

Even as subsistence farmers and herders coped with zoonoses, the very nature of industrial food business has exacerbated the issue.

The influenza A(H1N1) virus—swine flu—is not transmitted from human to humans by eating pork, and that remains its saving grace. Today, it is widely accepted that swine flu was first found in human beings in La Gloria, a little town in Mexico. It is known that a young boy suffering from fever in March 2009 became the first confirmed victim of the outbreak, which then spread from country to country. But then, when the disease broke out, what was quickly lost in this tragedy was the location of the ill-fated town—right next to one of Mexico's biggest hog factories, owned by the world's largest pig processor Smithfield Foods. What was also not reported that people in the town had repeatedly protested about water pollution, terrible stench and



waste against the food giant. While this fact was never followed up or uncovered, what was reported was that food majors wanted WHO to change the name of the contagion so that pork eating would not be affected. Virologists at the US CDC, however, based on genetic fingerprinting found that the strain of this swine flu is the same as first identified on industrial pig farms in North Carolina, the hub of industrial pig farms in USA.

The H1N1 strain is high on the evolutionary ladder. In 1998, when there was an outbreak of swine flu among pig herds in North Carolina, it was a triple hybrid—containing gene segments from human, bird and classical swine influenza

EPIDEMIC, PANDEMIC PRONE DISEASES

PLAGUE (bubonic)

TYPE
Zoonotic Bacteria

DEADLINESS*

Low

15%

CONTAGIOUSNESS**

3.5

Vaccine available

*Case Fatality Rate

**Number of people an infected person can infect

viruses—that spread across pig herds of the integrated world. Then it mutated further. Today, it is believed that the common flu virus infecting humans has got mixed with this hybrid, creating an altogether a new human-animal virus.

In 1997, when the world first caught avian flu (H5N1), wild migratory birds that are the natural carriers of the virus, had been widely indicted for the spread, but with little evidence. It was easier to blame wild birds with no defenders in agribusiness, than birds produced in poultry factory farms. The problem stemmed from the model of growing chicken in an environment that is highly conducive for the virus. The birds are

raised in tightly confined, often poorly ventilated enclosures with regular exposure to chemicals, blood and faecal matter. Diseases can spread, and spread fast, in such conditions. Since the birds also have lowered immunity because of their genetic uniformity, they are almost literally sitting ducks when a disease hits.

But after avian flu hit Asia, the Food and Agriculture Organization (FAO) told governments that while it would be possible to tighten biosafety in commercial poultry farms, it would be impossible to do it in non-commercial enterprises, such as backyard production systems where flocks forage outdoors. It recommended animal production should move to larger farms where surveillance is possible. Danielle Nierenberg, who researches this sector at Washington-based Worldwatch Institute, reports that this prompted Vietnam in April 2005 to impose a ban on live poultry markets and asking farms to convert to factory-style methods.

This is when, the need of the hour was to regulate the industrial processes of growing chicken so that the virus does not breed and does not grow. The business needed to improve the genetic stock of birds and raise their immunity against diseases, just the way traditional backyard poultry farmers do. But instead of reforming the poultry industry, the containment of the flu ended up promoting the very industry and its practices and destroyed the livelihoods of small and marginal farmers.

THE INEVITABLE

It's time the world planned in a prudent manner as zoonotic pathogens are ever-increasing and becoming unpredictable.

Studies also show how viruses are ever-adapting and ever-expanding via new susceptible hosts and additional transmission routes. S Abdul Rahman, executive director, Commonwealth Veterinary Association, says, unlike the old diseases like

SARS
TYPE
Zoonotic Virus
DEADLINESS*
Low
9.6%
CONTAGIOUSNESS**
2.8
Spreads from
human-to-human

CHOLERA
TYPE
Non zoonotic
bacteria
DEADLINESS*
Very Low
3.2%
CONTAGIOUSNESS**
9.5
Spreads from
human-to-human;
vaccine available

ZIKA VIRUS
TYPE
Zoonotic Virus
DEADLINESS*
Very Low
0.00003%
CONTAGIOUSNESS**
4.2
Spreads from
human-to-human

YELLOW FEVER
TYPE
Zoonotic virus
DEADLINESS*
Very Low
5.5%
CONTAGIOUSNESS**
4.3
Spreads from
human-to-human;
vaccine available

*Case Fatality Rate

**Number of people an infected person can infect

cholera and pneumonia, which we know how to deal with, these diseases are highly unpredictable. "With factors like climate change, zoonoses are emerging as the single-biggest threat to human health and we are not prepared, as is evident from COVID-19 pandemic," he says.

But the pathogens are honing their genome and preparing for their next mutation, and there is no doubt about it. A study published in *Nature* in October 2015, titled "[Spillover and pandemic properties of zoonotic viruses with high host plasticity](#)" says that pathogens, present in animals belonging to 10 biological orders, are 12 times more likely to transmit from human-to-human than those found in only one animal order. This is because the evolutionary process which equips a virus to rapidly adapt to new hosts also makes it capable of inter-species transmission. Many viruses, like Ebola, SARS-COV and MERS-COV, before jumping to humans were limited only to animals. When all conditions were met, they made the jump. Small wonder, most jumps have been made by RNA viruses.

The next step would be finding the right transmission route for easier, faster and effective dispersals.

So far, oral, aerosols, direct contact, fomite and vectors have been the five primary routes of disease transmission for zoonotic pathogens. These routes are crucial for determining their contagiousness, which is measured through reproduction rate (R0) or the number of secondary cases one case would produce in a susceptible population. In a way, they are responsible for taking a pathogen from the level of transmission to the level of epidemic spread. Cholera, a water-borne zoonotic bacterial disease, has a very high R0 of 9.5. By comparison, the R0 of Zika is 4.2; R0 of COVID-19 is 2.

A reasons for this low R0 of COVID-19 is that the virus is still only hitching rides on droplets, expelled from the body through coughs and sneezes. Since respiratory droplets are heavy, they



cannot travel more than 1 metre. At least, that's what WHO believes as of now. However, with studies finding that SARS-COV-2 can travel up to 8 metres, several virologists seem to disagree that it is not airborne.

As the jury is still out on how SARS-COV-2 travels, the fact remains that airborne transmission is the most lethal of all routes that can make a virus most contagious. Pandit says multiple factors determine if a pathogen is able to transmit with airborne droplets. First, an infectious person should be able to create droplets that are of appropriate size so that they can become aerosolised droplets

EPIDEMIC, PANDEMIC PRONE DISEASES

SWINE FLU

TYPE
Zoonotic Virus

DEADLINESS*
Very Low

0.2%

CONTAGIOUSNESS**
1.5
Spreads from
human-to-human

*Case Fatality Rate

**Number of people an infected
person can infect

with the help of particulate matter in the air. Then enough viable infectious dose has to remain in the air for a significant time so that either wind or air currents transmit it to other places where it can infect another susceptible person.

