



16-31 MARCH, 2024

Down To Earth

FORTNIGHTLY ON POLITICS OF DEVELOPMENT, ENVIRONMENT AND HEALTH

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BY OSMOSIS

RO is emerging as a popular choice for water purification in India. But it may not be without health risks



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Ambiguity persists over extent of forestland in India

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Why the fuss around household consumption-expenditure survey?

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RESIDENTIAL TRAINING PROGRAMME

CLEAN-BUILD

PATHWAYS TO DECARBONIZE THE BUILT ENVIRONMENT

DATES: April 23-26, 2024 | **LAST DATE TO APPLY:** April 13th, 2024

VENUE: Anil Agarwal Environment Training Institute, Nimli
(near Alwar), Rajasthan

The rapid urbanization and population growth in developing economies have fuelled a construction boom. India's buildings and construction sector is responsible for about a third of the nation's energy use and related CO2 emissions. The sector is expected to nearly triple the energy use and quadruple the emissions by 2050 as the country estimates to add 21.5 billion sqm of building space by 2040 which is dominated by residential buildings. At this juncture, it is crucial to build wise and prevent hefty carbon lock-in.

Decarbonizing strategies are required to address both operational and embodied energy which contribute nearly equally to emissions in a comprehensive outlook – an ecosystem approach. While India has been addressing the operational energy with renewable offsets and standards and codes like Energy Conservation Building Code 2017 and Eco Niwas Samhita 2018, efforts for reducing embodied energy and carbon have just begun. For instance, Building Material and Technology Promotion Council has released a compendium of indigenous materials and technologies. Efforts are now needed to mainstream such materials.

Embodied energy and carbon reduction involves two key strategies: low-carbon design and construction, and low-carbon material options which further involve responsible sourcing as well as production. Processing of construction and demolition waste and use of recycled materials can enable this to a great extent. Addressing these aspects is crucial for achieving India's net-zero commitments by 2070.

CSE's Anil Agarwal Environment Training Institute (AAETI) offers a residential course aimed at providing comprehensive knowledge on decarbonizing the built environment. This course will familiarize practitioners on low-carbon materials, design and construction, recycling of materials, current market trends, existing gaps between policy interventions and ground realities, and strategies for adopting a net zero approach in the construction sector. AAETI is a sustainable, state-of-the-art campus, designed to serve as a learning tool for sustainable building concepts and design practices.

TRAINING METHODOLOGY

Classroom lectures, case studies, class exercises, discussions, and field visit.

TRAINING HIGHLIGHTS

- National policy landscape for net zero and decarbonization strategies.
- Understanding operational and embodied energy and carbon in construction cycle.
- Introduction to low embodied carbon materials, design and construction: traditional, hybrid and emerging technologies.
- Urban heat island effect and mitigation strategies.
- Enabling thermal comfort to reduce operational energy in buildings: passive design techniques, Eco Niwas Samhita.
- Introduction to recycled C&D waste materials and products.
- Economics of recycled C&D waste materials and challenges in uptake.
- Renewable energy and urban interface.

COURSE FEES

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*Course fee includes tuition fee, external expert lecture sessions, training materials, boarding and lodging, transport from New Delhi to AAETI and back.

WHO CAN APPLY

Officials from urban local bodies, and other government departments, planners, architects, engineers, professionals from construction industry, academicians.

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Bengaluru today, your city tomorrow

SOME YEARS ago, at the release of our report *Excreta Matters* in Bengaluru, I got into a spirited discussion with the city's water and sewage managers. The discussion was about water management in the city, which our research showed was unaffordable and so unsustainable. The engineers disagreed. According to them, they had managed to secure water from the Cauvery, some 100 km away, through pipelines, and so had no reason to worry. Now as this hi-tech city hurtles towards a severe water scarcity, maybe, just maybe, these wise men will reconsider and rework their options going forward.

The fact is, Bengaluru is just another city that is being shown the mirror—the dreams of a perfect water supply driven by high-cost engineering solutions are being shattered. And this is in an era of climate risk, where rainfall will become more extreme and more variable.

Bengaluru in the now-distant past used to receive water from its vast network of lakes, designed to collect rain and mitigate floods. Then the search expanded: its first official water supply was from Hesaraghatta lake on the Arkavathi river, 18-20 km from the city; and then from T G Halli reservoir, 35-40 km away. But all this did not suffice and around 1974, the ambitious Cauvery Water Supply Scheme was conceived—where water would be pumped up to a height of 490 metres and transported over 100 km. During my interactions with the city engineers, they were deep into stage 4 of this engineering marvel, and as I said, they did not see any reason to worry. I spoke about the cost of transporting water longer distances—about a decade ago, the city required huge power to pump the water, which was eating into the fragile economics of its water and sewerage board. Also, as the distance increased, so did the water loss which, according to official sources, was 40 per cent. All this meant that the cost of water supply was going up.

I also pointed out that the engineers were discounting the following facts: one, groundwater usage was increasing in the city and its surrounding areas, which suggested that the water supply was not so perfect. Two, the city was exploding and this expanding water-sewage infrastructure would not keep pace with growth. Three, most importantly by their own admission, bulk of the sewage generated was not being treated and this in turn was adding to the pollution load in its lakes and streams. But again, the engineers were sanguine about the future. They boasted they

had already built some 720 million litres per day (mld) of sewage treatment capacity, using every available technology possible—which technically would be able to treat almost all the sewage generated. When I pointed out that less than half the capacity was being utilised, they told me, very soon the pipeline network would expand and all would be well.

Cut to present day. In 2010, the city's water requirement was pegged at 1,125 mld, which has more than doubled to 2,600 mld. While the Cauvery still supplies half, the rest comes from groundwater. In other words, the demand has remained unmet and people have had no option but to dig and dig deeper to secure their water supply. With increased variability of rainfall, these sources are drying up, and fast. But the pipedream sellers have not understood the crisis—the city's chief water manager is now banking on stage 5 of the Cauvery project, which, he says, will be commissioned very soon.

The sewage story is similar. New hardware for treatment has been built; according to the Central Pollution Control Board's 2021 inventory, the city now has 1,167.50 mld of sewage treatment capacity. And capacity utilisation has also somewhat improved to 75 per cent. But the gap between the generation of sewage and treatment capacity has widened. With the current water demand, sewage generation would be close to 2,000 mld—and so untreated sewage would be more than half. The city has gone round in circles, only to find that it is still standing where it was a decade ago.

This is the real crisis of our water planning—the inability to understand the need and the opportunity for the change. The fact is, Bengaluru receives enough rain; it has lakes that can harvest this rain and recharge groundwater, so that in times of extreme rain events, its rich and powerful denizens do not have to swim to avoid drowning in the flood. Every drop can be used for the coming period of scarcity. Then it can manage its sewage differently. Instead of believing that it can transport sewage with pipelines, it can ensure that every drop of excreta is collected by tankers and then treated and reused. But for this, water engineers have to come down to earth, rework and rethink. This is Bengaluru's story today and your city's story tomorrow. [dnto](https://www.dntoearth.org.in) [@sunitanar](https://www.instagram.com/sunitanar)

In an era of climate risk, water engineers have to come down to earth, rework and rethink

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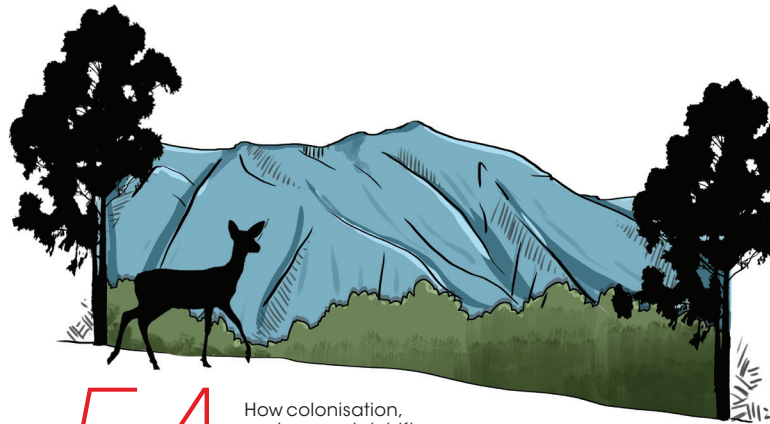
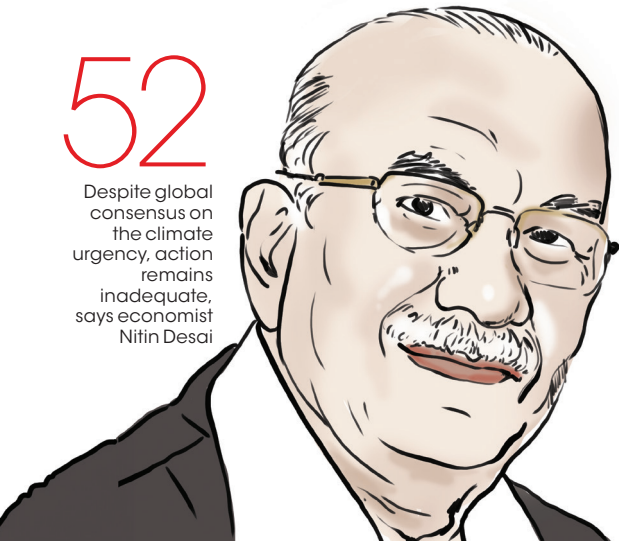


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A **DownToEarth** ANNUAL

STATE OF INDIA'S ENVIRONMENT

2024

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STATE OF INDIA'S ENVIRONMENT 2024

is the country's most definitive and trusted publication on environment-related events and developments of the year. Published by the Centre for Science and Environment, and Down To Earth, this annual publication is a must-have for individuals and organisations interested in the environmental sector.

Backed by four decades of research and ground reportage, as well as new data, State of India's Environment 2024 is the 11th edition of this annual publication, and focuses on:

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Engage



A tree-saving drive worth lauding

This is with reference to the article “(Un)nailed it” (16-19 February, 2024), which highlights how Madhav Patil, an engineer in Maharashtra, is on a mission to remove advertisements nailed on trees. I am glad to know some people notice such peripheral issues and start working to fix them. Nowadays, the practice of nailing trees for name tags is gradually changing—at least, it appears so in public parks. Name tags are now tied around trees with the help of a rubber or jute rope. A similar practice could be adopted by advertisement agencies if they want to fix their advertisement on trees.

To take this mission forward, corporate foundations can extend their financial support to focus on tree health in their project areas rather than developing new plantations every time. In cities, every monsoon, we see large healthy trees falling unexpectedly due to extreme concretisation of their root zone, cuts along the stem area or branches becoming weak over time.

During my recent trip to Japan, I saw extreme bandage-fixing of weak, old, or wounded trees by specialised “tree doctors”. I wish we could do the same here. It is time we pay heed to more tree care than haphazard tree plantation drives. Patil’s initiative is much appreciated in this regard.

SAJID IDRISI
NEW DELHI

ERRATUM

In the cover story “Clear and present danger” (1-15 February, 2024), the seismic zones of the Himalayan region in the graphic “Cliffhanger” do not align with the boundaries of India. The error is regretted and has been corrected on the website.

Recognise the poor state of environment

The cover story “Silent famine” (16-31 January, 2024) describes a disturbing trend. The authors of the study highlighted in the cover story mention that the nutrition value of rice and wheat, our staple foods, has declined by as much as 45 per cent. This is due to multiple factors like soil degradation, groundwater pollution and depletion. Added to that, the toxic content of the grains is increasing. More worrying is the warning that this situation will worsen by 2040, much before India can even celebrate its 100th year of independence.

Already, we are crippled by climate change and have failed to control greenhouse gas emissions. The atmosphere has already warmed by 1.1°C, against the target of keeping it below 2°C, which will lead to disastrous impacts of flooding and rise in seawater. Pollution in ambient air also affects human health. We cannot leave out the filth, waste and plastics thrown into waterbodies, rivers and oceans or dumped on the roadside.

Where are we heading to in the upcoming two decades? It looks like the whole Earth, humanity, animals as well as plants are at great risk if we do not recognise this danger and overcome it sooner rather than later. I only hope the government, ministries, organisations and agencies take corrective action, while expanding our economy to a developed state.

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Digest

WHAT'S INSIDE

Sarpanch helps residents of a water-scarce village start flower farming **P10**

World records its hottest ever February in 2024 **P11**

Down To Earth releases its "State of India's Environment 2024" **P12**

1,000 WORDS VIKAS CHOUDHARY



Over half a million donkeys are slaughtered annually worldwide for their skin, reveals a recent report by UK-based non-profit The Donkey Sanctuary. The unregulated trade is driven by demand from China, as skins are boiled to produce "ejiao", a gelatin used in traditional Chinese medicine, says the report. In India, the donkey population has also rapidly declined, from 0.32 million in the 19th livestock census in 2012 to just 0.12 million in the 20th census in 2019, marking a 62 per cent drop in their numbers over the past eight years.

FOR MORE PHOTOS, SCAN



Smell of success

A LONG, winding road through the hills of the Sahyadri range in north Maharashtra leads to Dohrepada, a village once plagued by barren lands and seasonal migration. Yet, today, a remarkable transformation has unfolded, with the tribal village full of bushes of roses, jasmine and trees of fragrant *champa*, locally known as *sonchafa* (*Magnolia champaca*). Amid this verdant landscape thrive mango, lemon, guava, dragon fruit and cashew trees, painting a picture of newfound prosperity.

"If you had come a decade ago, all you would have seen is barren land and empty houses, as almost 90 per cent of the residents would migrate post-Diwali in search of work and return with the arrival of the monsoon in June to do subsistence farming," says 42-year-old Vishnu Ramu Pawar, Dohrepada resident and the sarpanch of Dhanoshi panchayat, which includes Dohrepada and other neighbouring villages. Today, thin black pipes for drip irrigation criss-cross the farmlands in the village.

The credit for transforming the village of 72 tribal families lies with the young sarpanch, who despite being a graduate, had to work at a petrol pump before the transformation. "I decided to commercially cultivate and sell flowers. Many residents thought I had gone mad because the village is water-scarce," he says. Today, almost all the households in the village are into flower farming round the year and enjoy profits that run into lakhs of rupees.

It was not an easy journey for Pawar. In 2010, when he decided to try his hand at jasmine farming, he thought of sourcing water from a rivulet a kilometre away from the village. "Nearly 10 of us pooled in money and laid down a pipeline. In a couple of months, the entire system became dysfunctional as the rivulet started to run dry," says

A sarpanch in Maharashtra turns to rainwater harvesting to transform parched tribal village into a hub for flower farming
NIDHI JAMWAL



Pawar. Next, he and his friends decided to collect discarded mineral water bottles and fix them atop jasmine plants to do drip irrigation. "The idea worked as we could ration the amount of water we were using, but it was a painstaking process, so we decided to discard it within a year," he says. By then, they had decided to cultivate *sonchafa*, which promises high returns as the plant flowers all through the year. They then dug six borewells, costing ₹1 lakh each, to flower the plants, but knew it was not sustainable and finally decided to carry out rainwater harvesting. They reached out Diganta Foundation, a non-profit that helped them build bunds on the local rivulets to harvest and store rainwater, while the residents contributed labour. Dohrepada now has three bunds constructed on its local rivulet to store rainwater, which is pumped using a solar irrigation system comprising six motors and six pipelines that supply water to each and every farmer. All the farmers do drip irrigation in the village.

