

1-15 AUGUST, 2019

DownToEarth

FORTNIGHTLY ON POLITICS OF DEVELOPMENT, ENVIRONMENT AND HEALTH

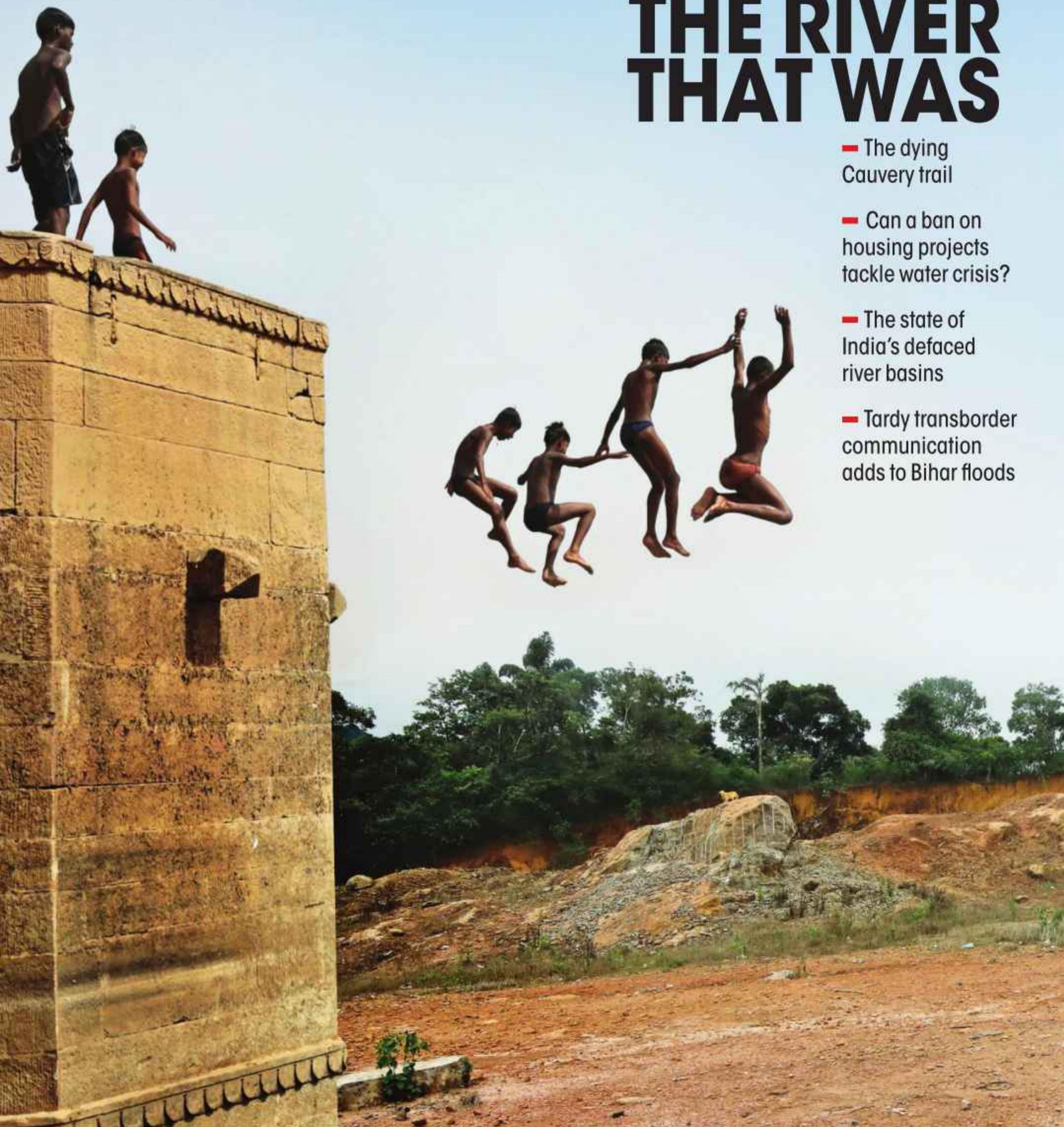
Subscriber copy, not for resale

₹60.00

SPECIAL COVERAGE

THE RIVER THAT WAS

- The dying Cauvery trail
- Can a ban on housing projects tackle water crisis?
- The state of India's defaced river basins
- Tardy transborder communication adds to Bihar floods