Once in the air, the success of the virus to remain infections depends both on the virus and the particle. Environmental factors like temperature, ultraviolet radiation, relative and absolute humidity, and air movement are important drivers influencing virus viability. Factors like temperature and humidity also impact the size of droplets which, in turn, affect the viability of virus.

So far, Q fever among animals like goat, sheep and cattle, caused by zoonotic bacteria *Coxiella burnetii* is believed to be the only disease that is transmitted through airborne dispersal. While it remains to be seen as to how long other pathogens can resist this temptation to go airborne, [a study published in the Cell in 2014](#) found evidence of airborne transmission of avian influenza among ferrets. The researchers discovered that the ability to go airborne only took five substitutions in the virus.

DON'T PANIC, PREVENT

The threats zoonoses pose to the public health, global economy, food security and geopolitics are well established.

In what may sound like prophesy now, a 2014 study published by the Bank of American Merrill Lynch, after extrapolating historic examples, estimated that, “a severe and prolonged global pandemic could kill 180-360 million and hit global GDP by as much as 5-10 per cent in the first year, with most industry sectors adversely affected.”

Pandemics aside, between 1997 and 2009, the economic cost of six major zoonoses outbreaks was estimated to be about US \$80 billion by the World Bank, report [People, Pathogens and our Planet: The Economics of One Health, 2012](#). The cost would have been much higher had these outbreaks metamorphosed into pandemics. A 2011 report by the Organisation for Economic Co-operation and Development showed that pandemics are a prime global catastrophic threat. Potential losses resulting from a severe influenza pandemic, for instance, can be about 71 million human fatalities and \$3 trillion, or 4.8 per cent of global GDP. Zoonoses such as leptospirosis cause an estimated 1.03 million human infections and 60,000 deaths annually across 34 countries, for which there is adequate surveillance data, says Bethan Purse, an ecologist at the UK Centre for Ecology

FOREST FEVER

KFD is India's endemic zoonotic disease

BETWEEN AN enemy of unknown prowess and a familiar foe, constantly perfecting its assault techniques, it's difficult to tell who is more dangerous. Yet Karnataka recently found itself grappling with such a dilemma. Over the past few months, as it engaged in a desperate battle against the novel coronavirus (COVID-19), the worst infectious-disease emergency since the Spanish flu of 1918, another infection that it had thought to have thwarted to an extent, made people sick across the Western Ghats. The Kyasanur Forest Disease (KFD), as the tick-borne viral infection is known because of its origin in the Kyasanur forest, spreads through monkeys, causing haemorrhagic fever among some and killing about 10 per cent of those who get infected. To contain KFD, health authorities had conducted a door-to-door vaccination last year. But some 12 per cent of those who were vaccinated against the disease have contracted the infection again. The per centage of children in the total number of positive cases is also high at 8.6 per cent this year, compared to the usual 2 per cent.

COVID 19

TYPE

Zoonotic Virus

DEADLINESS*

Very Low

0.2%

CONTAGIOUSNESS**

2

Spreads from human-to-human



TYPHOID

DEADLINESS*

Very Low

1%

CONTAGIOUSNESS**

1.2

Spreads from human-to-human, vaccine available

*Case Fatality Rate

**Number of people an infected person can infect

and Hydrology. In 2000, WHO estimated that more than a billion people are at the risk of scrub typhus and over one million cases occur annually. Since then, South-Asian countries with good surveillance have shown a rising incidence of scrub typhus.

Muliya says zoonoses kill the most number of people, second only to non-communicable diseases. In terms of years lost due to premature death or to disability for living with the health condition or its consequences, they are second to none.

Unfortunately, though most of the major disease outbreaks have been caused by zoonotic viruses, Pandit says viral infections, in general, are difficult to treat. Very few antiviral drugs are effective against them, unlike antibiotics which we use against bacterial infections as they are broadly effective. Besides, since emerging viruses are novel, developing vaccines or antibodies related treatments take a lot of time, he adds.

THE GREATEST RESERVOIRS OF VIRUSES

A RECENT study identifies domesticated species, primates and bats, to be harbouring more zoonotic viruses than other species. Three mammalian orders (rodents, bats and primates) have together been implicated as hosts for the majority (75.8 per cent) of the zoonotic viruses, while about 88 per cent of the mammal species have not been recorded with a zoonotic virus, says the study published in the *Proceedings of the Royal Society Biological Sciences* in April this year. Species listed as endangered on IUCN due to exploitation of habitat have also been found to share more viruses with humans than others. Yet more than any other species, bats have always been implicated in the emergence of most zoonotic diseases.

There's a reason. Bats are hosts to more zoonotic viruses per species than any other species, particularly those causing Ebola, SARS and now COVID-19. "Bats have a very good immune system and for their size, they live long, for around 30 years. They live in large colonies and are long distance migrants, which make it easy for the virus to spread," says Sanath Krishna Muliya, a project scientist with the Wildlife Institute of India, Dehradun. Many bat species are gregarious and some live in dense aggregations. Some Mexican free-tailed bat colonies can reach densities of 3,000 bats per square metre, in populations of up to a million individuals per roost. "Roosting sites can house diverse assemblages of multiple bat species. High intra- and interspecific contact rates can facilitate rapid transmission of pathogens and large population sizes could sustain acute-immunising infections," says a study published in *Proceedings of Royal Society Biological Sciences* in April 2013. It says since bats are ancient mammals in evolutionary terms, they might have co-evolved with pathogens to become immune to them.

Another study has focused on the feeding habit of bats as a reason for the spread of viruses. "Bats' feeding habits are constrained by the aerodynamics of flight, so they can't ingest huge amounts of food. Yet many bats are frugivorous—that is, they meet their energy requirements by ingesting fruits. But they merely chew them to extract the sugars and higher energy components, and then spit out the partially digested fruits. Other animal species ingest these fruit remnants and may consequently become infected with virus particles in residual bat saliva," says a study published in *Science* in 2005.

"Dealing with zoonoses is tricky because they keep mutating, forcing us to restart the effort to control it anew," says Muliya. This also makes it difficult to promote a permanent cure.