"During winters and the wedding season, there is a huge demand for our flowers. In peak season, a farmer can even earn anything between ₹5,000 and ₹8,000 a day. For instance, today I harvested 1,000 flowers, and each flower sells for ₹2," says Suresh Mondkar, who owns 450 *sonchafa* trees.

The flowers from Dohrepada are supplied to the Dadar flower market in Mumbai through a vendor. "The vendor gets a 30 per cent cut, and we take the remaining 70 per cent. He takes care of transportation," adds Mondkar.

Pawar now has new plans for the village. "We now want to farm crabs, kadaknath chicken and dairy. We also want to take up vegetable cultivation. We plan to collect household waste from the village and convert it into compost and use it in our fields," he says.

BITS GLOBAL

This February was the warmest on record globally, extending a streak of nine consecutive months with record temperatures. Data from the EU's Copernicus Climate Change Service reveals that global sea surface temperatures have hit unprecedented levels. February's temperature was 1.77°C warmer than pre-industrial levels and 0.81°C above 1991-2020 averages. Over the past 12 months, temperatures have soared to 1.56°C above pre-industrial levels, momentarily surpassing the critical 1.5°C threshold for long-term climate change impacts.



Over 1,000 Tibetans, including monks, have been arrested for protesting a hydropower dam on the Driчу river in eastern Tibet. Protests started February 14 with 300 Tibetans demonstrating against the project and relocation. Videos released by the International Tibet Network show monks pleading with Chinese officials to stop the dam. Authorities arrested over 100 on February 22 and more than 1,000 on February 23.

The Great Barrier Reef has suffered its fifth mass coral bleaching event in eight years, linked to global heating, confirmed by the marine park authority. Aerial surveys by the authority and Australian Institute of Marine Science cover 300 reefs, revealing widespread bleaching across two-thirds of the reef. This 2,300 km-long reef system has faced repeated bleaching since 1998, reflecting record-high ocean temperatures globally.

The James Webb Space Telescope has captured the oldest-known defunct galaxy, ceasing star formation 13 billion years ago. Discovered when the universe was 700 million years old, it lived fast, experiencing intense star formation for 30-90 million years. However, 10-20 million years before observation, star formation abruptly halted, as detailed in a study published in *Nature*.

BITS INDIA

Bengaluru, the third most populous city in India, is facing the worst potable water crisis in its nearly 500-year history. Over 30 localities under the Bruhat Bengaluru Mahanagara Palike (BBMP) are receiving water on a rotational basis every alternate day. The capital city of Karnataka requires nearly 1,450 million litres per day (MLD) of water from the Cauvery and an additional 700 MLD from groundwater resources. However, with both sources going dry, several distress calls have been coming in from various industries, institutions and residents.

After an extended dry spell, Himachal Pradesh saw significant snowfall and rain from March 1 to 3. Kinnaur and Lahaul-Spiti districts experienced about a metre of snow, posing challenges for locals. According to India Meteorological Department, Lahaul-Spiti recorded 530 per cent more snow than average, while Chamba district saw 516 per cent excess. Avalanches disrupted Chenab river flow and cut off Lahaul Valley. According to disaster management data, the sudden snow and rain affected 652 roads and 78 water projects.



A recent report by the UN Food and Agriculture Organization reveals that in India and 23 other low- and middle-income countries, rural poor households suffer significant income losses during extreme heat. They lose 2.4 per cent of on-farm incomes and face decreased crop and off-farm income values. A 1°C temperature rise could force them into climate-sensitive agriculture, potentially leading to a 33 per cent decrease in off-farm incomes.

IN COURT

NATIONAL GREEN TRIBUNAL

■ Acting on a newspaper article, the principal bench of the National Green Tribunal (NGT) on February 26 took *suo motu* cognisance of illegal extraction of sand in Subarnarekha river in East Singhbhum, Jharkhand. NGT has sought a response from Jharkhand state pollution control board and district magistrate of East Singhbhum.

■ On February 26, NGT criticised Delhi Jal Board's delay in addressing a sewer line issue connected to a stormwater drain, directing arguments for the May 6 hearing regarding environmental violations.

SUPREME COURT

■ The Supreme Court on March 6 prohibited tiger safaris in Uttarakhand's Jim Corbett National Park, limiting them to peripheral and buffer zones. This move aims to protect the majestic creatures' habitat and minimise tourism's impact on the reserve's core areas, aligning with broader conservation efforts.

■ The apex court on February 27 directed that mining activities should be prohibited in areas notified as eco-sensitive zones and, in any case, within a radius of a kilometre from protected forests.

So far...

Number of cases on environment and development tracked from January 1 to March 7, 2023

NATIONAL GREEN TRIBUNAL	SUPREME COURT	HIGH COURTS
104	21	19

FOR DETAILED VERDICTS, SCAN



All things climate

From environmental crimes to extreme events to fight over minerals, the Anil Agarwal Dialogue 2024 discussed ramifications of climate change



A panel discussion on the impact of climate change on the Himalayas at the Anil Agarwal Dialogue 2024 on February 28

THE ANIL Agarwal Dialogue 2024, an annual media event by the Delhi-based non-profit Center for Science and Environment (CSE), commenced on February 28 with the unveiling of the "State of India's Environment 2024" report, focussing on the impact of climate change on India.

The toll is staggering: over 3,200 lives lost, 2 million hectares of cropland devastated, and a barrage of extreme weather events wreaked havoc across the nation in the first nine months of 2023.

India, like much of the world, is heating up rapidly. The report highlights a concerning trend: the global mean near-surface temperature soared 1.4°C above pre-industrial levels by 2023. Urgent action is needed to curb greenhouse gas emissions and limit warming to 1.5°C or 2°C, according to scientific consensus.

Furthermore, environmental crimes continue to plague the country, with forest diversions and pollution exacerbating the crisis. Despite some decrease in



ANIL AGARWAL DIALOGUE 2024

environmental crimes, the backlog of cases in courts remains a significant challenge. The repercussions extend beyond India's borders, with global ramifications of climate change becoming increasingly apparent. Nations worldwide are grappling with the fallout from extreme weather events, underscoring the urgent need for collective action.

"2023-24 was a year of polycrisis—a period when we are losing our many, multiple conflicts, among them our war with nature; our war with humans (such as Ukraine and Gaza conflicts); and our war of control over minerals and technology (where China plays a significant role)," said Sunita Narain, director general of CSE, at the three-day event. The dialogue also featured a series of round-table discussions on pivotal issues including climate change, glacier melt, plastic pollution and biodiversity loss, underscoring the urgency of addressing these pressing challenges.



MIRIAM JACKSON,
Programme coordinator,
Cryosphere, International
Centre for Integrated
Mountain
Development, Nepal

On risk of rapidly melting glaciers

THE WORLD is witnessing global warming, with particularly rapid changes occurring in high-elevation regions. So these higher temperatures are having a big effect on the glaciers of the Himalayas. With consistently high temperatures over several decades, the glaciers sink and end up forming lakes that are vulnerable. We today know where these lakes are being formed, but the problem is that they are changing rapidly and there are a lot of uncertainties as they can be triggered by landslides, permafrost snowing or avalanches. We can do two things to reduce the risk. The best thing is to lower the lake level but to do this at high altitudes is difficult. The next thing is to have an early warning system, which does not reduce the risk of floods, but can save lives.

On large cat conservation

GIVEN THE challenges India faces with a human population of 1.4 billion, among the densest globally, India has done remarkably well in conservation, especially with large cats. We have been blessed with a high diversity of large cats, from leopards, lions, tigers to now a few cheetahs from Africa. At the same time, it is important to reflect on what we have done right and what we have not done right especially when it comes to habitat connectivity, the impact that conservation efforts have on communities. Unless we do that, our conservation models are not going to be sustainable.



RAVI CHELLAM,
Wildlife expert and
coordinator of the
Biodiversity Collaborative



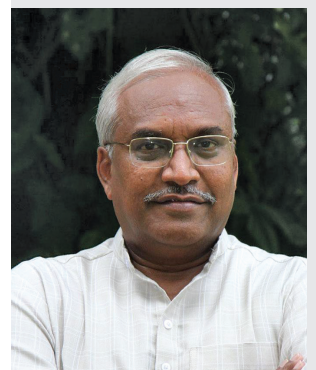
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Research, Chennai

On marine litter

MARINE LITTER is symptomatic of a wider malaise. And once microplastics enter the ocean, we have no way to deal with them. We do not yet have the technology to contain it. We have recently started collecting data on coastal pollution and the preliminary data shows that currently, every kilometre stretch of coastline receives around 1 tonne of garbage daily. Of this, 60-70 per cent is plastics. We have also found that water 2-3 km all along the Indian coast is highly polluted. At the same time beaches away from urban areas are relatively cleaner. East coast, which has several rivers flowing in, has higher load of plastics. While Indian studies do not exist, global studies show a link between microplastics and human health.

On changing nature of El Niño

FOR ALMOST six weeks (since March), gradual moderation has been occurring, with significant changes expected in April. By May, we will reach ENSO-neutral conditions. Until then, the warming experienced last year is likely to persist, due to anthropogenic warming overshadowing El Niño's natural influence. Consequently, no relief from heatwaves can be anticipated. El Niño, like other circulation systems, is affected by global warming. This was evident in 2023, when traditional El Niño patterns were disrupted, particularly in the Western Pacific, which was not as cool as it should have been.



K J RAMESH,
Former director general,
India Meteorological
Department

An assembly of crises

The sixth UN Environment Assembly acknowledged planetary ecological meltdown but could not move countries to act upon it

MAINA WARURU
NAIROBI, KENYA

POLYCRISIS IS the planetary context in which the UN Environment Assembly (UNEA)—the highest decision-making body on environment comprising all 193 UN members—convened in Nairobi, Kenya from February 26 to March 1. Polycrisis is the term to define the state of the global environment, pointing at three crises wrecking the planet—the climate emergency, biodiversity loss and pollution. Before the Assembly ended, the planet recorded nine consecutive warmest months on record, through February. New estimates suggest the extinction rate has sped up. “None of us live on an island. We live on planet Earth, and we are all connected,” said Inger Andersen, executive director of the UN Environment Programme (UNEP) whose work is defined by UNEA, before the Assembly started. “The only way we can solve some of these problems is by talking together.”

The Assembly did talk, and agreed on resolutions that take many environmental agreements towards implementation. Altogether, by March 1, members passed 15 resolutions “aiming to boost multilateral efforts to address the triple planetary crisis of climate change, nature loss and pollution”. The resolutions range from management of

A silent protest against war and environmental pollution by civil society during the opening session of the UN Environment Assembly held in Nairobi

PHOTOGRAPH COURTESY: IISD/ENB/MIKE MUZURAKIS



THE/NUDGE Prize



DCM SHRIRAM
FOUNDATION

Empowering Smallholder Farmers Through Irrigation as a Service

While the Software as a Service (SaaS) model is well-known in India's IT hubs, Irrigation as a Service is a model that has the potential to significantly impact the agricultural sector.



Both models are similar – instead of a one-time investment, users can get on-demand services on a pay-as-you-go basis. In the world of software, this allowed even small companies to use enterprise-grade software, unlike earlier when they would have to purchase the entire system to access that one piece. The situation in agriculture isn't very different. Although we have systems like drip irrigation which are effective, they are out of reach for many small-holder farmers because of their cost, even after government subsidies. They can also be complicated to operate and maintain, especially if farmers need to use them only sporadically when rains are insufficient. In contrast, Irrigation as a Service providers can offer immediate and affordable solutions to small-holder farmers who do not own their own equipment.

AgriRain and Oorja are two organizations providing these services selected to be part of the DCM Shriram AgWater Challenge cohort to improve agricultural water utilization for smallholder farmers. The challenge was launched in June 2023 as a partnership between DCM Shriram Foundation and The/Nudge Prize and aims to promote disruptive AgWater solutions. The core objective of the challenge is to nurture an ecosystem of industry-led solutions to India's water crisis, offering a cash purse of ₹2.6 crores to the winner, along with mentorship and investor access support to all contestants. While other contestants cover a gamut of solutions from biotechnology to mechanization and information services, players like AgriRain and Oorja play a key role in

ensuring that small-holder farmers of every type are supported.

Although both provide the same service model, they use contrasting technologies to address different needs. AgriRain has developed an innovative mobile hose reel rain-gun system that has been adapted to work for small land parcels. It is a movable and towable irrigation system that mimics rainfall and serves a cluster of 60-100 farmers using a trained operator. The system is complemented by an array of supporting tech solutions, from satellite imagery to monitor soil moisture and weather parameters to on-ground moisture detection using field devices with Bluetooth sensors that send information to a mobile app. This combination of technologies ensures irrigation schedules can be optimized for maximum yield, with the company's estimates suggesting a 30-50% increase in yield and an irrigation efficiency of 79.4%. Continuous monitoring of soil health in geo-tagged farms also enables farmers to get short-window insurance coverage and targeted advisory through AgriRain's constellation of services. Farmers need to pay only ₹1,000 per acre for 10 mm, which includes irrigation along with labor, fuel, and all associated costs, in contrast to ₹5,000 - ₹20,000 per acre per season for traditional irrigation.

Oorja, as the name suggests, is dedicated to using clean solar energy to provide farming as a service, with solar irrigation being one of many solutions. Oorja provides an alternative to diesel-powered pumping and allows 15-25 farmers with adjoining farmlands to access irrigation water year-round on demand at a cost of ₹3.5 - ₹4 per cubic meter using solar-powered pumps that can be shared by farmers. This helps them escape the high operational expenses of diesel fuel, engine rental, and maintenance, while improving yield by 15%, along with an estimated 15-20% water savings.

Oorja is focused on Uttar Pradesh and paddy and wheat crops, while AgriRain is spread over 5+ states spanning from Uttar Pradesh to Andhra Pradesh and Karnataka, covering crops such as wheat, cotton, sugarcane, rice soybean, maize, chickpea, groundnut, sesame, and millets but especially beneficial for water-intensive sugarcane cultivation. The complementary nature of these services helps address different needs of farmers across regions as well as other socio-economic realities.

With small-holder farmers making up 86% of India's farming households and the agricultural sector accounting for 78% of our freshwater and groundwater usage, we need many varied technological solutions to solve the problem from different vantage points. As the DCM Shriram AgWater Challenge races to a conclusion in 2025, two of the largest cities in India, Bengaluru and Chennai, are already struggling with depleted water sources. While city residents waiting for tankers dominate the headlines, we might need to look at the margins of our news coverage to understand the true state of our water conservation efforts.

Our water security is inextricably linked to the prosperity and livelihoods of smallholder farmers who grow the most water-intensive crops such as paddy, wheat, sugarcane & cotton and these crops consume a sizable portion of our water resources. In the face of a looming water crisis, the true measure of our progress might lie in how well we support them.

"This article is one part of an 8-part series covering agricultural water utilisation in India."



RESOURCE USE TO EXCEED NEEDS

GLOBAL PRODUCTION and consumption of material resources has grown more than three times over the past 50 years, at an average of more than 2.3 per cent a year, according to “Global Resources Outlook 2024—Bend the trend: Pathways to a Liveable Planet as Resource Use Spikes”, released during the UN Environment Assembly in Nairobi. This increase is the main driver of the triple planetary crisis, says the report by the UN Environment Programme. Consumption and use of resources is largely driven by demand in high-income countries. Extraction and processing of material resources, including fossil fuels, minerals, non-metallic minerals and biomass, account for the emission of over 55 per cent greenhouse gases (GHG) and 40 per cent of particulate matter. Extraction and processing of agricultural crops and forestry produce account for 90 per cent of land-related biodiversity loss and water stress and a third of GHG emissions.