Another reason for the difficulty in treatment is that many zoonotic outbreaks are underreported. Zoonoses mostly infect people living under poverty with little access to healthcare. WHO's report on neglected diseases also notes a correlation between living in proximity with livestock and the emergence of zoonoses. "Although one or more of these diseases can be found in almost every livestock-keeping community in the developing world, they are often simply forgotten," acknowledges a 2015 report titled "The control of neglected zoonotic diseases", prepared by WHO,

Since these diseases are neglected, adequate efforts have not been made to curb them. Consider Ebola and Zika. Before they caught the global attention with outbreaks in 2013 and 2015, these diseases were, for a long time, considered tropical neglected diseases. But despite the attention, vaccines have not been developed for them so far. Ironically, before the outbreak, two promising candidates, the adenovirus-vectored (Ad5-GP) and the vesicular stomatitis virus-vectored (vsvag/ebovgp) were tested on non-human primates in 2003 and 2005. Although the trials produced positive immunogenicity and safety data, Ad5-GP was not investigated further.

PLAN AND PREPARE

Experts had been warning about a COVID-19-like pandemic for a long time. Yet, no one could say when it was going to strike.

The potential for future pandemics is vast. As many as 1.7 million unidentified viruses of the type known to infect people are believed to still exist in mammals and water birds. Any one of these could be the next "Disease X", and it could be potentially more disruptive and lethal

than COVID-19. Since such pandemics are a direct consequence of irresponsible human activity, we need to act now, when we are in the middle of a pandemic, caused by a zoonosis.

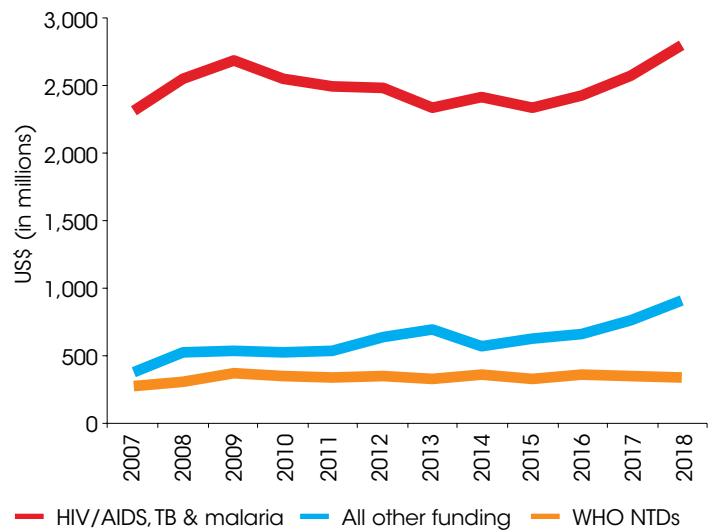
Rampant deforestation, uncontrolled expansion of agriculture, mining and infrastructure development as well as unregulated trade in wild animals have created a “perfect storm” for the spillover of diseases from wildlife to people. Unfortunately, communities who live on the fringes of forests are most vulnerable to such infectious diseases and pay the price of resulting outbreaks.

Experts at the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), an independent intergovernmental body, [in a recent article](#) thus suggest to ensure that the actions being taken to reduce the impacts of the current pandemic are not themselves amplifying the risks of future outbreaks and crises. First, ensure the strengthening and enforcement of environmental regulations and deploy only those stimulus packages that offer incentives for more sustainable and nature-positive activities. Second, recognise the complex interconnections among the health of people, animals, plants and our shared environment. Third, fund health systems and incentivise behavioural change on the frontlines of pandemic risk. It may be politically expedient at this time to relax environmental standards and to prop up industries such as intensive agriculture and fossil-fuel-dependent energy sectors, but doing so without requiring urgent and fundamental change, essentially subsidises the emergence of future pandemics, say the IPBES experts.

WHO has already floated a globally recognised response framework for dealing with zoonoses. According to WHO, “One Health” is an approach to design and implement programmes, policies, legislation and research in which multiple sectors communicate and work

Neglected, even in funding

While funding for HIV/AIDS, TB, malaria has increased since 2001-15, funding for neglected infectious diseases has remained flat for almost a decade



Source: “Neglected Disease Research and Development: Uneven Progress” by G-FINDER in 2019

together to achieve better public health outcomes. Purse says, “We need to first understand how people come into contact with zoonotic infections as they use ecosystems for their livelihoods, what are their priorities and means of coping with diseases. Only by taking this joined up approach, can we understand what changes in policy, behaviour or systems might be required to reduce risks of infection and mitigate impacts.”

There is also a need to pump in more funds for neglected tropical diseases, which include zoonoses (see ‘Neglected even in funding’). As part of pandemic preparedness, surveillance programmes need to be initiated of species like bats that are known sources of zoonotic pathogens (see ‘The greatest...’, p48) and studies need to be done to understand “zombie” viruses and microbes that are being released as the Arctic thaws.

COVID-19 pandemic has offered us a opportunity to prepare for much bigger threats that are yet to come. Let’s not waste it. [DTE](#) [@ikukreti](#)

A promise of equitable access to all

THERE DOES not appear to be any evidence that intellectual property (IP) is a barrier to access to vital medical preventive measures, such as vaccines, or to treatments or cures. The problem is, rather, that there is, as yet, no vaccine or scientifically proven and approved treatment or cures to have access to.” Thus stated Francis Gurry, director-general of the World Intellectual Property Organization (WIPO), towards the end of April when anxious questions were being raised worldwide about equitable access to equipment, treatment and cures for the SARS-CoV-2 pandemic.

Gurry could not be faulted for the latter part of his statement. There are no proven drugs to treat COVID-19, the disease caused by the SARS-CoV-2 virus.

A vaccine is still a long way off. But surely, was Gurry also aware that desperate governments have used and plan to use patented drugs, such as Gilead’s remdesivir and Fujifilm Toyama Chemical Co’s favipiravir to treat COVID-19 patients? He must also be aware that patents on these drugs are blocking generic companies from mass producing these drugs at affordable prices for the poorest countries. Gurry’s statement was perfectly in character since the WIPO’s brief is to promote IP globally. But it struck a jarring note when other UN organisations were focused on a ‘landmark collaboration’ to provide equitable global access to innovative tools for COVID-19.

Put together by a beleaguered WHO, the initiative—called Access to COVID-19 Tools Accelerator, or ACT Accelerator—brings together the pharma industry, big ticket donors such as the Wellcome Trust and the Bill and Melinda Gates Foundation, and the

World Bank in what could be termed an unusual venture. For WHO chief Tedros Adhanom Ghebreyesus who has been under attack from the US, it was a validation with ACT Accelerator getting global backing, notably from the European Union, which has also pledged a substantial funding of Euro 7.5 billion.

Will it be able to end the shortages, high prices, and curb the tendency of rich nations to corner medicines and equipment as they have done so far? We can hope so. Should the choice of former Nigerian Minister of Finance Ngozi Okonjo-Iweala who is a board member of GAVI, the Global Vaccine Alliance, and Andrew Witty, former CEO of GlaxoSmithKline, as special envoys to

advance the ACT Accelerator be reassuring? We think so.