Despite this, resource exploitation could increase by 60 per cent from 2020 levels by 2060—from 100 to 160 billion tonnes. This will far exceed what is required to meet essential human needs. The report reveals that upper middle-income countries have joined the wanton consumption bandwagon and have more than doubled their resource use in the past 50 years for infrastructure growth. On the other hand, per capita resource use and related environmental impacts in low-income countries have remained comparatively low and almost unchanged since 1995. The current extraction and consumption of resources was not only wasteful but was unjust, as per Janez Potočnik, lead author of the report.

metals, mineral resources, chemicals and waste to environmental assistance and recovery in areas impacted by armed conflict to sustainable lifestyles. On the closing day, members agreed on a Ministerial Declaration that reiterated member states’ “commitment” to “slow climate change, restore and protect biodiversity, create a pollution-free world and confront issues of desertification, land and soil degradation, drought and deforestation by taking effective, inclusive and sustainable multilateral actions”.

“I am proud to say this was a successful Assembly. We advanced on our core mandate: the legitimate human right to a clean, healthy and sustainable environment, everywhere,” said Leila Benali, UNEA-6 president and the Minister of Energy Transition and Sustainable Development of Morocco.

The Assembly convenes every two years. In 2022, its members adopted 14 resolutions, including the path-breaking agreement on a legally binding instrument to end plastic pollution. So, on the first day of the current Assembly, calls to speed up formulation and adoption of the Global Plastic Treaty became the main agenda. The speakers noted that the world was drowning in plastic, a crisis linked to the fossil fuel industry. This led to another big call from the Assembly: formulation of an international treaty for phasing out fossil fuel production and supporting a just transition in favour of “sustainable and renewable energy sources”.

Delegations who spoke on the final Ministerial Declaration, however, expressed regrets that the document was not emphatic on the urgency of actions needed to end the

plastic crisis. This included representatives of countries such as Mexico, Colombia, Switzerland and Senegal. India, Egypt, the US and Japan observed that the 21-point document did not go far enough in affirming the place of the 2015 Paris pact in calling for actions to save the planet from the polycrisis.

Saudi Arabia sponsored a resolution calling for “strengthening international efforts to combat desertification and land degradation, restore degraded land, promote land conservation and sustainable land management, contribute to land degradation neutrality and enhance drought resilience”. Others included resolutions on considering environmental aspects of minerals and metals, the call for circularity of a resilient and low-carbon sugarcane agro-industry, promoting sustainable lifestyles, appeal for action on sound management of chemicals and waste, action on highly hazardous pesticides sponsored by Ethiopia, and call for action for combating sand and dust storms by Iran.

Also passed by the Assembly is a resolution supported by Costa Rica, that called for “effective and inclusive solutions for strengthening water policies to achieve sustainable development”, and a related one calling for “strengthening ocean efforts to tackle climate change, marine biodiversity loss and pollution”. Benali said while all resolutions were important, what mattered was follow-up actions to actualise the decisions. She noted some resolutions that went a long way in addressing “silent killers” such as sand and dust storms, as well those addressing air and water. “We are also happy that we have seen a stronger science-policy interface emerging from these deliberations,” she said. [.dte](#) [@down2earthindia](#)



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Forests' lingering question

Nearly three decades have passed since the Supreme Court ruling in 1996, which mandated the use of dictionary definition to delineate forests. Still, India grapples with the challenge of accurately identifying its forests

HIMANSHU N
NEW DELHI



IN THE wake of a recent interim order handed down by a Supreme Court bench on February 19, the debate surrounding India's forest definitions has reignited. The court has mandated all states and Union Territories (UTs) to ascertain their total forestland based on the dictionary definition of a forest, as outlined by the Supreme Court's landmark verdict in the T N Godavarman Thirumulpad *v* Union of India case in December 1996. The deadline for submission of this data to the Union government is March 31.

The apex court, in essence, has ordered the government to step back and adhere to the 28-year-old

dictionary meaning of forest till a final verdict is handed out on a series of petitions challenging the constitutional validity of Parliament's 2023 Amendment to the Forest (Conservation) Act, 1980, known as the Van Sanrakshan Evam Adhinyam, 1980, and the Van Sanrakshan Evam Adhinyam Rules, 2023.

The petitioners argue that the 2023 amendment could exclude approximately 197,000 square kilometres, or roughly 27 per cent of the total forest area, due to its "constricted" coverage. They assert that this amendment contradicts the 1996 order, which directed states and UTs to establish expert committees (EC), headed by the princi-

pal chief conservator of forests, to identify their forest area based on the dictionary definition, thereby including forests not officially notified as such.

Almost three decades post the Godavarman verdict, ambiguity persists regarding both the understanding of forests and the extent of forestland across the country.

DELIBERATE OVERSIGHT

While the Union Ministry of Environment, Forest and Climate Change (MOEFCC) claims the 2023 amendment is in line with the Godavarman verdict, a closer examination reveals it is not completely true. Under Section 1 A, the amend-

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RAJASTHAN COMMUNITIES AT RISK OF LOSING LAND

Village residents oppose declaring traditional pastoral land as deemed forests, fearing loss of access and livelihood

A RECENT state government notification has sparked fear among community dwellers in western Rajasthan, who are concerned about potential loss of access to forest produce and livelihood. The community is apprehensive about the state's proposal to recognise *orans* (sacred groves) as deemed forests. The government notification on February 1, 2024 declares that, in compliance with directives from the Supreme Court (SC), *orans*, *dev vans* (sacred forests) and *runds* (traditionally conserved open forests) will be categorised as deemed forests. The notification also invites objections and issues to be raised by locals, if any.

Sumer Singh from Savata village in Jaisalmer tells *Down To Earth* that his community through representation of the organisation "Gochar Oran Sanrakshak Sangh Rajasthan" has raised objection to the decision. "The Degray *oran* in our village supports at least 5,000 camels and 50,000 sheep," he says. The village residents also depend on the forest for gum, timber, forest produce and wild vegetables, crucial for their livelihoods and daily needs. If *orans* are declared as deemed forests, the people fear they will lose access to forest produce and grazing land for their herds and sheep.

Singh adds that some houses are situated in close proximity to *orans*. "Residents may have to vacate their homes if the state forest department takes over. Moreover, last rites, and religious events are held inside *orans* and are deeply intertwined with the trees, waterbodies and other features of the forest," he says.

In a letter submitted to the district collector, the organisation highlights the interconnectedness between *oran* land and neighbouring villages, emphasising that any restrictions in the forest area would impact movement and livelihoods. Singh alleges that the government did not engage with community members for consultation or hearings before proposing the classification of these lands.

Parul Gupta, conservation lawyer practising before SC and the National Green Tribunal, explains that deemed forests are areas with forest-like characteristics that are not officially recorded in government or revenue records. "To prevent further degradation of such lands, the Supreme Court, in the TN Godavarman case, directed state governments to identify them and stipulated that all forests, including deemed forests, would be covered under section 2 of the Forest (Conservation) Act, 1980," she says. Gupta asserts that the provisions in this section prohibit non-forestry activities such as mining, deforestation, quarrying, or infrastructure projects on such forest land without permissions from the central government. However, she says that the move does not restrict individuals or communities from accessing the forest for grazing or worship.

ed Act says forests include land declared or notified as forest under the Indian Forest Act, 1927, or any other prevailing law. Additionally, it includes land recorded in government records as forest on or after October 25, 1980, with an exemption for land converted from forest to non-forest use before December 12, 1996.

Prakriti Srivastava, former principal chief conservator of forests, Kerala, and one of the petitioners, argues that the amended Act seeks to legitimise diversions that occurred between 1980 and 1996 through government orders or local body directives. Srivastava also questions MOEFCC's assertion made to the Joint Parliamentary Committee (JPC) on the Forest Conservation Amendment Bill, 2023, regarding the inclusion of EC reports while deciding the forest area in the 2023 amendment. "...deemed forests as identified by expert committees of the states, have been taken on record and hence the provision of the Act will be applicable in such lands also..." notes the JPC report tabled in Parliament in July 2023.

Srivastava had filed a query under the Right to Information (RTI) Act in January 2024 to access the EC reports that are not available in the public domain. In response to her query, MOEFCC replied that "requisite information is not available in the Forest Conservation division of the Ministry" and that her queries have been directed to the principal chief conservator of forest for replies. "The RTI response shows that MOEFCC has not accessed the EC reports for the amendment," she says.

As of February 26, Srivastava had EC reports for only two states—Kerala and Assam. Kerala's records, obtained during Srivastava's



Pollution Control Board, Assam Launching of the Golden Jubilee in June 2024

Pollution Control Board, Assam has been relentlessly working towards sustainable environmental management in Assam and facilitating industrial growth.



The Board is glad to share some of the milestones achieved during last 2 years.

- ▶ 41 Business Reform Action Points (BRAPs) have been integrated with Ease of Doing Business (EoDB) portal and granted more than 18,000 consents and authorizations to various industrial and service sector units in the State in the last two years
- ▶ Successful implementation of the National Clean Air Programme (NCAP) in the State in Guwahati, Nalbari, Nagaon, Sivasagar and Silchar. Integration of Mission LiFE with NCAP
- ▶ Assessment of Ambient Air Quality of the State through 53 Manual Monitoring Stations and 9 Continuous Ambient Air Quality Monitoring Stations. The process of installation of another 10 manual monitoring stations is in progress
- ▶ Adopted use of e-tools (e-Office, GeM, e-Auctioning through MSTC, etc.) for improvement of office functioning
- ▶ Water quality is monitored in more than 237 locations in the State under the National Water Quality Monitoring Programme
- ▶ For management of Industrial hazardous waste, the first Transport, Storage and Disposal Facility (TSDF) is being established in Lekai, Dibrugarh
- ▶ Facilitated establishment of Common Bio-Medical Waste Management Facility (CBWTF) at Panikhaiti and Bajali for management of Bio-Medical Waste generated in various Health Care Facilities
- ▶ Awarded with coveted NABL Accreditation for the Central Laboratory with a scope of 69 Air and Water Quality Parameters
- ▶ Restoration of the plinth area of Baghjan Well No. 5 by planting about 35,000 saplings of native trees following Miyawaki method of plantation
- ▶ Collaborating with Institutes of repute (IIT-Guwahati, Gauhati University, Bhattadev University, CIPET (Assam), Kanoi College, MNC Girls' College, B. Borooah College, Sonapur College, Arya Vidyapith College, etc.) and NGOs (Centre for Cultural Integration, Earthful Foundation, etc.) to work in the field of Pollution Control and Environment Management



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tenure as a forest officer, indicate substantial forest areas under government and private ownership. Assam's records, acquired through the RTI query, reveal significant forestland, albeit with challenges in identifying specific areas due to inadequate geo-referencing. "Comprehensive information on the location of forest with geo-reference and demarcation should have been provided by the states according to the judgement in the Lafarge Umi-am Mining v Union of India case in 2011. But it has not happened," she adds. As a result, though states have overall numbers for its forest areas, the exact location of these areas cannot be verified, she adds.

28 YEARS OF INACTION

The delay in defining forests in India is attributed to the complexity of the process and numerous challenges encountered along the way. The problem lies in identifying deemed forests, which are forest-like areas but not recognised as forests in government records. Going by the Godavarman verdict's definition, such areas should have been identified and declared as forests, but in the absence of the ECs, a comprehensive identification of deemed forests never happened. Experts believe that a sincere effort post the 1996 and 2011 judgments could have expedited this crucial task.

"State governments hesitate to protect forest-like areas or traditional ecosystems like *orans* and *runds* in Rajasthan and the Aravalis in Haryana," says Debadityo Sinha, senior resident fellow and lead of the climate and ecosystems team at Vidhi Centre for Legal Policy, New Delhi (see 'Rajasthan communities at risk of losing land', p20).

Karnataka is one of the few states that has tried to identify its deemed forests at several times in the past, but ended up with different figures each time. The expert committee report in 2014 identified 0.994 million hectares (ha) as deemed forest in the state. In 2022, deemed forests was reduced to 0.33 million ha due to absence of land records, plantations, transfer of area and other reasons.

Meenakshi Negi, who served as Karnataka's additional principal chief conservator of forests, says forests are dynamic in nature and need to be monitored regularly, in the absence of which numbers are bound to be different. "Beyond the central issue of identifying deemed forests, for which Karnataka has a framework that other states can emulate, the challenge is excluding

NUMEROUS INSTANCES EXIST WHERE DESIGNATED FOREST AREAS HAVE BEEN DIVERTED FOR OTHER PURPOSES, UNDERMINING CONSERVATION EFFORTS

the areas that are recorded as forests in government records but have degraded over time due to government projects such as dams or has seen human settlement," says Negi.

Sharachandra Lele, distinguished fellow at Ashoka Trust for Research in Ecology and the Environment, Bengaluru, says state governments have resisted the expansion of the scope of the Forest Conservation Act. "They want a land bank at their disposal which they can release without any central oversight for various activities, especially industries," he says. This is why most states have not even identified deemed forest areas, in spite of repeated orders from the Supreme

Court. Many of these places are also inhabited by communities, who will be alienated once the land is declared as forests, says Srivastava. She highlights the lack of initiative when she says that as the district forest officer of the Munnar region in Kerala, she had found that the revenue department was in possession of around 7,200 ha of land earmarked for transfer to the forest department for designation as reserved forest. Still, this parcel of land was inexplicably excluded from the 1997 EC report of the state. It was not until 2002, after protracted and contentious battles with state authorities, that the area was identified, demarcated, and eventually notified as reserved forest in 2011.

"Numerous instances exist where forest areas were diverted for other purposes. For instance, a sandalwood reserve was redirected for land distribution, while Mathiketan, now a national park, fell victim to encroachment facilitated by political patronage. Additionally, the allocation of the elephant corridor in Chinna-

kanal to landless tribal, despite warnings of escalating human-elephant conflicts, exemplifies the consequences of such actions," she says.

The recent Supreme Court order granting states time until March 31, to submit EC reports offers a glimmer of hope. Pia Sethi, senior fellow at the Centre for Ecology Development and Research, Uttarakhand, anticipates increased clarity once this information is made public. Lele, though, warns of delays and lingering issues. He cautions that without swift action, the forest conundrum may persist for years to come, perpetuating a challenge that has plagued the nation for decades. [RTI](#) [@down2earthindia](#)

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FACT OR FALLACY

Water purifiers that use reverse osmosis (RO) are emerging as a popular choice for safe and clean drinking water in India. But along with pathogens, the technology removes essential minerals from water. Experts warn that RO water with dangerously low levels of mineral content can have adverse impact on health—it can even lead to micronutrient deficiency, joint pain and cardiovascular ailments. Besides, boiling water and using simple filters can ensure potable water in most areas. An analysis by **Vivek Mishra**



IMAGINE A business that does not involve raw material cost and deals with a product that is in high demand. That is what the business of supplying RO water (or water purified through reverse osmosis) is like in Vidarbha region, says Vinod Lunge of Mangrulpir taluka in Maharashtra's Washim district. Lunge used to work with a land development bank in Washim till 2011. After the bank shut shop, he decided to try his luck in the booming water purification market, and set up an RO plant at one corner of his orange orchard. "I invested ₹4 lakh on setting up the plant along with a chiller machine and another ₹3.5 lakh on buying a pick-up car for delivering water jars. The plant uses 12,000 litres of groundwater daily from a borewell in my farm and yields 4,000-4,500 litres of filtered water, which I supply to 380 house-holds," says

Lunge, adding that he makes a profit of ₹30,000 a month from the business.