But Gurry’s focus is only on “supporting science and innovation that will produce a vaccine,

WHO, pharma giants and governments have come together to provide access to all on COVID-19 therapies. But will WIPO allow this to happen?

treatments or cures” while ignoring the IP barriers to access. He lists other obstacles: lack of manufacturing capacity, impediments to the movement of supplies and lack of medical facilities and health workers. These are, indeed, valid issues and WHO does not demur.

However, it maintains “that alongside public health measures, innovative COVID-19 diagnostics, therapeutics and vaccines are needed—in record time and at record scale and access—to save millions of lives and countless trillions of dollars, and to return the world to a sense of ‘normalcy’”. Why is Gurry being so obdurate? **DTE**

 @down2earthindia

Palette



WHAT'S INSIDE

An ancient herb to combat coronavirus **P56**

Female health workers remain invisible and stigmatised **P58**

Migrants are the new untouchables **P62**

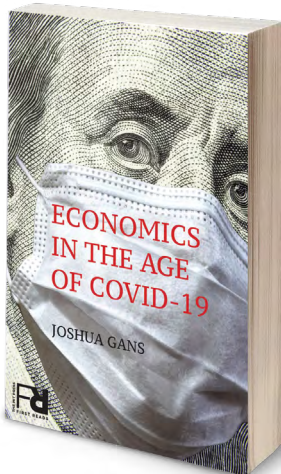
RECOMMENDATIONS: PANDEMICS

BACK TO CONTENT

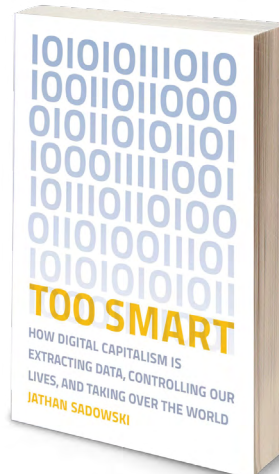


The first full-length feature film on the pandemic, *Corona* follows six unlikely neighbours stranded in their building's elevator. They suspect a seventh neighbour—a Chinese who also boards the elevator—of having the virus and likely to infect them. Fear and racism spread faster than the virus. "The film was shot handheld in one take to bring out the realism," says director Mostafa Keshvari.

BOOKS



Economics in the Age of COVID-19 by Joshua Gans was written, edited and peer-reviewed in just over a month. Published by MIT press, the book traces the various phases of the pandemic economy—from containment to reset, recovery and enhancement—and presents some interesting choices. "We happily shut down most economies each Christmas and no one screams depression. So the easiest way is to just delay bill payments, provide loan guarantees, wage subsidies, straight-out cash and moratoriums on evictions or foreclosures," he says.



As concerns are being raised in India about confidentiality and privacy while using the Aarogya Setu app, a new book, *Too Smart*, explores how digital capitalism is extracting data, controlling our lives and taking over the world. Data has become a new form of capital. "Smart technology in hands, homes and cities will measure, monitor, manage and monetise all aspects of our lives," says author Jathan Sadowski. The book cites examples of how personal details are sent to various entities, including manufacturers and even insurance companies.

ROOTS OF WATER SCARCITY

CONTRARY TO POPULAR BELIEF, AFFORESTATION PROGRAMMES THAT BLINDLY PLANT TREES IN THE HOPE OF CONSERVING WATER ONLY END UP CONSUMING MORE WATER

AKSHIT SANGOMLA

NATURE-BASED solutions like planting of trees and restoration of forests are often touted as the panacea for water conservation. This is because forested watersheds—lands covered by forests which drain all the water flowing through them into waterbodies like rivers or lakes—provide a whopping 75 per cent of the world's accessible freshwater resources. But many organisations implementing this crucial nature-based solution have been unable to differentiate between restoration of forests and planting trees.

For instance, in India, afforestation was one of the interventions of the Union government's Jal Shakti Abhiyan, launched in July 2019, to make the country's most water-stressed districts water secure. Under this programme,

Fast-growing species such as eucalyptus consume more water as compared to needle-leaved species such as casuarina and pines



district administrations were encouraged to undertake planting of trees in a big way. The enthusiastic local authorities reported a staggering number of afforestation activities which turned out to be fudged data, as admitted by district officials as well as a senior official in the Jal Shakti ministry. Even if these numbers were real, simply planting trees will not conserve water. In fact, trees can suck up water and release it through evapotranspiration—water lost by trees to the atmosphere through tiny openings on the underside of their leaves known as stomata.

INCORRECT ASSUMPTION

“Studies conducted in various parts of the globe, especially in semi-arid and arid regions have shown that blind afforestation does not increase water supply,” says Gopal Singh Rawat, former dean of the Wildlife Institute of India, Dehradun. “When sparsely vegetated land is converted into forest, there is a reduction in blue water (available for human use) and increase in green water (part of water available for plant use). Trees can consume more water than other shorter vegetation. According to the mass balance principle, if more water is used by trees, less water will flow into rivers and lakes or recharge the groundwater that people can directly use,” he says.

There are three aspects to be considered while planting trees for water conservation. First is that of scale. In general, forest expansion of 2 sq km or more can increase the possibility of rainfall. Trees transport water to the air, and water vapour moves to another location, which can be far from the afforested area. “On a global scale, afforestation can bring benefits to the water cycle,” says Rawat. The

SIMPLY PLANTING TREES WILL NOT CONSERVE WATER. TREES CAN SUCK UP WATER AND RELEASE IT THROUGH EVAPOTRANSPIRATION—WATER LOST BY TREES TO THE ATMOSPHERE THROUGH OPENINGS ON THE UNDERSIDE OF LEAVES KNOWN AS STOMATA

second aspect is what kind of tree species must be planted for water conservation. Invariably, fast-growing broad leaved species such as eucalyptus and poplar consume more water as compared to needle-leaved species, such as casuarina and pines. The third aspect is that of site characteristics. Areas with varying geology, soil and patterns of precipitation have different responses to large-scale plantations. For instance, a study carried out for 30 years till 2011 in China shows that different regions experienced varying changes in precipitation and soil moisture with increasing number of trees.

In north and southeast China, enhanced precipitation resulting from increased tree cover was able to cancel out water loss due to evapotranspiration leading to no changes in the regions’ soil moisture levels. In southwest China, during the same period, the researchers observed a significant decrease in soil moisture, while there was also a weakening of the summer monsoon season. In northeast China—the only region where a decrease in forest cover was observed—soil moisture went down drastically because of an anomalous anti-cyclone (high pressure area that disrupts the formation of rain bringing low pressure areas) formation during summer. A study published in *PLOS One* in August 2016 found that soil moisture in the topmost layer of soil decreased after afforestation and this decrease was different for different species of trees and varied with regions.