Residents estimate that over the past decade more than a dozen RO-based water purification plants have sprung up in Mangrulpir. Sachin Kulkarni, a social activist from Washim district, explains the reason for the flourishing business: "People depending on groundwater find the taste brackish and unpalatable, while those who have access to tap water supplied by the municipality complain of a strong smell of chlorine and bitter taste."

Halfway across the country in Haryana's Charkhi Dadri district, Jai Bhagwan, a 60-year-old resident of Gothra village, also blames brackish groundwater and irregular water supply for the mushrooming RO plants in the region. He buys a 20-litre water jar every other day from an RO plant in neighbouring village. In Uttar Pradesh's Shravasti district, Virendra Mishra has set up an RO plant in his farm land in Patna Khargaura village. He claims that the district has 75 RO plants. Located just 4 km from the district headquarter of Bhinga, most households in the village have access to tap water. "But it usually has a yellow

QUEST FOR CLEAN WATER

Various methods, technologies to remove impurities from water

Boiling, straining

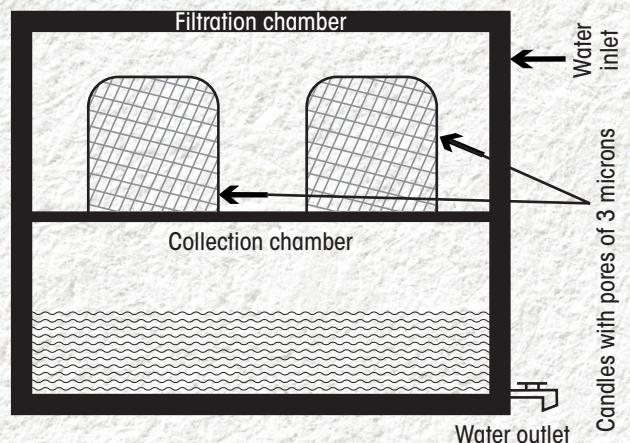
Simplest method to rid water of all impurities and microbes

While boiling kills microbes, straining ensures all solids are removed



Candle filter

Basic purification system that clears drinking water of large sediments



tint. So people have started buying RO water for drinking purposes,” says Rahul Pandey, a resident of Patna Khargaura.

A report “Water Purifiers for Drinking Water” published by the National Institute of Hydrology in Roorkee, Uttarakhand, says that yellowness in water is a sign of excess iron or bacterial infection, which can be eliminated by simply boiling water. However, Rahul says there is a firm belief among residents in the village that the RO water is better for health.

Such belief also appears to be driving up the market of point-of-use domestic RO systems, particularly in urban areas. In 2018, when 45-year-old Rakesh Parmar shifted to his new house in Greater Noida, in the National Capital Region (NCR) of Delhi, he immediately installed an RO system and discarded his carbon-candle water purifier. His housing society receives groundwater and Parmar finds the taste and odour of the water quite palatable. His decision was purely based the suggestion of his neighbours who believe that the region’s groundwater is contaminated with heavy metals. Santosh Kumar Jha, an RO trader from Delhi, tells *Down To Earth* (DTE) that

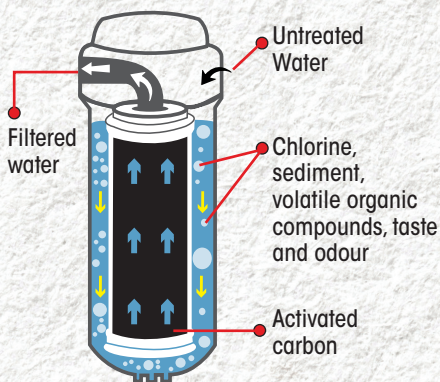
Delhi-NCR accounts for 70 per cent of the RO sold in the country.

According to a 2017 report by Transparency Market Research, a market intelligence company in Pune, of the various water purifier technologies available in India, RO technology has the maximum 37 per cent market share. This share is only going to go up as the country’s water purifier market is poised to double—from US \$3,080.7 million in 2023 to \$6,880.3 million by 2032, as per the “India Water Purifier Market Report” by International Market Analysis Research and Consulting Group (IMARC) Group, a market research firm. Though the market is currently dominated by industry behemoths like Eureka Forbes, Kent RO Systems, Hindustan Unilever, Tata Chemicals, Ion Exchange, Blue Star, AO Smith Corporation, Livpure, LG Corporation and Nasaka, the competition is likely to get stiff due to the introduction of several small and local players.

However, DTE analysis shows that RO water purification business is shrouded in mystery—little is known about the effects of RO water on people’s health and about regulations that govern the industry.

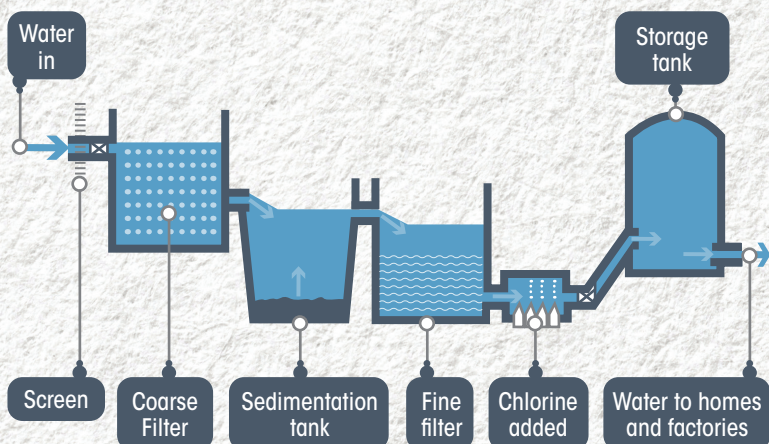
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Filtration, chlorination

Method used by most municipalities, water-supplying authorities. Sedimentation removes solids, while chlorination kills bacteria



PURITY FOR TASTE OR HEALTH?

Water is not merely the combination of hydrogen and oxygen. Depending on its origin and flow path, it contains a number of particles, including microscopic organisms like certain bacteria that are beneficial to our health. Water also contains small amounts of essential minerals like calcium and magnesium that aid in the development of muscles, heart function and production of enzymes, along with sodium, potassium, copper, iron and zinc, says a chapter in the 2021 book *Climate Impacts on Water Resources in India*, written by researchers led by Rajesh Singh from the National Institute of Hydrology in Roorkee. When passing through polluted areas, water becomes the carrier for disease-causing microbes and fertiliser runoff like ammonia and pesticides. At places, groundwater may contain elements like fluorides and heavy metals like chromium, arsenic and lead, which if ingested in larger amounts, can lead to anaemia, liver and kidney ailments and even increase the risk of cancer. The load of minerals and heavy metals in water is called total dissolved solids (TDS)—a high

TDS level is usually responsible for the unpalatable taste and hardness of water.

Among all the water purification systems, RO is fast gaining popularity as it can not only remove impurities and pathogens but also lower the TDS level. A typical RO system consists of a semi permeable membrane, with pores 0.0001 to 0.001 microns in size. As untreated water passes through the membrane under applied external pressure, dissolved salts, impurities and germs are separated—thus providing water that is clean and sweet.

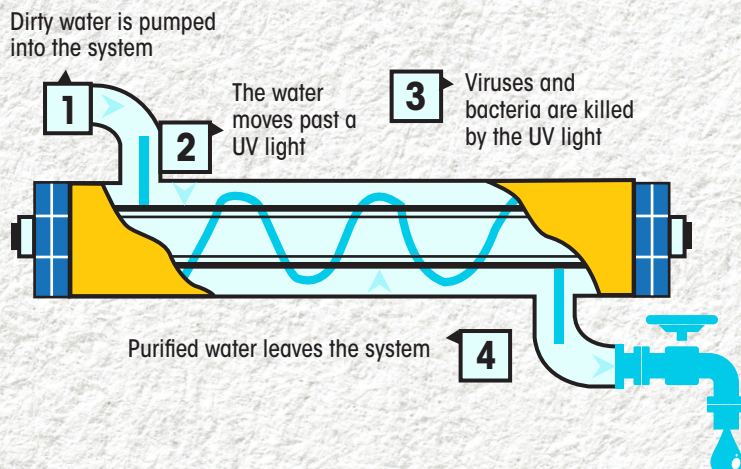
RO systems come with the claim to remove 90-100 per cent of TDS, says Anil Arora, senior consultant at the Institute of Liver Gastroenterology and Pancreatic Biliary Sciences, Sir Ganga Ram Hospital, New Delhi. But in this process, essential minerals like calcium and magnesium are also lost. This could pose a public health threat as most people in the country suffer from micronutrient deficiency, says Arora. He calls for an in-depth study to understand the effects of RO water on health.

In the report “Water Purifiers for Drinking Water”, the researchers from the



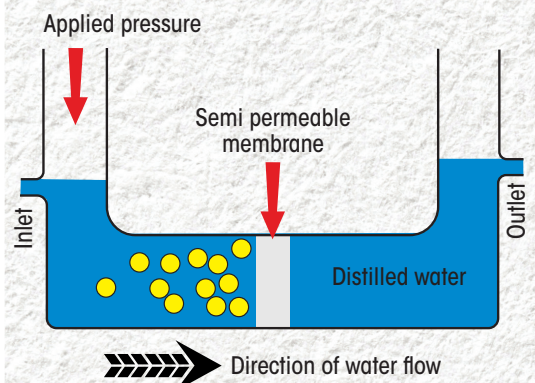
Ultraviolet purification

Targets disease-causing microbes in water, often used in conjunction with sediment-removal systems



Reverse osmosis

Removes nearly all sediments and elements including essential minerals



National Institute of Hydrology in Roorkee tested three brands (names withheld) of RO water and found that in two of them, TDS was less than 50 mg per litre (mg/l). Physiochemical analysis indicated decreased calcium and magnesium levels.

Atul V Maladhure, principal scientist at the Council of Scientific and Industrial Research-National Environmental Engineering Research Institute (CSIR-NEERI) tells DTE that in almost 4,000 places across the country, he has tested the quality of RO water installed in households, and has found the TDS in the range of 25 or 30 mg/l. Such low level of TDS indicates low levels of essential minerals in water.

The Society of Pollution and Environment Conservation Scientists (SPECS), a non-governmental organisation based in Dehradun, has been examining water sources in the city for the past two decades. Brij Mohan Sharma of SPECS tells DTE that in many areas drip candle filters are sufficient to purify water, but due to a huge lack of awareness, people race to install RO systems. Sharma says that in most houses surveyed by SPECS, RO water has TDS of 18 to

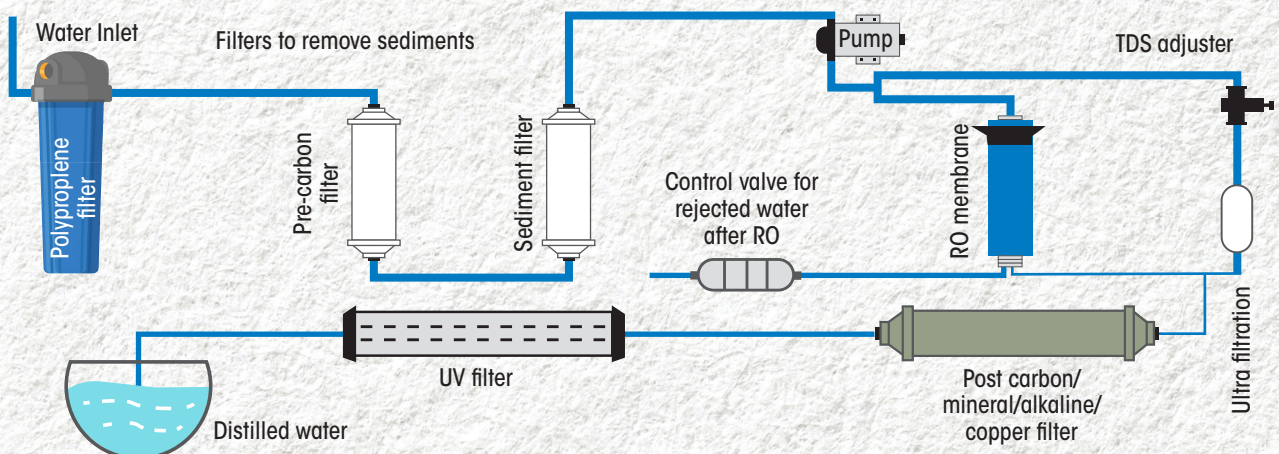
25 mg/l. “This is dead water. It can be used in batteries but not for drinking.”

In a bid to regulate the use of RO purifiers, the National Green Tribunal (NGT) in May 2019, directed the Union environment ministry to issue notification, prohibiting the use of RO where TDS in water is less than 500 mg/l, and wherever RO is permitted, a requirement is laid down for more than 60 per cent recovery of water. The NGT order was based on the report of an expert committee which said that if TDS is less than 500 mg/l, an RO system will not be useful but will result in removing important minerals as well as cause undue wastage of water. In March 2022, the Supreme Court stayed the NGT order, which was challenged by the Water Quality India Association, a non-profit in Mumbai.

In November 2023, the Union environment ministry published the Water Purification System (Regulation of Use) Rules, 2023, which outline guidelines for the proper management, storage, and utilisation of reject water and discarded elements generated by these systems. “The notification has given one year to RO

Multi-stage purification systems

Modern purification systems come with multiple technologies, providing nearly fully distilled water



Sources: Based on communication with scientists, information from company websites



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companies to abide by the rules. The notification also ignores the NGT recommendation to keep the minimum TDS level at 150 mg/l,” says Sharad Tiwari, founder of Friends, a non-profit, which had approached NGT, seeking conservation of potable water by preventing its wastage on account of unnecessary use of RO systems.

In January, DTE filed a Right To Information (RTI) application with five questions for the Indian Council of Medical Research (ICMR): Does the drinking water coming out of RO system have any adverse effect on health? Is there mineral deficiency in the drinking water released from RO? If yes, then what kind of mineral deficiency is observed in the body? The third question was, has any study been done on the effects or side effects of RO water on the body, if yes, can the report be shared? The fourth question was whether RO water has been recommended by the Union health ministry for villages, cities and towns, and finally, whether there is any research on the impact of RO systems on public health.

On February 21, ICMR-National Institute of Nutrition, Hyderabad, gave a single-sentence answer to the questions: “We do not have this information.”

^ Mangrulpir taluka of Maharashtra's Washim district has over a dozen RO water purification plants. Most households depend on water supplied by these plants as they find the taste of groundwater unpalatable. Those who have access to tap water complain of a strong smell of chlorine

Earlier, in August 2023, a study published in *Journal of the Indian Medical Association* by researchers from the Medical College Baroda in Vadodara, says 90-92 per cent of beneficial calcium and magnesium are removed by RO systems. The study analysed the health condition of more than 2,600 urban citizens of Vadodara and found a “statistically significant association between RO water usage and joint pain”. The research also explored a link between RO water and coronary heart disease and back pain, but found no correlation. Its results, however, are preliminary, and it emphasises that more analysis is needed.

Another study in Vadodara, published in *The Egyptian Journal of Internal Medicine* in January 2022, says RO water also causes deficiency of micronutrients. It analyses patients visiting ssg hospital (Sir Sayajirao General hospital) in the city in 2017-18 with symptoms of vitamin B12 deficiency. The results significant association of vegetarian diet, dark complexion, socio-economic status and use of RO water with vitamin B12 deficiency. However, it notes that the results cannot be generalised.