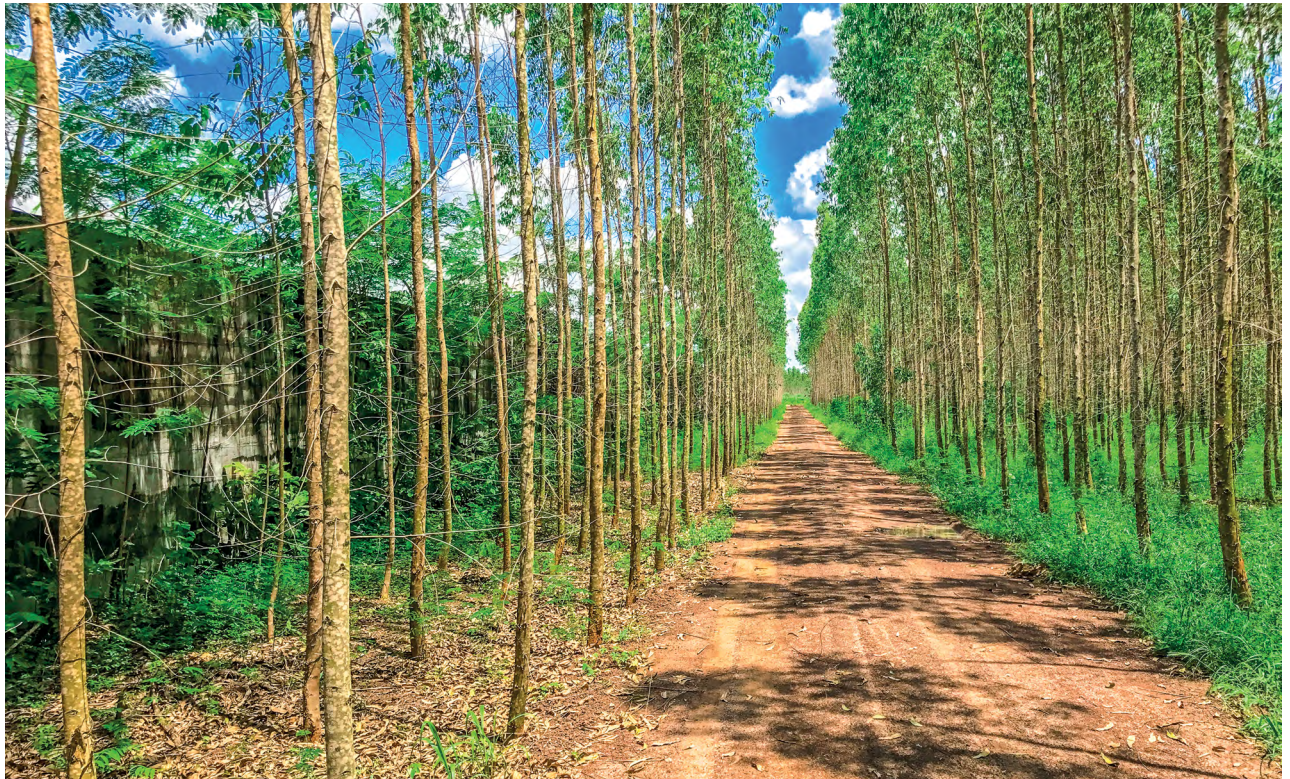
In India, the problem began a

long time ago. “Misplaced tree plantations began when some trees like the eucalyptus were used for draining swamps in the Nilgiri hills of Tamil Nadu, especially near Ooty. This was done in the middle of the 19th century by the British,” says M D Subhash Chandran, a senior scientist with the Centre for Ecological Sciences of the Indian Institute of Science, Bengaluru. The British saw these areas as health risks as these were mosquito habitats which could cause malaria. Moreover, most of the tribes who lived in the area also practiced slash-and-burn cultivation, which changed the character of vegetation, from primary to secondary. In later years, the British harvested teak trees for timber from secondary forests. “The British faced significant problems as sometimes the old evergreen trees would grow back in these secondary forests as well. They shifted to large-scale tree plantations which introduced monocultures to India for the first time,” explains Chandran.

Post-Independence, governments have pursued the same strategy, sometimes even more vigorously. “Eco-restoration of degraded natural terrestrial ecosystems would be better as compared to blind afforestation,” says Rawat.

MODEL OF SUCCESSION

Natural ecosystems, especially evergreen systems found along the catchments of rivers in the Western Ghats, are much better at conserving water as they have complex root systems, which can



Plantations can lead to soil and water erosion as compared to natural ecosystems whose complex root systems hold soil and water

hold large amounts of soil together and that can, in turn, hold large quantities of water in place. They also slow down the flow of water streams through them which helps the soil absorb and hold more water.

“Plantations, on the other hand, lead to soil erosion and greater water flow,” says Chandran. Moreover, secondary forests can also be restored back to primary forests scientifically. “This can be done using the model of succession. You cannot plant sensitive species of an ecosystem in the open areas as they will be scorched in sunlight. There are certain transitional species that need to be planted first. Then, the ecosystem needs should be allowed to grow around them, with sensitive species being introduced at a later stage,” says Chandran.

There are myriad problems

with tree plantation exercises being carried out in India, even by forest departments. “Forest departments generally use tree species which can give good results, which in this case means survival,” says Chandran. So they have very few choices of tree species that are fire-resistant and consume less water. This criterion for the choice of tree species to be planted needs to change if we have

IT IS ILLOGICAL TO PLANT SENSITIVE SPECIES IN OPEN AREAS AS THEY WILL BE SCORCHED IN SUNLIGHT. THERE ARE TRANSITIONAL SPECIES THAT NEED TO BE FIRST PLANTED, AND THEN ALLOW THE ECOSYSTEM GROW AROUND THEM

to restore secondary forests and plantations back to primary forests, he says.

“At least in Uttara Kannada district of Karnataka, I have observed that wherever teak plantations have come up, water in the surrounding areas have dried up. If water flows of natural ecosystems and randomly planted systems are compared during the monsoon season, the former are far more consistent than the latter,” adds Chandran. Areas where trees are randomly planted are also prone to landslides, forest fires and weed infestation. This is what happened in the case of bushfires in Australia and forest fires in California. “Fire hazard will be far less in the restoration model. The plantation policy of the country needs to be redesigned,” adds Chandran. **DTE**

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Immune to corona!