Similar impacts have been reported from other parts of the world. In a 2005



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Norms in place

IS 10500, 2012, by Bureau of Indian Standards, sets acceptable and permissible characteristics of drinking water

CHARACTERISTIC	ACCEPTABLE LIMIT	PERMISSIBLE LIMIT
Colour (Hazen units, max)	5	15
Odour	Agreeable	Agreeable
Taste	Agreeable	Agreeable
Turbidity (nephelometric turbidity units, max)	1	5
pH	6.5 to 8.5	-
Total hardness (as calcium carbonate, mg/L, max)	200	600
Iron (mg/L, max)	0.3	-
Chloride (mg/L, max)	250	1000
Free residual chlorine (mg/L, min)	0.2	1.0
Total dissolved solids (mg/L, max)	500	2000
Calcium (mg/L, max)	75	200
Magnesium (mg/L, max)	30	100
Copper (mg/L, max)	0.05	1.5
Manganese (mg/L, max)	0.1	0.3
Sulphate (mg/L, max)	200	400
Nitrate (mg/L, max)	45	-
Fluoride (mg/L, max)	1.0	1.5
Phenolic compounds (mg/L, max)	0.001	0.002
Mercury (mg/L, max)	0.001	-
Cadmium (mg/L, max)	0.003	-
Selenium (mg/L, max)	0.01	-
Total arsenic (mg/L, max)	0.01	0.05
Cyanide (mg/L, max)	0.05	-
Lead (mg/L, max)	0.01	-
Nickel (mg/L, max)	0.02	-
Anionic detergents (mg/L, max)	0.2	1.0
Total chromium (mg/L, max)	0.05	-
Polynuclear aromatic hydrocarbons (mg/L, max)	0.0001	-
Mineral oil (mg/L, max)	0.5	-
Total alkalinity (as calcium carbonate, mg/L, max)	200	600
Aluminum (mg/L, max)	0.03	0.2
Boron (mg/L, max)	0.5	1.0

Note: Max is maximum, min is minimum

Source: IS 10500:2012 Drinking Water—Specification, Bureau of Indian Standards

paper, the World Health Organization (WHO) highlights cases in the Czech and Slovak populations who began using RO systems in home taps in 2000-02. Within months, the populations complained of cardiovascular disorders, tiredness, weakness or muscular cramps—this indicates acute magnesium (and possibly calcium) deficiency, notes the WHO paper.

Rajesh Singh from the National Institute of Hydrology explains another way water with low TDS can harm health. “Water with low TDS is called ‘hungry water’. Drinking two glasses of such water will not make any immediate difference but will gradually absorb the enzymes and minerals already present in the body. This can cause problems like diarrhoea.”

TOO HIGH OR TOO LOW?

In its drinking water standards issued in 2017, WHO states that TDS in drinking water should be between 600 and 1,000 mg/l. However, it acknowledges that there is little data on whether excess or low TDS has any adverse health effects. Countries in Europe, the US and Canada have set TDS standards at 500 to 600 mg/l. In India, the Bureau of Indian Standards (BIS) has set standards for drinking water since 1991. According to its latest norms in 2012, maximum limit of TDS should be 500 mg/l. However, in the absence of any alternative water source, a TDS limit of 2,000 mg/l is permissible.

To address concerns related to TDS, RO manufacturers introduced TDS controllers (or modulators) and mineral infusion cartridges (or mineralisers) for commercial and residential machines. TDS controllers help set TDS levels in purified water, while mineral cartridges inside the machine infuse specific minerals into water as it passes.

Reduction of TDS also lowers pH, which increases the acidity of water. Hence, newer RO systems have alkaline

INTERVIEW

‘RO a defence against contaminants’

The demand for advanced purification methods in the country is likely to soar, says **Mahesh Gupta**, chairperson of Kent RO Systems

Why has RO become so popular?

RO's popularity stems from its ability to eliminate a wide array of contaminants, including bacteria, viruses, salts, chemicals and other impurities. A report by the National Statistical Office indicates that two-thirds of households in India drink water that is neither safe nor treated. Shockingly, only 8 per cent of households boil water before consumption, a method that is not particularly efficient in removing contaminants.

The Bureau of Indian Standards (BIS), in its water quality report, highlights that conventional water sources in numerous cities, including Delhi, Kolkata, Chennai, Bengaluru, Jaipur and Lucknow, fail to meet the required parameters for safe drinking water. In contrast, RO purifiers provide an effective defence against these contaminants, making them a vital technology in the quest for clean water. Moreover, the versatility of RO purifiers makes them adaptable to various water sources, whether it be groundwater, municipal supply, or alternative sources.

With a growing population, increasing urbanisation and industrial activities contributing to water pollution, the demand for advanced purification methods in the country is likely to soar. The future of RO lies in further technological advancements, increased accessibility and a heightened awareness of the importance of clean water.

How does Kent RO balance minerals, for example, to preserve the properties of copper and zinc, in water?

Reports and studies have indicated that RO water, while effectively removing impurities and contaminants, might also eliminate essential minerals during the purification process. The safety and impact of RO water on health are crucial considerations. To counteract this, Kent has



developed a proprietary Mineral ROTM technology, a multi-stage filtration process that seamlessly combines the prowess of RO, UV (Ultraviolet filtration), UF (Ultrafiltration), and total dissolved solids (TDS) control. By incorporating the Mineral ROTM technology, Kent's RO systems allow users to adjust the TDS level of purified water. This feature empowers users to customise their drinking water, ensuring that it not only meets the highest standards of purity but also retains the essential minerals vital for the human body's

well-being. Kent's RO purifiers and Mineral ROTM technology also aim to preserve essential minerals such as copper and zinc in water. To ascertain the zinc and copper levels in water at a specific location, water quality testing kits or professional laboratory analysis can provide accurate information. Kent holds a substantial position in the water purifier market, boasting a 40 per cent market share in the RO sector. The company's RO systems are particularly popular in the northern regions of India.

How do people who rely on government-supplied tap water address health concerns?

It is essential to recognise potential challenges associated with the municipal water sources. In many instances, the source of the supply remains unknown, leaving consumers unaware of the quality of water they receive. A prevalent issue faced by households is the occurrence of hard water, a concern with implications for health.

In major Indian cities like Delhi-National Capital Region, Mumbai, and Bengaluru, reports highlight the alarming presence of toxic chemicals, including arsenic, lead, and microplastics, necessitating the use of advanced RO technology for effective removal.



cartridges so compounds like bicarbonates and hydrogen oxide can be infused.

While little is known about the beneficial impacts of the TDS controllers, mineral and alkaline cartridges, such “superior technologies” have definitely helped companies keep the prices of their RO elevated. Take Kent, a major RO player, which has four wall-mountable RO systems under the label “Elegant”. The Kent Elegant Lite, whose features read as “RO+UF+TDS Control”, retails for ₹21,000 (UF stands for ultra filtration, an RO-like method of purification). The Kent Elegant Alkaline (RO+UF+TDS Control+Alkaline +UV In-tank) and Elegant Copper (RO +UF+TDS Control+Copper+UV In-tank) are priced at ₹21,500 each, while the Kent Elegant RO purifier (RO+UF+TDS Control+UV In-tank) sells for ₹22,000.

Similarly, Livpure has a Zinger Water Purifier with RO+UV+UF technology and a copper 29 cartridge for ₹20,990, and a similar system for hot water for ₹31,990. The company also has multi-filter alkaline system, Envy, for ₹21,490. These systems also incur recurring expenses as filters, the RO membrane and cartridges need to be periodically changed.

▲
In urban areas with increasing number of households installing point-of-use domestic RO system, RO water appears to have become synonymous with clean water

The RO industry may be due for one new technology, with BIS’s new standards, IS 16240, issued in 2023. According to BIS’s response to an RTI application filed by DTE, the new standards allow addition of minerals in ROs producing 50 litres per hour. Scrutiny of the claims made by RO companies for BIS standard licences shows that no one has so far mentioned artificial addition of minerals to the water.

To understand whether RO water is scrutinised, DTE in January filed an RTI application with various authorities such as the Union health, environment and drinking water ministries, the Central Pollution Control Board (CPCB) and the Delhi Jal Board, asking if the output of domestic RO firms is tested. Only CPCB responded as of March 4, saying that testing the water does not fall within its ambit.

FOCUS ON TOXINS

“It is a myth that RO is the solution to all water problems,” says Ashok Ghosh, chairperson of Mahavir Cancer Sansthan & Research Centre, Patna and former chair of the Bihar State Pollution Control Board. “Most ROs claim that they have installed a mineraliser, but there is no clarity on how

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UNDER THE RADAR

Several RO companies in the country evade drinking water standards and avoid regulation

INDIA MAY have thousands of commercial plants making reverse osmosis (RO) systems, but only a few of them adhere to standards set by government agencies. IS 14543 of the Bureau of Indian Standards (BIS), issued in 2016, asks commercial RO plants to ensure the water they sell is packaged and has all information on manufacturing, production, packaging date as well as expiry and various parameters on every packet, bottle or jar. About 6,328 units in the country are licensed under this standard.

However, these standards do not apply to those plants that sell “open” or unpackaged water, and hence they evade adherence to regulation. Since 2023, authorities in Ghaziabad in the National Capital Region have taken action against 122 such commercial RO plants. Hariom Singh, nodal officer of Ghaziabad District Water Council, tells *Down to Earth* (DTE) that the authorities have taken action only when a complaint is registered, and no steps have

been taken so far to count or survey such plants.

Further, in March 2023, BIS issued a new IS 16240 standard for domestic RO systems with capacity up to 50 litres per hour. Under the new standard, companies selling domestic RO systems have to maintain the purity of drinking water as per IS 10500 of 2012 (the Central Pollution Control Board is yet to frame guidelines for this standard). The 2015 IS 16240 had already mandated that companies selling ROs up to 25-litre capacity must obtain a licence. BIS’ response to a Right To Information application filed by DTE in January 2024 suggests only 38 domestic RO companies with capacity of 50 litres per hour in India have licenses for IS 16240 standard. This means thousands of companies in the market selling non-branded RO systems are not following these licensing procedures. Even among the 38 firms, several sell systems of higher capacity—1,000 litres or more—despite a lack of proper regulation.

much this increases or decreases the mineral level,” he says.

Even if minerals in water could be tested, they are likely not enough to meet humans’ requirement. Rajesh Singh of the National Institute of Hydrology explains that this plays back to a scientific debate on whether water should be considered a source of minerals. “Humans get minerals less from water and more from grains and vegetables. The calcium requirement of an adult human being is fulfilled by two glasses of milk. This is also the reason WHO has not given much importance to the health effects of TDS in water,” he says.

Experts highlight that when assessing the need for RO, emphasis should be on the region and the condition of water. The “Water Purifiers for Drinking Water” report recommends that RO is only necessary in areas where the surface or groundwater is hard. In many places where surface water is the source of drinking water, a combination of candles, activated carbon and UV filters is sufficient for water purification.

BIS, in its 2015 standards IS 16240, cautioned that RO systems cannot be recommended for areas where arsenic level

is above 0.1 mg/l and fluoride is more than 8.0 mg/l. This has, however, been excluded from updated standards in 2023.

Recently, NGT has taken *suo motu* cognisance of the issue of arsenic and fluoride in groundwater in various areas of the country. NGT, on the basis of a report, found that arsenic is present in 230 districts in 25 states of the country, while there is a problem of fluoride in 469 districts of 27 states. But the Central Ground Water Authority has not installed arsenic and fluoride removal plants in these areas.

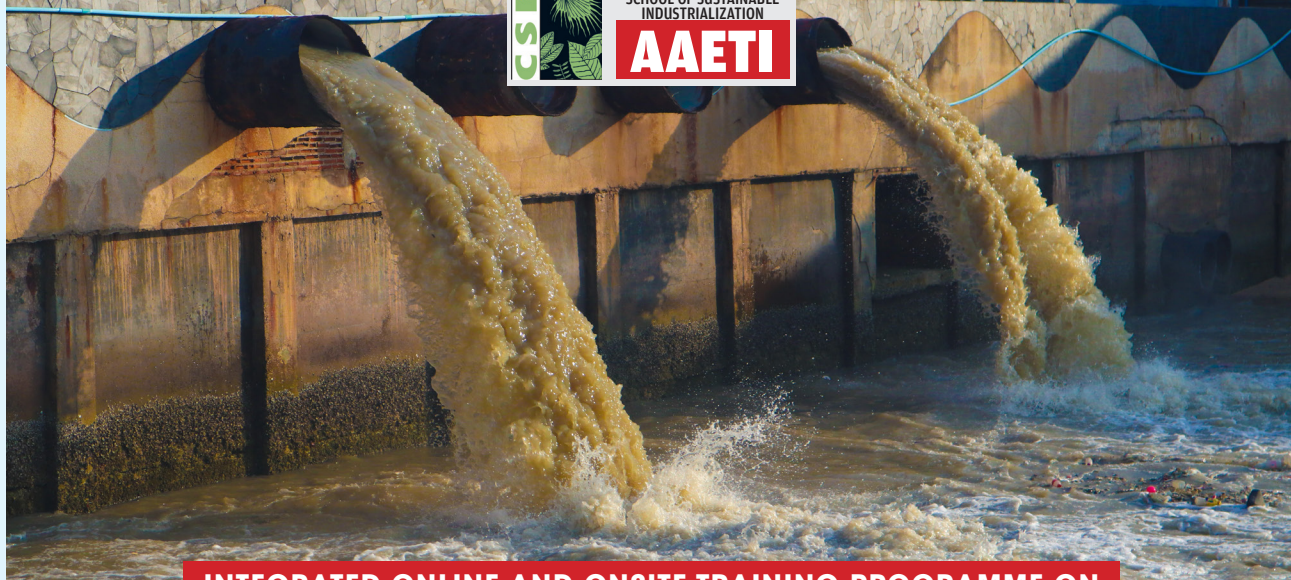
“RO definitely rejects arsenic and fluoride, but if the problem is only of these toxic elements, then we should use selected technology to remove them. For example, in places like Jharkhand and Odisha, people still use hand pumps where there is a problem of arsenic or fluoride. But as soon as water reaches every house through pipes, it will be the responsibility of the corporation or panchayat to supply water as per BIS standards. In such a situation there should be no need for RO,” says Maldhuru of CSIR-NEERI. **DTE**

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Each winter, the wetlands of the Kashmir Valley become a sanctuary for countless migratory birds which arrive in October and stay until March

Flight for life

Migratory bird hunting continues across wetlands in the Kashmir Valley despite a blanket ban since 1972

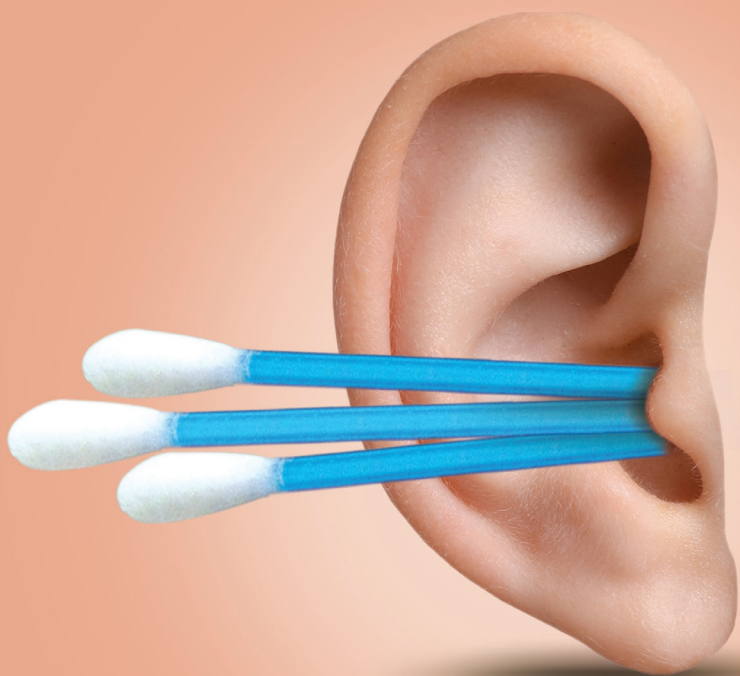
MASHKOORA KHAN
SRINAGAR,
JAMMU AND KASHMIR

AS THE moon rises over the Narkara wetland of Jammu and Kashmir, gunshots shatter the tranquillity of the night. Here, just a stone's throw away from the summer capital city of Srinagar, poachers prowl with their aim set on the migratory birds that grace the region each winter. "We know that it is illegal and impacts the region's fragile ecosystem. But it is our tradition and is lucrative," says a poacher unabashedly, his voice muffled behind the bushes as another bird falls prey to his shot.

The scene unfolding in Narkara offers a glimpse of a longstanding

conflict between heritage, economic desperation and environmental conservation. Each year, thousands of migratory birds, including ducks, geese and cranes, journey thousands of kilometres to find sanctuary in the wetlands of Kashmir. Yet, instead of refuge, they encounter a deadly threat lurking in the shadows—illegal hunting.

For generations, hunting has been deeply woven into the fabric of Kashmiri culture, revered as both a tradition and a means of sustenance. "We feel hunting keeps our tradition alive and we support it," says 45-year-old Mushtaq, a resident of



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Narkara. Poachers tell *Down To Earth* (DTE) that they can earn ₹500 to ₹1,000 for each bird they kill, making it a tempting source of income in a region plagued by limited livelihood opportunities. Narkara residents say that almost 200 birds are killed every day in the wetland during the winter season. The birds are clandestinely traded in local markets and eaten by the residents, despite the existing wildlife protection laws. India banned hunting in 1972 by enacting the Wildlife Protection Act, implemented in Jammu and Kashmir in 1978. Still, serious loopholes remain in its implementation.

WITHOUT A CHANCE

Narkara remains a haven for poachers due to its exclusion from the Ramsar list of wetlands of international importance, resulting in minimal surveillance. However, poaching persists even within some of the Ramsar sites, highlighting a broader challenge to the conservation efforts in the region.

“During a recent raid, the poachers opened fire on us. Several of the team members were injured, and I narrowly escaped the attack. We were defenceless, facing hunters armed with guns, and lacked safety measures. That day, they could have killed us,” says Gulam Hassan, a wildlife warden at Hokersar wetland, one of the six Ramsar wetland sites in Kashmir. Hassan and the team have only one life jacket among them and a private boat to monitor the wetlands. “Forget about guns, we lack even



A lifejacket and a private boat is all that Gulam Hassan, wildlife warden at Kashmir's Hokersar, and his team have to fight heavily armed poachers in the region

basic gear such as boots to venture into the wetland. So instead of fighting the poachers, we are only fighting for our safety,” says Hassan.

Sajid Ahmad, range officer of Hokersar wetland, says that even when raids are conducted and arrests are made, the poachers get out on bail easily and return to the illegal trade.

While Rashid Naqash, the wildlife warden of Jammu and Kashmir, asserts that poaching has ceased in heavily monitored wetlands like Hokersar, he acknowledges the persistent threat in non-surveillance areas. “We have 24x7 surveillance in Ramsar wetlands. We have also established an integrated Management Action Plan for 2022-27 to preserve biodiversity and ensure the balance between wetland ecosystem conservation and livelihood security,” he

says. “Kashmir has over 12,000 wetlands. Most of them have large areas where people illegally carry out paddy cultivation, which attracts the migratory birds. Some poaching might be happening in them, but we do not monitor them,” says Naqash.

HEFTY COST

The toll of poaching extends beyond mere numbers; it disrupts research efforts and threatens the fragile ecosystem. A research project to study the migratory patterns of various bird species in Kashmir in 2017 faced setbacks when satellite tracking devices attached to 200 migratory birds ceased transmitting signals, suspected to be tampered with by poachers.

“Poaching does not harm the environment directly, but it is a major threat to migratory birds. The wetlands are vital for them to rest and prepare for their journey to South India,” says Khursheed Ahmad, principal investigator of the project and head of the division of wildlife sciences at the Sher-e-Kashmir University of Agricultural and Technology.

Intesar Suhail, wildlife warden from Shopian division, tells DTE that in November 2020, Hokersar for the first time recorded two Bewick swans, which are a subspecies of Tundra swans. The pair was later sighted at Dal and Wular lakes. “Soon after, poachers killed the birds. Despite exhaustive efforts, we have not been able to find the poachers,” says Suhail. Bewick swans have not been spotted since, he adds. **DTE** @down2earthindia

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Grab the pathogens, but don't share the drugs

Developing countries led by the African bloc fight for access to vaccine and therapy at WHO talks on pandemic policy

AT THE Geneva headquarters of the World Health Organization (WHO), complicated negotiations are going on to reach consensus on a Pandemic Access and Benefit Sharing (PABS) system. This is central to a new international treaty on pandemic prevention, preparedness and response that WHO hopes to finalise by May this year for the approval of its 194 member-countries.

To many readers, the question of sharing pathogens might seem esoteric. Why is there a need for a PABS system to access pathogens—these are in the main viruses and bacteria along with fungi, protozoa and worms—and to share the benefits from their utilisation? After all, for more than half a century, formal and informal networks have existed for sharing pathogens and influenza viruses have been exchanged freely through WHO.

This is because the landscape was altered by two UN agreements, the Convention on Biological Diversity (CBD) and its supplementary pact, the Nagoya Protocol, which came into force in 1993 and 2014, respectively, and sought to make PABS a vital component of fighting disease. While CBD agreements gave nations sovereign rights over their genetic resources including microorganisms, these did not make access or benefit sharing any easier. For one, they did not guarantee timely access. Delays or refusals for pathogen-sharing have resulted in sub-optimal vaccine composition and diagnostics that were not tailored or tested against the original or new variants of pathogens, according to experts. And missing completely from the picture was any kind of benefit sharing.

The most dramatic example of this remains the case of Indonesia, which in 2007 refused to share H5N1 influenza virus samples after an outbreak of avian flu in the country. The genomic sequence data of H5N1 as with any virus, were needed to track the virus's evolution, develop vaccines and diagnostics and also to monitor drug resistance. While Indonesia has been pilloried for its decision in January 2007 to stop sending H5N1 viruses to WHO's reference labs, much of the blame lies elsewhere, not least with the apex health organisation itself. Indonesia had followed protocol at the start of the problem.

It identified the first human H5N1 cases in July 2005 and sent clinical specimens to two labs in WHO's influenza surveillance network, that is, the US Centers for Disease Control and Prevention (CDC) and Hong Kong University, for confirmation and risk assessment till the end of 2006. In the meantime, scientists started reporting results of analyses of H5N1 viruses without first notifying or getting permission from Indonesia as the rules demanded. Articles were published in scientific journals without including Indonesian experts at a



ILLUSTRATION: YOGENDRA ANAND / CSE

time when a cluster of cases in the country signalled an impending pandemic. This contravened the WHO guidance issued in March 2005 concerning the timely sharing of viruses with pandemic potential. At the time, Indonesia was on edge having reported 81 human cases along with the highest fatality rate of 63 deaths.

Because of fears of a pandemic, Indonesia was also criticised for releasing genetic data only to a small network of research bodies linked to WHO and CDC although that was all it was required to do.

It then decided that all its H5N1 virus sequence data should be deposited in GenBank while it continued to send samples to CDC for risk assessment and generation of seed viruses for vaccine production. In spite of following the protocol it got nothing in return. The final straw was confirmation of reports that an Australian company planned to develop an H5N1 vaccine from a virus that Indonesia had provided to WHO. This "was not only in violation (again) of the WHO guidance for virus sharing (March 2005) but also . . . revealed the unfairness and inequities of the global system," as Indonesian scientists pointed out in a 2008 article in a scientific journal.

In its defence, Indonesia argued that pathogen samples given freely by developing countries are used by companies in rich nations to develop vaccines and other products that are unaffordable in the donor countries. Indonesia justifiably sought a guarantee that it would benefit from products derived from the isolates it was sharing.

This experience of being short-changed has been a recurring theme at WHO negotiations on PABS. In the first of the meetings held by WHO in 2007 to resolve the virus-sharing issue, Thailand was blunt.

Its representative to WHO's executive board meeting was quoted thus: "We are sending our virus [samples] to the rich countries to produce antivirals and vaccines. And when the pandemic occurs, they survive and we die. . . . We are not opposed to the sharing of information and virus [samples], but on the condition that every country will have equal opportunity to get access to vaccine and antivirals if such a pandemic occurs." But no solution has been found yet to address the

breakdown of trust in the global flu surveillance system. A major change was signalled in the early days of the COVID-19 pandemic when China shared on a public database the first genetic sequence data (GSD) of the virus which causes the novel coronavirus disease. The GSD was shared within a couple of weeks of the first cluster of the severe acute respiratory syndrome-coronavirus-2 or SARS-cov-2 being reported (see "Sharing pathogens but not the benefits during pandemics", *Down To Earth*, February 1-15, 2021). The GSD was shared with WHO and GenBank, a partnership of the US, Europe and Japan.

However, the underlying problems persist. At the current round, the eighth meeting of WHO's Intergovernmental Negotiating Body (INB) which ended on March 1, the schism between rich countries and the developing world seemed as wide as ever, with many blaming the WHO secretariat for failing to facilitate impartial negotiations. Over 70 countries from two groups, the Africa Group (48 countries) and Group for Equity (29 countries), have proposed comprehensive text proposals for the PABS system to provide legal and financial certainty, effectiveness and accountability, both in sharing access to pathogens and GSD.

Top among the proposals made in February was the setting up of a WHO-coordinated laboratory network, PABS database and legal devices like Standard Material Transfer Agreements. Ethiopia made it clear what the African member-states want: a multilateral PABS with clear data governance and accountability for sharing pathogens and a "dedicated financing mechanism with inclusive governance".

Intellectual property (IP) is a major sticking point. Developing countries have sought a safeguard that no IP is allowed on "WHO PABS biological material, including its GSD, or parts thereof, in any form including any modified form or for any use". That is a tough nut to crack since scientists from the developed north have always patented data extracted from developing countries without the knowledge of the latter. Can these humps be crossed? The next meeting of INB is on March 18, making the time for convergence extremely short as the pandemic treaty deadline looms closer. [DTE](https://www.downtoearth.org.in) [@ljishnu](https://www.instagram.com/ljishnu)

Delays or refusals for pathogen-sharing have resulted in sub-optimal vaccine composition and diagnostics



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Palette

WHAT'S INSIDE

High leprosy risk in climate-battered, poor districts **P48** / Collective cooperation needed for climate action, says Nitin Desai **P52** / Accounting government support in household income **P58**

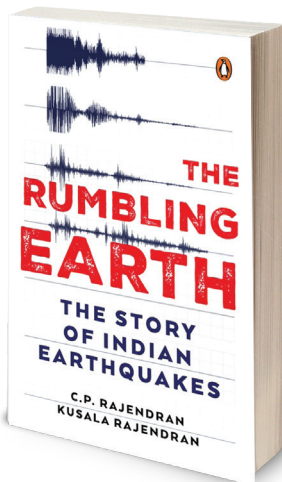
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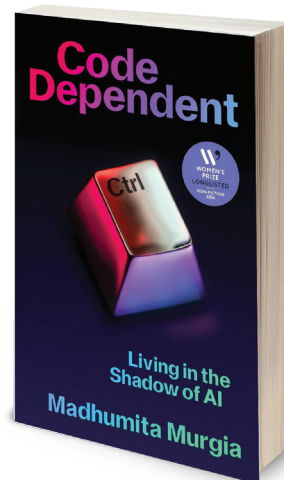


Every family, regardless of species, has a leader—strong, fierce, fearless, and in some cases, female. Matriarchies may not be too common in the wild, but when present, these leaders stop at nothing to ensure the safety and survival of their kin. To celebrate some of these female leaders, National Geographic present a new docuseries, *Queens*. Narrated by actress Angela Bassett, each episode of the series closely follows female leaders of the natural world to see how they nurture and protect their kind—be it lions, bonobos, elephants or even killer whales. *Queens* is now streaming on Disney+ Hotstar.

BOOKS



To humans, an earthquake only brings forth damage and devastation. But in the natural order, the phenomenon can change the topography of the Earth, giving rise to mountains and volcanoes, creating valleys and even deserts. In *The Rumbling Earth: The Story of Indian Earthquakes*, seismologists C P Rajendran and Kusala Rajendran show how tremors have shaped the topography of the country, and how these events, whether in the Himalayas or in the Indian Ocean, can change lives, trade and livelihoods.



Artificial intelligence or AI has a myriad applications. A few lines of code can not just bring healthcare to remote communities, but also warn law enforcement about the "future" crimes they ought to start monitoring. As humankind experiments and innovates to reshape the world through AI, there remains a need to decide morals and controls we want to encode with it, says journalist Madhumita Murgia. In *Code Dependent: Living in the Shadow of AI*, Murgia details how AI influences the world and how we must approach it.

TRIPLE JEOPARDY

Districts with high climate anomalies and socio-economic vulnerabilities also report a greater prevalence of leprosy

SUBHOJIT GOSWAMI AND NIKITA SARAH

SINCE MAY 2020, Suresh Sarkar's family of seven in West Bengal has seen a decline in nutrition intake. First, cyclone Amphan devastated their village, Bamonpukur, in the Sundarbans. Their house, a semi-permanent dwelling made of bamboo and mud, was damaged and all the fish in their pond died, as a nearby embankment had breached and released polluted, saline sea water. This dealt a major blow to Shankar, Suresh's nephew and the sole earner of the family, who used to earn ₹15,000 a month from fishery in the pond. The next year, cyclone Yaas made landfall exactly at the time of high tide. Fields were inundated

with saline water, destroying crops in a region where most people survive on subsistence agriculture and fishery.

Now, Shankar drives a cycle van to transport goods and finds jobs as a construction worker, for just ₹7,000 a month. The family has also incurred debt after building a small *pucca* house post Amphan. This economic disparity has changed food habits; rice and wheat are now staples, and leafy vegetables grown in the wild have replaced eggs, fish and chicken.

The change is especially risky for 50-year-old Suresh, due to his history with leprosy, a bacterial disease that affects motor and sensory

Suresh Sarkar and his family were greatly impacted by heavy cyclone rainfall in Bamonpukur village, West Bengal. This has affected their food security, which is especially risky for Suresh due to his history with leprosy



nerves causing numbness and deformities in the limbs. The infection targets people with protein-energy malnutrition, lack of sanitation and hygiene, and inadequate housing. Suresh was diagnosed twice, in 2003 and in 2011. Although cured, he still faces muscle weakness and chronic fatigue. He fears developing ulcers on his numb hands and feet and cannot even work as a contractual labourer. His 16-year-old son and 18-year-old daughter, genetically susceptible to leprosy, eat barely one nutritious meal a day.