AN ANCIENT HERB IS STAGING A COMEBACK FOR ITS PROPERTIES TO BOOST IMMUNITY

SANGEETA KHANNA

THE COVID-19 outbreak has disrupted life all over the world. There is a sense of insecurity and uncertainty about everything. Most people are looking for immunity-boosting foods. The price of *Chyawanprash* has skyrocketed. While there is an environment of fear and distrust, people are still searching for foods and herbs that can boost immunity. Several herbal teas and decoctions are being unearthed from the treasure chests of Ayurveda and Siddha forms of medicine, as there is no study about the specific immunity against the novel virus. Cure is a far-fetched idea because the exact impact of the virus on human physiology is still a puzzle.

Yet it is vital to improve our generic or the broad spectrum immunity in these times so that our body is equipped to deal with this new infection. Fear psychosis and stress also compromise immunity, and therefore, the new course of immunity-boosting should be a holistic approach. Ethnic medicine offers some hope.

AKARKARA BY CHANCE

When I needed vegetables recently, I walked to the neighbourhood vendors expecting some fresh vegetables and fruits of the season, least expecting I would find something much more exciting. There was a large bunch of yellow flowers scattered on the sidewalk with dark green leaves and brown stems creeping close to the ground. I recognised the plant as *Akarkara*. In usual times, my first reflex would have been to pluck a flower and bite it to experience the sharp tingling sensation that it sends across the palate, numbing the mouth for a few minutes. But I had



The plant is also used as an aphrodisiac

to restrict myself from putting something straight into the mouth—the reflexes now being readjusted to not touch anything and never reaching the face when outside. Nevertheless, I could not suppress my urge to uproot a few branches and bring it back for my own garden. The life force of the creeper kicked in quickly, and it is now a flourishing bunch of tiny branches. I could taste the new flowers.

Something more interesting happened later when I shared a picture of the plant on Instagram. Someone from Arunachal Pradesh replied that this therapeutic herb is called *Marsangin* in her state, and a *chutney* is made out of the leaves. That spurred my interest and I immediately made a tiny amount of the *chutney* using about 10 leaves. It turned out to be an explosion of flavours in my mouth. Only tribal recipes—where minimal native ingredients are used for greater impact, both on the taste buds as well as on health—have such quality. I have to thank Yapi Gongo for this recipe that's going to be a regular in my

steamed leaves. People in Kokrajhar, Assam, cook a chicken soup with it, adding just ginger and salt to boost immunity.

ANCIENT WISDOM

For generations, *Akarkara* (*Anacyclus pyrethrus*) has been used for toothache relief, treating oral infections, nerve-related conditions like headaches, epilepsy, facial palsy and stammering, apart from being used as a muscle relaxant and for its anti-rheumatic properties. *Akarkara* has also been categorised in Ayurvedic and Unani medicine as one of the aphrodisiac herbs owing to its inherent properties to enhance testosterone levels coupled with improved nerve functioning.

Since *Akarkara* is rich in pyrethrums, like many *Chrysanthemum* species plants, it has been trusted to be a potent insect repellent, anti-microbial, anti-bacterial and has been shown to kill intestinal worms.

Sialagogue action (increased secretion of saliva) of *Akarkara* has also been used by some ethnic groups across the country. In some

AKARKARA HAS BEEN USED BY SOME ETHNIC GROUPS ACROSS THE COUNTRY. IN SOME PLACES, TODDLERS ARE ASKED TO LICK A PASTE OF ITS FLOWERS TO GENERATE APPETITE

kitchen (see recipe). Another person from the Northeast, Jacqueline T Misra, messaged me that when the tribal heads in her state prayed for the safety of people after the COVID-19 outbreak, they got the vision of this herb. They shared the prophecy through a scripture from the Bible, urging everyone to stay behind shut doors. A friend from Manipur, Rina Akoijam, told me they call it *Yahidak* and make *Kangshoo*, a spicy salad with

places when toddlers don't eat solid food, they are made to lick a paste of its flowers to generate appetite. I was told by a family friend, Biranchi Sarang, that people in his hometown in Gaya, Bihar, mixed its flowers with chewing tobacco to increase salivation and their testosterone levels.

The saliva-inducing and anti-microbial action makes *Akarkara* a great aid for gum and dental hygiene. In fact, the taste is

RECIPE / MARSANG CHUTNEY

INGREDIENTS

Handful of *Akarkara* leaves and tender stems (about one cup)
2 tbsp: chopped fermented bamboo shoots
5-7: dry red chillies
3 tbsp: black sesame seeds
Salt to taste

METHOD

Rinse and clean *Akarkara* leaves, parboil them in minimal water. Now dry roast the chillies in a pan or over open flame till it becomes aromatic and smoky. Toast sesame seeds and powder. Now pound everything together and serve with meals like rice and *dal*, *khichdi* or *congee*.

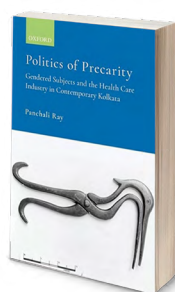
almost like natural camphor paired with schezuan pepper and it causes tingling along palate for some time. The root decoction is also used to treat foul breath and pyorrhoea, an inflammatory condition of the gum.

There are a number of chemical constituents in *Akarkara*. The photochemical screening of roots, stems, leaves and flowers have revealed the presence of alkaloids, reducing agents and catechism tannins. The flavonoids, total phenol and ployphenol contents are highest in flowers, compared to leaves and roots. The roots are rich in alkaloids, while the aerial parts are rich in tannins and flavonoids. Dried roots of this plant are sold by herb dealers across India, but it is mostly used as an aphrodisiac. The aphrodisiac action is due to the presence of a bioactive compound N-alkylamides (pellitorine). With such a wide spectrum of medicinal properties, *Akarkara* may well be the magic herb in times of COVID-19. **DTE**

(The author is a food and nutrition consultant)

Untold labour of care

POLITICS OF PRECARIETY BY PANCHALI RAY IS AN ETHNOGRAPHIC STUDY THAT INVESTIGATES HOW HIERARCHIES IN THE NURSING SECTOR INTERSECT WITH SOCIAL IDENTITIES TO PRODUCE A DIFFERENTIATED WORKFORCE. THE BOOK'S RELEVANCE IN TIMES OF COVID-19—WHERE THESE INVISIBLE HEALTH WARRIORS ARE PERFORMING YEOMAN'S SERVICE—CANNOT BE MISSED. IN THESE EXCERPTS, THE AUTHOR EXPLORES THE QUESTION OF NURSING ETHICS



**Politics of Precarity:
Gendered Subjects and
the Health Care Industry
in Contemporary Kolkata**

By Panchali Ray

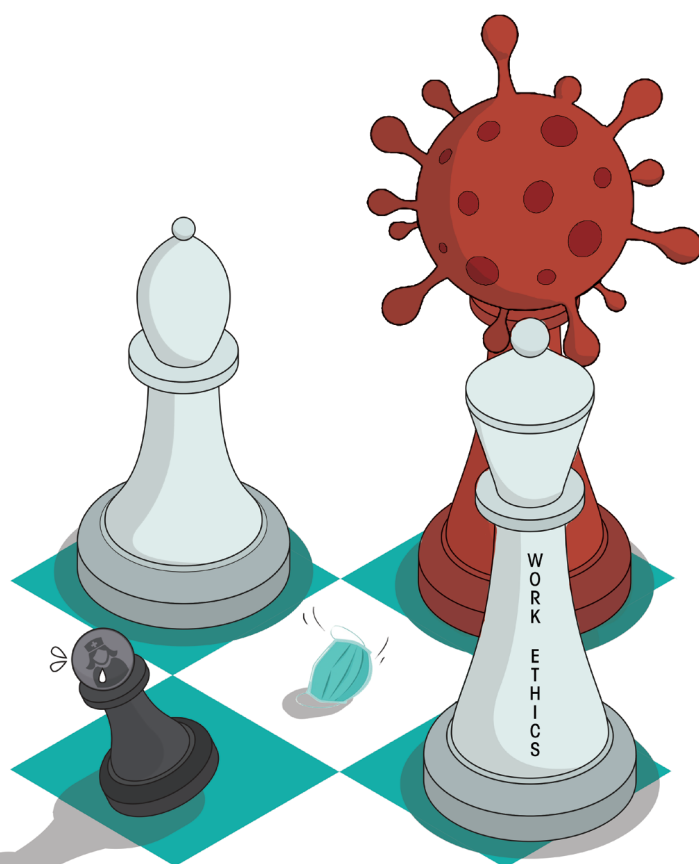
Publisher: Oxford
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Pages: 280; **Price:** ₹1,060

THE URGENCY to label nursing labour as “care labour” could arise from nursing ethics, which has a history of accommodating care ethics in its methodology. Nursing overlaps strongly with domestic work. The distinctions between affective labour that calls for “taking care”, “responding to needs” of the recipient of care, and menial/manual labour oriented towards cleaning rather than caring, is at best fuzzy.

The domestic worker, nurse, or governess fulfils a role that is crucial in reproducing life in its most crude and biological form. What exactly comes under nursing care, and under what other domestic services? The difficulty in disentangling nursing from other kinds of domestic labour often leads to a conflation between the two, thus extending the stigma associated with the former to the latter. In fact, the struggles of the nursing profession have been to disassociate itself from domestic work and establish itself as skilled, trained labour, often leading to compartmentalization. While nursing within the domestic sphere overlaps with other kinds of reproductive labour, it is assumed that the professionalization of nursing would have countered such trends.

Nursing labour is essential for



reproduction of life: cleaning the sick body, tending to bed sores, feeding, aiding in daily ablution, fanning and sponging, uttering soothing words to calm patients enough to administer medicine or keeping the environment clean, making the bed, disinfecting and sterilizing instruments, watching over patients for symptoms that help in diagnosis—a range of activities that include menial, manual, and affective labour which requires varied skills. For example, changing soiled sheets without making the sick person get up from bed requires not just skill, but also strength and dexterity. It goes without saying that diagnosis and administering medicine is one component of healing; regular care, cleaning, and vigilance over the sick body and the environment forms the backbone of the healing process. Not just reproduction of life, nursing—like domestic work in middle-class households—is also status-producing work; it is bound with reproduction of lifestyles.

Nurses have the responsibility of ensuring that both the sick person and his/her environment are not dirty, infected, and contaminating. They are the keepers of the boundaries between sickness and health, ill-being and well-being, contamination and purity.

Thus a nurse is not just responsible for ensuring that there are no open festering wounds, infected equipment, dirty and soiled bandages/clothes, but also for maintaining a clean, sanitized, and cheerful sick room essential for reproducing social order. The classification of nursing labour thus poses a problem given the multiple tasks that fall under its ambit, which range from purportedly

unskilled domestic work to highly specialized medical tasks.

The increasing commodification of women's reproductive labour raises newer questions on ethics. The tension between acknowledging the relational and the emotional component of feminine affective labour and the difficulty in measuring and adapting it to market values informs most of the debates on paid care work. The demand for valorizing reproductive labour as skilled work so as to be able to ascribe a market value to emotional/affective labour is in direct tension with understanding "care" as a distinct feminine quality that escapes masculine market transactions. It would be fruitful to look at the intersection of feminist debates on care ethics with newer concerns of renaming paid

THE CLASSIFICATION OF NURSING POSES A PROBLEM GIVEN THE MULTIPLE TASKS, WHICH RANGE FROM UNSKILLED DOMESTIC WORK TO HIGHLY SPECIALIZED MEDICAL TASKS

reproductive labour as care work, particularly in the context of nursing.

Carol Gilligan's *In a Different Voice* (1982) sparked the debate on care ethics, where she argued that feminine morality and conception of the self as relational, interdependent, and located in a complex web of social relations gave rise to an "ethics of care" as against the masculine "ethics of morality". This context-bound character of care ethics informed much of later theorization on work ethics, particularly for health service providers; nursing ethics, for instance, is far more hospitable to care ethics than others. Feminists have critiqued the traditional

Western health care system that presumes that doctors are the sole repositories of specialized knowledge, and patients are constructed as passive recipients and beneficiaries. The questioning of such traditional views of knowledge has highlighted the role of patients and other health care providers as equal participants in knowledge production.

This challenge to traditional ways of knowing has opened up debates on nursing ethics that perceive nurses as equal participants in the healing process, but distinguishes them from that of a physician. Nursing ethics highlights the "caring" role of nurses as relational and context-specific interventions that stress on affective bonds as against medical approaches. However, traditional

nursing ethics are hardly feminist; deploying gender-oppressive norms and stereotypes, it promotes nursing as secondary to other forms of medical interventions.

The association of women's work with care implied that historically doctors distanced themselves from such roles, carving out a professional function that had no linkages with affective/emotional labour. In later periods, when nursing education was modified to incorporate scientific and medical components, it occasioned debates regarding the suitable role of a nurse. This sexual division of labour within health care services reflects wider hierarchical binaries of objective/subjective, reason/emotion, masculine/feminine whereby male doctors practiced medicine and female nurses healed through affective labour, both inhabiting normative gender roles.

FOR INTERVIEW TURN TO P60 ►

“We worship people when it is convenient for us, and then go on to discriminate when they are no longer needed”

PANCHALI RAY SPENT THREE YEARS IN HOSPITALS AND NURSING HOMES TO STUDY THE WORKING CONDITIONS OF FEMALE HEALTH WORKERS, AND FOUND A WORKFORCE DIVIDED BY CLASS, CASTE AND SEXUALITIES. SHE SAYS THEIR STATUS WILL NOT CHANGE EVEN AS WE LIVE THROUGH A PANDEMIC. RAY SPEAKS TO **MEENAKSHISUSHMA**



Could you explain the title of the book *Politics of Precarity*?