Such stories are found across the Sundarbans, the cyclone capital of India. But this region is not the only one. Several districts face the triple burden of high leprosy prevalence, climate extremes and socio-economic vulnerabilities.

RISK PATTERNS

India has the highest leprosy prevalence in the world, contributing about 55 per cent of the global cases reported each year. Historically, seven states—Bihar, Chhattisgarh, Jharkhand, Maharashtra, Odisha, Uttar Pradesh and West Bengal—contribute 70-80 per cent of the cases, as per data with the Directorate General of Health Services (DGHS) under the Union Ministry of Health and Family Welfare.

“Climate Vulnerability Assessment for Adaptation Planning in India Using a Common Framework”, a report released by the Department of Science and Technology in 2021, identifies states highly vulnerable to climate change. An analysis of the report by The Leprosy Mission Trust of India finds that these same states have a high endemicity of leprosy and other neglected tropical diseases (NTDs) such as lymphatic filariasis, a vector-borne infection that causes swelling in the legs, arms and genitalia.

Definite links

Districts vulnerable to climate and faring poorly in nutritional intake and other health indicators report a high leprosy prevalence

STATE	DISTRICTS	LEPROSY PREVALENCE RATE (PER 10,000 POPULATION)	CLIMATE VULNERABILITY RANK (OUT OF 612 DISTRICTS)	SHARE OF POPULATION MULTI-Dimensionally POOR (IN %)
Bihar	Kishanganj	2.32	8	64.75
	Supaul	1.11	53	64.1
	Sitamarhi	0.95	36	63.46
Chhattisgarh	Surguja	0.99	419	47.37
	Bastar	1.71	NA	46.95
	Jashpur	1.10	NA	45.85
	Bijapur	1.54	427	41.2
	Kabirdham	1.94	474	39.6
	Korba	1.52	413	31.86
	Raigarh	4.40	263	30.82
	Mahasamund	3.34	328	29.85
	Bilaspur	1.99	273	25.66
Maharashtra	Nandurbar	2.46	50	52.12
	Dhule	1.79	101	33.23
	Yavatmal	1.4	167	23.54
Odisha	Nabarangapur	1.72	74	59.32
	Malkangiri	0.45	100	58.71
	Koraput	0.89	55	51.14
	Kalahandi	1.22	NA	47.28
	Mayurbhanj	1.05	NA	44.90
	Nuapada	3.21	14	38
Uttar Pradesh	Shravasti	1.24	58	74.38
	Bahraich	0.72	30	71.88
	Kaushambi	0.61	358	56.06
	Lakhimpur Kheri	0.98	109	59.95
	Sitapur	0.98	188	56.83
West Bengal	Purulia	1.33	31	49.69
	Birbhum	0.9	161	27.6
	Bankura	0.8	146	27.4
	Jhargram	1.45	57	23.82

Source: The Leprosy Mission Trust of India's analysis of data from "Climate Vulnerability Assessment for Adaptation Planning in India Using a Common Framework", 2021, "India National Multidimensional Poverty Index 2021" and figures from the Central Leprosy Division

Further, a study of NITI Aayog's "India National Multidimensional Poverty Index 2021", which measures the parameters of health, education and living standards, shows that the same districts that fare poorly in nutrition intake and other indicators are also co-endemic for leprosy and other NTDs.

Take Bihar, for example. On average, the state reports about 15 per cent of the new leprosy cases in India each year, as per the Central Leprosy Division. More than half (51.9 per cent) of its population is multidimensionally poor. In its three northern districts, Sitamarhi, Supaul and Kishanganj, the leprosy prevalence rate is up to 2.32 per 10,000 population, as against the national average of 0.57. Some 63-65 per cent of people in these districts live in multidimensional poverty.

In some districts of the state, up to 75 per cent of leprosy cases are multibacillary (MB), in which the patient has high bacterial load and can lead to more transmission. They are also at greater risk of developing reactions and consequent nerve damage. MB leprosy cases develop in patients with reduced or impaired cell-mediated immune reaction, caused due to protein-energy malnutrition, says a 2017 study by researchers from Brazil and the US, published in *PLOS Neglected Tropical Diseases*.

This calls attention to Bihar's food security landscape. Some 31 of its 38 districts are among the top 25 per cent most climate-vulnerable districts. Around 6.8 million hectares (76 per cent of north and 73 per cent of south Bihar) of the state's 9.4 million hectares is flood-prone. Extended dry spells in summer, erratic monsoon rainfall, and abnormal rise and fall in temperature during the rabi sowing season in winter causes high variability in

foodgrain yield, especially in diverse and nutritious crops, which can affect intake of essential nutrients.

Bihar's neighbour Uttar Pradesh shows a similar cause-and-effect relationship. In 2020, the state reported 15,484 new leprosy cases, the third highest in the country. In Shravasti and Bahraich districts, where it is highly prevalent, over 70 per cent of the population lives in multidimensional poverty. The districts also report other NTDs.

About 31.2 per cent of the population in the state does not have adequate sanitation facilities, according to the fifth National Family Health Survey for 2019-21. Out-of-pocket expenditure accounts for 72.6 per cent of the state's total

DISTRICTS IN CHHATTISGARH, ODISHA AND MAHARASHTRA WITH HIGH ENDEMICITY OF LEPROSY AND HIGH PROPORTION OF TRIBAL POPULATIONS SHUTTLE BETWEEN DROUGHTS AND FLOODS

health expenditure—much higher than the national average of 48.8 per cent—forcing households to compromise on food security.

In terms of climate vulnerability, 69 per cent of districts in Uttar Pradesh are exposed to events like floods and droughts, according to a 2021 report by the Council of Energy, Environment and Water. Over the past two decades, it has seen an increase in incidence of extremely high temperatures and torrential rain. Its agricultural productivity is predicted to decline by up to 25 per cent in irrigated areas and up to 50 per cent in rain-fed areas, as per the "Uttar Pradesh State Action Plan on Climate Change", 2017.

Similar patterns emerge in Chhattisgarh, Odisha and Maharashtra. Districts with high endemicity of leprosy and high proportion of tribal populations

shuttle between droughts and floods. This impacts agriculture and allied sectors, leaving marginal farmers and tribal people who rely on rain-fed monocrop agriculture or forest produce, the most vulnerable to the impact of climate change.

FOCUS ON HEALTH

The National Leprosy Eradication Programme has two specific targets for 2027: interruption of transmission at district level, or zero occurrence of new child cases for at least five consecutive years; and elimination of leprosy as a disease, or no new cases reported for at least three consecutive years. For this, we need interventions on supply and demand sides of health systems.

It is important for the at-risk population to be able to prioritise health. This is not possible when exposure to climate anomalies raises concerns over food insecurity, homelessness and debts. There is a need to move away from national and focus on block-level vulnerability assessment through hyperlocal epidemiological and meteorological data.

On the supply side, frontline health workers must be sensitised on the linkages between climate and health and build their capacity to identify risks and plan preventive interventions. Implementing a holistic One Health approach towards leprosy elimination, which goes beyond only the clinical aspects of the disease and focuses on intersectoral coordination between the departments of health, tribal affairs, agriculture and environment is needed. **DTE**

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(Subhojit Goswami is senior programme manager and Nikita Sarah is head of advocacy and communications at The Leprosy Mission Trust India)



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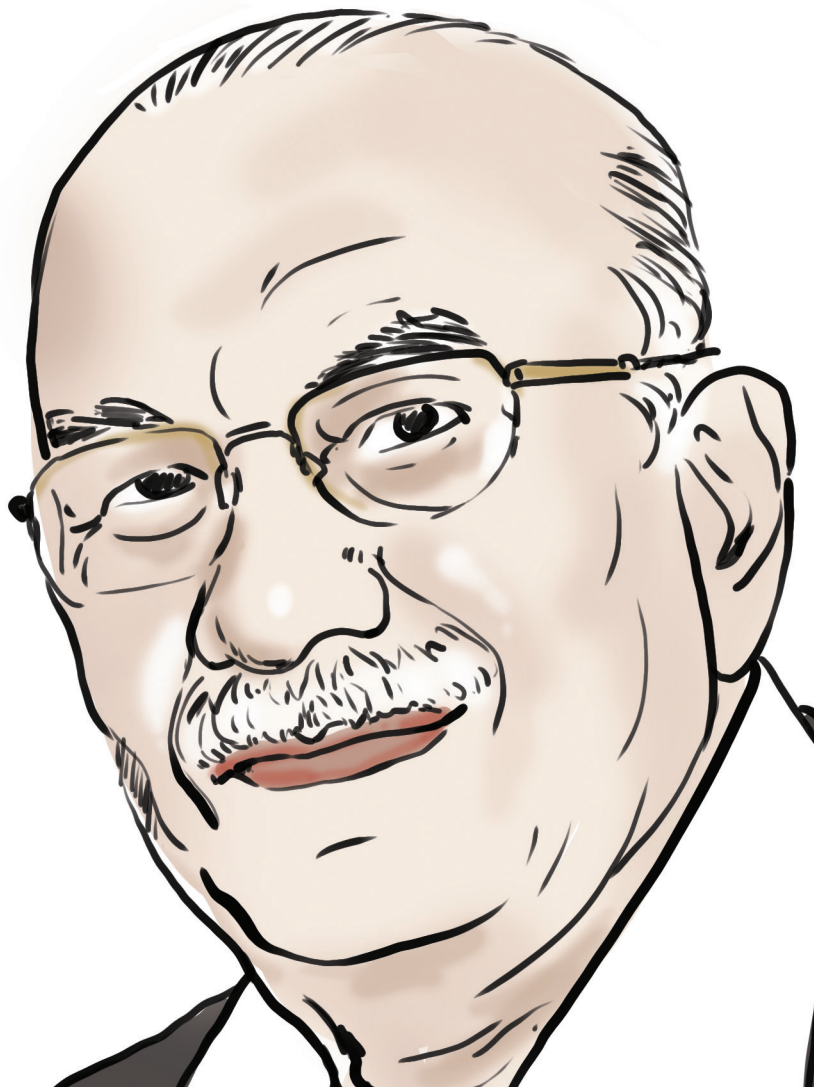
'Environment ministries in most countries are still led by junior politicians'

The concept of sustainable development emerged from the Brundtland Commission (1984-87) to bridge environmental and developmental concerns. Championed by economist **NITIN DESAI**, whose role in climate negotiations during the 1980s and 1990s helped propel its prominence, the notion underscores the imperative of meeting present needs while safeguarding the interests of future generations. Its resonance has transcended boundaries, appealing to a diverse spectrum of stakeholders. Despite its historical roots, sustainable development continues to evolve in global policy discourse. Desai, who was the deputy secretary general of the Rio Earth Summit of 1992 that provided a road map for international action on environmental and developmental issues in the 21st century, tells **RAJIT SENGUPTA** about the evolution of climate negotiations over time and the hurdles impeding their progress. Excerpts:

Was there political consensus on climate change during the Rio Earth Summit in 1992?

In 1992, when the climate convention was signed, there were countries like the US that were skeptical about whether there was human-induced climate change. The reason for this skepticism was that the first report of the UN Intergovernmental Panel on Climate Change in 1990 did not openly attribute

ILLUSTRATION: YOGENDRA ANAND / CSE



climate change to human actions—a fact that it acknowledged in its third report in 2001. However, times have changed. Today, there is a consensus that climate change is a result of human actions, necessitating changes in how humans interact with nature. Even corporations like Exxon have shifted towards acknowledging and taking action against climate change, indicating a broadening consensus.

Has the global consensus translated into climate action?

While progress has been made, particularly in the expansion of renewable energy, action remains inadequate. The dramatic reduction in solar power costs, largely driven by China's initiatives, has been a notable advancement. However, efforts in energy efficiency and other areas fall short.

A significant shortfall lies the world's unwillingness to discuss climate justice. The prevailing notion is that developed countries, having contributed significantly to the accumulation of greenhouse gases, bear the primary responsibility for addressing climate change. Even if we set aside historical emissions and focus on future projections, the outlook remains concerning. Between 2020 and 2050, scientists estimate that governments worldwide can emit around 500 billion tonnes of carbon dioxide. When we distribute this emission allowance per capita over the next 30 years, it averages to approximately 1.8 tonnes per person annually. If we compare the projected emissions per capita for China and the US to what they should be, assuming they meet their 2030 targets and reach net-zero emissions, we find a staggering disparity—four times higher than the recommended rate. Conversely, India's emissions per capita align more closely with the prescribed limit. Europe, while worse off than India, is also close to the target. The crux of the matter lies with the two major emitters. The failure to address this stark contrast in emissions presents a significant shortfall in climate justice.

At the global level, cooperation remains elusive.

Instead, we rely on individual countries to declare their actions. This fragmented approach is inadequate for addressing the collective challenge of climate change.

COLLECTIVE COOPERATION IS MISSING AT THE GLOBAL LEVEL. INSTEAD, WE RELY ON INDIVIDUAL COUNTRIES TO DECLARE THEIR ACTIONS. THIS FRAGMENTED APPROACH IS INADEQUATE

Do you believe sustainable development has been sufficiently popularised?

Sustainable development has become a buzzword, but its integration into various sectors, particularly concerning environmental protection and livelihood sustainability, remains incomplete. Development efforts must consider environmental impacts and the well-being of communities dependent on natural resources. Sustainable development should be framed as promoting sustainable livelihoods, connecting present needs with long-term environmental goals. This is important as most impacts of climate change, such as sea-level rise, is long-term and communities will only protect natural resources if it benefits them right now.

Do you think the world needs a new agreement on climate change, similar to the one reached at Rio Summit?

Not immediately. The current political climate lacks the necessary commitment to address environmental challenges comprehensively. While annual climate conferences occur, significant leadership is required to drive meaningful progress. Countries like India and China could potentially take the lead, but broader international cooperation is necessary.

How do you envision future diplomatic efforts regarding environmental issues?