Precarity is a term often used by researchers to understand the contemporary labour market, which is characterised by the spread of contingent work and insecure employment. It is not just economic marginalisation of nurses—lack of job security, less than minimum wages, little access to mechanisms of collective bargaining and no social security—but also the diminishing social and political networks, which are making their lives vulnerable and unlivable.

Will the ongoing pandemic change the status of nurses?

It is almost impossible. Evidence suggests that even today most bedside care has been delegated to ancillary nursing staff, employed in large numbers, and in an ad hoc manner. Moreover, most private establishments submit dubious data to the government to hide the fact that a majority of their nursing staff are women with no registration and have minimum training. The invisibility of unregistered nurses, nursing aides and attendants means that those who give most of the nursing care are not counted in the official statistics. So in a pandemic, like the one we are facing now, any recognition or access to infrastructure is denied to them because of their sheer invisibility. The pandemic has unmasked the risk and uncertainty that marks their lives and labour.

What are the differences in the employment condition of nurses working in India and those who have migrated?

Migrant nurses often find themselves in a labour market in a foreign country that is deeply hierar-

chical and structured. They often find themselves working in less prestigious hospitals, with low pay and exploitative working conditions, doing jobs that local nurses refuse. However, it is still better than the way we treat nurses in India. The potential for economic and social mobility is so much that women who work as nurses abroad are considered prize catches in the marriage market. We see this in Kerala, where women have migrated only to be followed by their husbands and families. However, intersecting inequalities constituted by race, gender and class place migrant nurses at the lowest end of the hierarchy. This discrimination reflects in the former's access to institutionalised forms of recognition

"THE PANDEMIC HAS UNMASKED THE RISK AND UNCERTAINTY THAT MARKS THE LABOUR OF HEALTH WORKERS"

and infrastructure, which further constitutes their responses to harassment and discrimination, whether it is sexual or racial abuse.

Health workers are being "worshipped" for their role during the pandemic. In the long-run, will this bring them dignity?

I don't think there will be much difference. This is the hallmark of neo-liberal society that is morally bankrupt. We worship people when it is convenient for us, and then go on to discriminate when they are no longer needed. In fact, instead of the semiotics of worship, what we need is a language of justice, recognition and rights. Worshipping and labelling them as 'warriors' out to 'save' humanity takes away the fact that they are not being provided minimum protective gear; in some cases

they are also being physically attacked. This is a classic trick in the book of discrimination—we celebrate women, yet we devalue and look down on feminine labour. It is just a ploy to brush away the fact that they continue to work in extraordinary situations without minimum support.

How do you explain the huge increase in people opting for jobs in healthcare services?

For the last few decades, there has been masculinisation of the labour market; women have been pushed out from agriculture, industry and manufacturing. While some middle-class women continue to gain employment, for most working class women it is domestic work or the lower end of healthcare service. Health services are seen as one of the few sectors that has been employing women, but there has been no significant increase in the number of

nurses in the past decades. So one would assume that the increase has been either at the level of the doctor (middle-class women), or the lowest end—the precariously located healthcare givers.

What will be the position of healthcare labourers once the lockdown is lifted?

This is a tricky question. We are all vulnerable. How do we respond to this vulnerability depends on the ethical and moral ethos of the country and as a race. Can we go back to our usual ways of devaluing and stigmatising those who ensure the reproduction and continuity of life? Or shall this moment of vulnerability make us rethink our fundamentals of how we view society, life and labour. I think this is the moment of reckoning. **DTF**

 @down2earthindia

Migrants are the new untouchables

WHILE REPORTING distress migration from rural areas, I have often come across many migrants making a powerful statement: “We faced distress in cities, but escaped the social regression of the caste system in our villages.” It is not that villages only practice the great Indian genetic caste hierarchy. But the poor who belong to the lower hierarchy suffer the most in villages, where they are taught to inculcate “social distancing” right from their childhood. When they move to cities/towns in search of better livelihoods, they become “the migrants”. Here, they continue to remain poor, but somehow the caste barrier feels “distant”.

As they now return to their villages due to loss of jobs in cities, a new and equally discriminatory type of social distancing awaits them: they are assumed to be carriers of the virus that causes COVID-19, thus, must be kept in that medically prescribed “quarantine”. And this period is being increased—in Odisha, one has to spend 28 days in quarantine. In the last few weeks, there have been widespread reports of villages not allowing their own migrant residents. Even migrants walking to their villages are being vilified on the way, as many villages have stopped them from crossing their geographical area. In Odisha, some people even went to the High Court, which ruled that only COVID-19-free migrants would be allowed into the state. Fortunately, the Supreme Court stayed this order. But in popular imagination, migrants continue to be perceived as carriers of this contagious virus. They are the new untouchables; the new pariahs. And it is no longer a clinical “disease distancing” they have to suffer from, but that of being pronounced a long-term outcast—both physical and social.

Worse, the caste distancing is going to become even more pronounced. This is because

socially and economically disadvantaged groups have always been kept out of the developmental bonanza. They have the least landholding; they have the least access to irrigation; and they have the least level of education. Now, having lost their livelihoods in urban areas, they are re-entering the old regressive system that perpetuated inequality. Some may argue that the massive relief efforts announced by secular governments could halt caste distances.

But past pandemics have demonstrated that inequality widened in such crises. To begin with, pandemics have always impacted the already poor and marginalised the most. Though some say that the pandemic of 1918 was “social neutral”, but in reality, scientific examinations showed that those who shared rooms/apartments

Past pandemics have demonstrated that inequality widens during such crises

in higher density suffered the most, or died the most. Who are these people who had to share apartments/rooms? Invariably,

they were the migrant workers belonging to the lower economic strata.

The current pandemic is no different. A recent research paper by IMF’s Davide Furceri, Prakash Loungani and Jonathan D Ostry, and, Pietro Pizzuto of Italy’s University of Palermo shows that “the shares of incomes going to the top deciles increases and that to the bottom deciles falls after a pandemic event”. According to their research based on the last five pandemics, “the share of income going to the top two deciles is 46% on average, while the share going to the bottom two deciles is only 6%—a gap of 40 percentage points.” After five years of a pandemic, this gap in inequality in distribution of income increased by 2.5 percentage points.

A poor’s person’s economy depends a lot on interactions with society. The poorer one gets, the more is the dependence on others. So, social distancing is the highest order of economic punishment—those living on the margins will, sadly, fall first. **DTE**

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