Diplomatic efforts must integrate environmental considerations across all sectors consistently. Currently, there's a fragmentation between environmental negotiations and other diplomatic endeavours like trade and finance. Prioritising environmental concerns alongside economic and political interests is essential. Another significant challenge lies in the leadership of environmental ministries within most countries. Often, these ministries are led by inexperienced politicians, lacking involvement in decision-making processes. We must strive for a paradigm shift where the insights of environmental ministries are valued on par with other key institutions like central banks. It is essential to foster a culture that acknowledges the role of environmental governance within the broader framework of policymaking. [DTE](https://www.downtoearth.org.in)

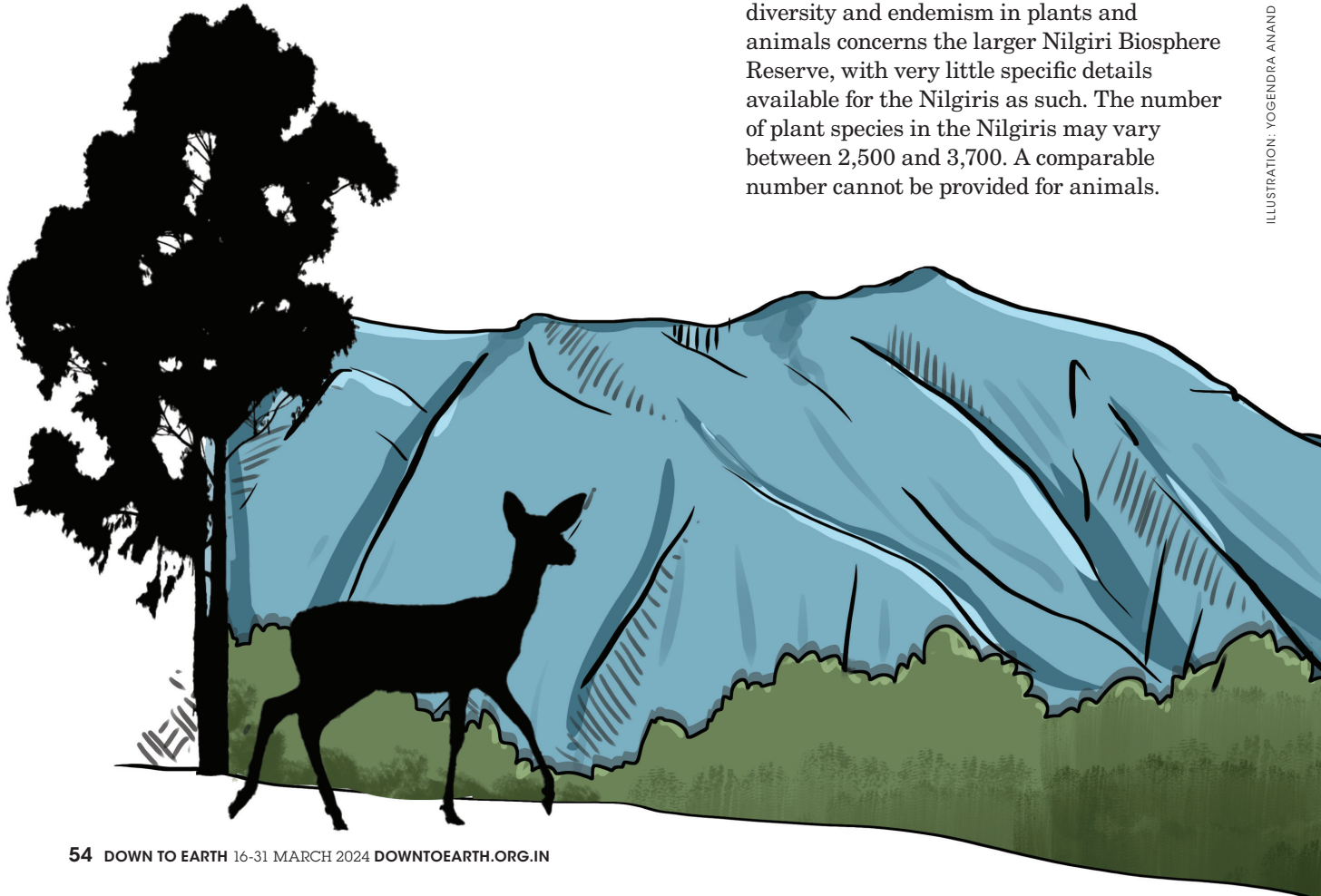
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Walk in the hills

Two centuries ago, British officer John Sullivan created India's first hill station, Ootacamund or Ooty, in the Nilgiri hills. This region is now a well-researched landscape, with its unique flora and fauna, communities and traditional practices featuring extensively in literature. Yet, there is more to explore, shows *The Nilgiri Hills*, edited by anthropologist Paul Hockings. Its various chapters do not just discuss the culture and biodiversity of the Nilgiris, but also how it has changed with colonisation and environmental shifts. Excerpts:

THE GEOCLIMATIC variability is the primary reason for the diversification of vegetation types in the Nilgiris. While there are mosaics of scrub and tree savannah in the lower and drier areas, the vegetation changes to denser dry deciduous forests, moist deciduous forests, and wet evergreen forests along the elevation and rainfall gradients. At elevations above 1,500 m ASL [above sea level], one finds the unique complex of sholas and grasslands. This vegetation type, which is characteristic of the higher elevation hills in the Western Ghats, is best developed and preserved in the Nilgiris.

Diversity of vegetation has underlain the richness of plants and animals in the landscape. Exactly how many species of plants and animals are found in the Nilgiris can at best remain a matter of guesswork. Much of the existing knowledge on the diversity and endemism in plants and animals concerns the larger Nilgiri Biosphere Reserve, with very little specific details available for the Nilgiris as such. The number of plant species in the Nilgiris may vary between 2,500 and 3,700. A comparable number cannot be provided for animals.



However, a study of the birds of the Mudumalai Tiger Reserve by the Salim Ali Centre for Ornithology and Natural History listed 266 species. Yet another study by the Bombay Natural History Society of the birds of the Nilgiri Plateau suggests the presence there of 192 species. Consolidation of the results of the two studies has provided a comprehensive list of nearly 350 species of birds for the Nilgiris District.

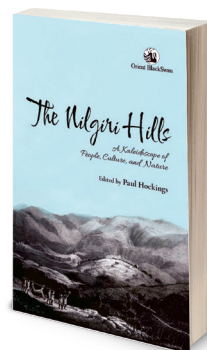
Precise details of other groups of animals are not available. However, one can scale up the figures based on certain benchmark numbers available for the Mudumalai Tiger Reserve. That 321km² Reserve is home to fifty-five species of mammals, fifty-eight species of fish, twenty-one species of amphibians, and thirty-four species of reptiles.

Despite the lacunae in the knowledge of biodiversity for the landscape, it is important to realise that the Nilgiris is biologically the most well-explored area in the Western Ghats. This

claim can be substantiated by the fact that several species of animals endemic to the Western Ghats have been named in English using the title Nilgiri. Thus we have among birds the Nilgiri Wood Pigeon, Nilgiri Laughing Thrush, Nilgiri Thrush, Nilgiri Flycatcher, Nilgiri Flowerpecker, Nilgiri Shortwing, and Nilgiri Pipit. Among mammals, there are the Nilgiri Tahr, Nilgiri Langur, and Nilgiri Marten. Further, among the lower vertebrates, we have the Nilgiri Cricket Frog (amphibian), Nilgiri Salea (reptile), and Nilgiri Danio (fish). More importantly, the first Biosphere Reserve in India has been named after the Nilgiris: the Nilgiri Biosphere Reserve was established in 1986 to conserve the biodiversity and cultural diversity of the extended landscape.

The rich biodiversity of the landscape is of relevance not only to the Western Ghats, but also to the nation as a whole. As a result, we currently have two important protected areas of the landscape, the Mudumalai Tiger Reserve and the Mukurti National Park. They are not only representative of the landscape's heterogeneity and biodiversity, but are also home to a handful of endemic and endangered animals. The Mudumalai Tiger Reserve is home to around sixty tigers and some 800 elephants. It is also one of the last habitats in the state for the critically endangered White-rumped Vulture and the Indian Vulture.

The Mukurti National Park is representative of the high-elevation ecosystem complexes in the Western Ghats, and is one of the mainstays of the endemic and endangered Nilgiri Tahr. A 2004 census reported between 200 and 250 Tahr in this National Park.



The Nilgiri Hills: A Kaleidoscope of People, Culture, and Nature

Edited by Paul Hockings

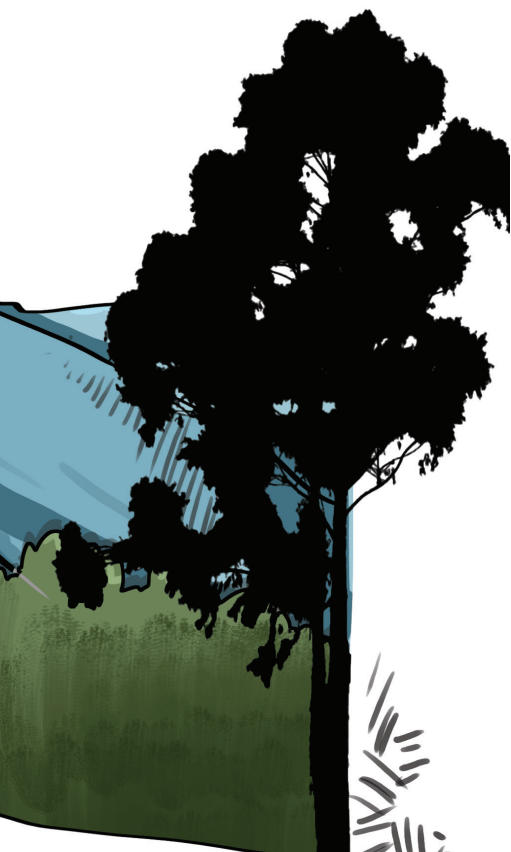
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Besides, the protected area is home to endemic plants and other endemic animals, including birds, amphibians, and reptiles.

The need to conserve the rich biodiversity of the Nilgiris was first felt in the early 1870s. It was at this time that unregulated hunting of wildlife had led to a drastic reduction in the population of many species; and this was particularly true for the Nilgiri Tahr, which had reached the brink of extinction in the Nilgiris 150 years ago. To address the issue of wildlife conservation, the erstwhile Nilgiri Game Association was established in 1877. Soon after this, in 1879, the Nilgiri Game and Fish Preservation Act was passed by the then Madras government. Despite these early interventions, conservation challenges in the Nilgiris have only been on the increase.

Once the British established colonies in the landscape, vast areas of forest were cleared to accommodate commercial agriculture and plantations, especially tea. The British



considered the grasslands as ‘wastelands’ and tried to ‘improve’ the productivity of these sensitive habitats by planting exotic trees. Eucalyptus and another Australian species, Wattle, were introduced into the grasslands in the 1840s, and by 1860, Cinchona was being cultivated locally too. Over the years, Pine and other non-native tree species were introduced into the landscape, upsetting the fragile ecological balance of the shola–grassland ecosystem.

The introduction of non-native plants did not stop with trees. Tea and coffee were introduced in the 1830s. Many other species of garden plants were brought in from Europe by the colonisers and planted. Most of these species naturalised in the landscape, thanks to the local climate. Some of the species have become invasive—for example, broom. Botanists estimate that there may be between 200 and 300 such exotic plant species in the Nilgiri landscape today.

Of all the introduced plants, the Wattle and Lantana have become devastating and have led to large-scale degradation of the natural hill ecosystem. While Lantana has emerged as a major cause for habitat degradation and fire in the drier habitats, Wattle has usurped extensive grasslands and has even invaded shola forests locally. Controlling the spread of these two species has cost the government huge sums of money annually for years now.

Centuries before the British set foot on the Nilgiris, there were tribes who had migrated into the landscape. It is generally

accepted that the earliest of these immigrants were the Todas and the Kurumbas. Todas brought with them the water buffalo. Due to their religious beliefs, some individual buffalo were set free in the wild and they have since contributed to the now significant population of feral buffaloes in the Nilgiris. These feral buffaloes look almost like the Wild Buffaloes of Southeast Asia. While some ecologists consider the feral buffalo invasive, the actual impact of the species on the local ecosystem

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needs to be studied in detail.

Loss of grasslands has endangered a local bird, the Nilgiri Pipit. The Nilgiri Tahr, which is totally dependent on this habitat, is also endangered. Although their population recovered well from the bottleneck in the 1870s, the numbers are still fluctuating. The government has launched several programmes to restore the grasslands. Restoration of grasslands in the Nilgiris remains, however, one of the biggest conservation challenges of the twenty-first century.

In an attempt to address the conservation challenges in the District, the government established the two protected areas in Mudumalai and Mukurti, as mentioned. On a broader scale,

the entire Nilgiri landscape has been brought into the fold of the Nilgiri Biosphere Reserve, with the two protected areas as a part of the ‘Core Zone’. The Biosphere Reserve concept was first conceived and brought into practice by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) in the 1970s under the banner of a ‘Man Biosphere Programme’. It is a global programme wherein conservation, research, and people’s livelihoods are

simultaneously addressed in vast natural areas. There are currently eighteen Biosphere Reserves in India, of which the Nilgiri Biosphere Reserve was the first to be declared, and also the first one in India to be included in UNESCO’s global list of Biosphere Reserves.

As many as ten hydroelectric projects are functioning in the Nilgiris. The dams have not only destroyed extensive forests and grasslands, but have also changed the character of the many streams and rivers that flow across the landscape. Dams and the associated infrastructure for conveying water to the power-generating units have led to the fragmentation of habitats, hindering the movement of wildlife like elephants and other large mammals. Dams have become a permanent blot on the Nilgiri landscape. **DTI**

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(Excerpted from The Nilgiri Hills: A Kaleidoscope of People, Culture, and Nature edited by Paul Hockings, with permission from Orient BlackSwan)



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Much ado about nothing

AFTER A gap of 12 years, the National Sample Survey Office (NSSO) conducted a Household Consumption Expenditure Survey (HCES) spanning from August 2022 to July 2023. The Union Ministry of Statistics and Programme Implementation released the survey data on February 4. According to the latest findings, the monthly per capita consumption expenditure (MPCE) stands at ₹3,773 for rural areas and ₹6,459 for urban areas, calculated at current prices. This translates to a daily expenditure of ₹126 for rural Indians and ₹215 for urban dwellers on expenses ranging from food, medical care, education, childcare, transportation, to clothing, among others. Notably, the bottom 5 per cent of rural India spends ₹45 per day, while the corresponding figure for urban areas is ₹67. Furthermore, the top 5 per cent of rural households spend nearly eight times more than the bottom 5 per cent.

The HCES data serves as the base for assessing the income poverty level in the country. However, there is currently no official estimation of poverty based on this survey. Previously, the Planning Commission utilised HCES data for poverty estimation, but since its dissolution, its successor, NITI Aayog, has not undertaken this task nor established a new national poverty line. Compounding this issue, the latest survey round presents a challenge as it deviates from the previous nine surveys conducted between 1972 and 2012, with changes in the items covered, questionnaire structure, periodicity of data collection and mode of data collection.

B V R Subrahmanyam, chief executive officer of NITI Aayog, has still released a widely reported “personal assessment” indicating that, based on the new consumption expenditure data, poverty levels are below 10 per cent. Subrahmanyam derives this estimation by considering the ₹32 per day poverty line established in 2011-2012, updated to ₹60 per day to account for inflation trends. Applying this revised poverty line to the

latest consumption expenditure figures, he inferred a poverty rate below 10 per cent.

In recent months, various estimates of income poverty, primarily conducted by individual economists, have suggested near-zero levels of extreme poverty. One notable aspect of these estimates is the inclusion of the value of free services and subsidies provided by the government in household income calculations. Subrahmanyam further elaborates on his assessment, suggesting that when accounting for the monetised value of free food grains and subsidies received by households, the poverty level was below 5 per cent, signaling a significant reduction in destitution and deprivation.

The NSSO survey typically presents two sets of MPCE data. One incorporating the imputed value of consumption from home-grown or

How much does the government support account for household's consumption expenditure?

produced stock, gifts, loans, free collection, and goods exchanged for services. This is widely accepted as the MPCE. The other incorporates the value of items received

through government schemes like free food grains under the public distribution scheme and non-food items like laptops and mobile phones. Many economists cite the latter set as a substantial addition to household income, thus reducing income poverty.

An examination of the benefits received from the aforementioned sources and their impact on consumption expenditure reveals that with the imputation of all such free or subsidised items, the latest survey places the MPCE at ₹3,860 for rural areas and ₹6,521 for urban areas, at current prices. Comparatively, this indicates that rural individuals receive only ₹87 per month and urban individuals ₹62 through such “freebies”. Percentage-wise, these additions account for just 2.25 per cent of rural consumption expenditure and 1.33 per cent of urban consumption expenditure. Thus, the question arises: is this fuss warranted, or is it “Much Ado about Nothing”? [DTE](#) [@richiemaha](#)

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