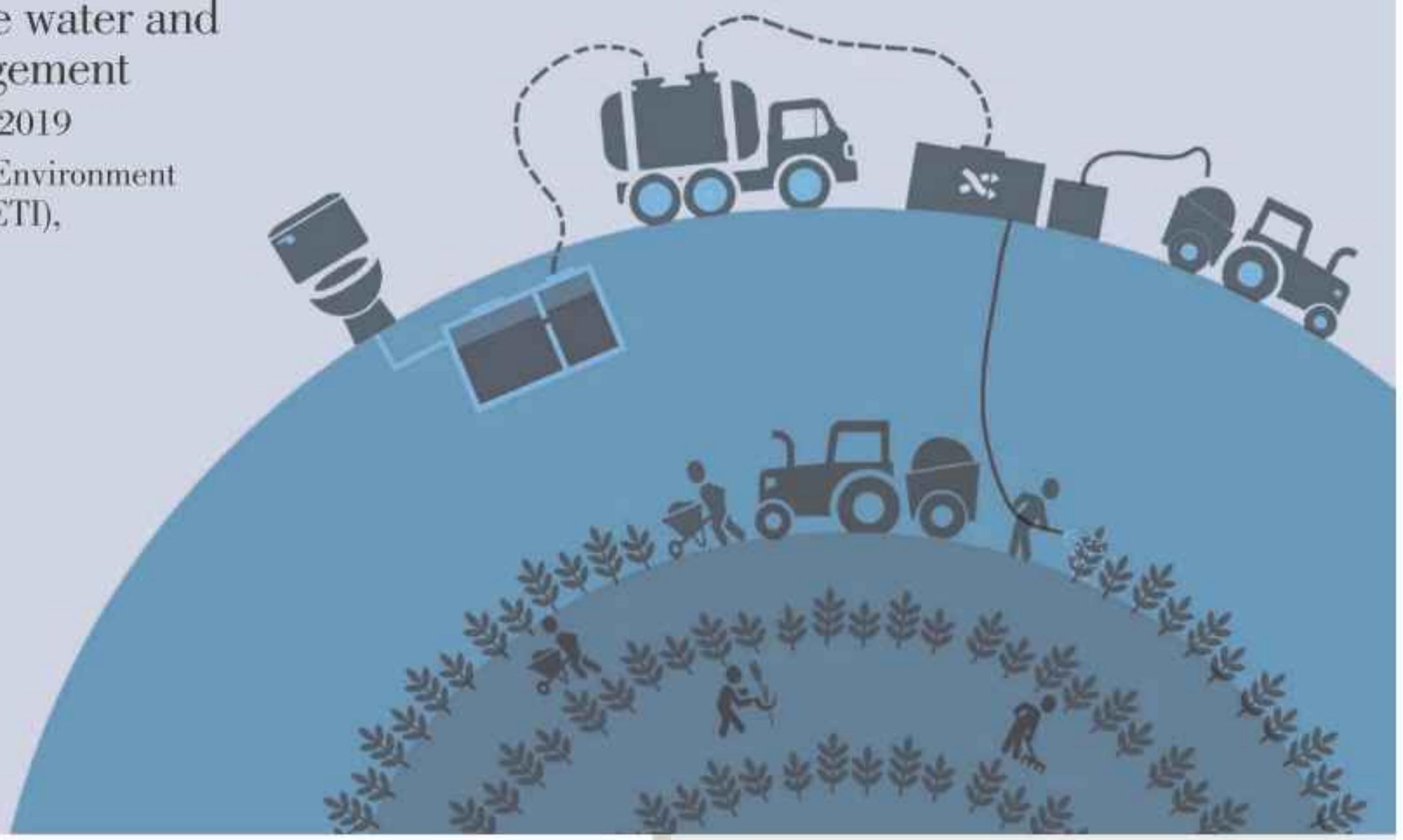


TRAINING PROGRAMME ON SANITATION SAFETY PLANNING (SSP)

Towards citywide water and sanitation management

Date: September 3-6, 2019

Venue: Anil Agarwal Environment Training Institute (AAETI), Nimli, Rajasthan



Background

The main objective of sanitation interventions is to protect and enhance public health. Currently, several measures are being undertaken to improve the sanitation status of developing countries; however most of these initiatives exclude public health. Rather, the focus is on the “hardware” aspect of sanitation which primarily includes the provision of services and infrastructure. The planning processes to improve sanitation in most countries fail to integrate “public health” across all spheres. Present interventions call for a convergence of regulatory and institutional aspects to approach sanitation from a holistic perspective which integrates service provision and infrastructure with public health.

Understanding this gap, the School of Water and Waste, AAETI is organising a four day training programme on **Sanitation Safety Planning (SSP)**. This training envisages to establish a pool of national and international sanitation players who will have in-depth understanding of SSP key concepts and principles.

HOW TO APPLY?

For filling the application form for registration and scholarship, please visit
<https://www.cseindia.org/training-ssp-2019-9497>

Day 1

Tools, approaches and relevance of SSP (including field visit)

Day 2

Describe the sanitation system

Day 3

Hazards, exposure risks and incremental improvement plans for SSP

Day 4

Control measures and review plans for citywide water and sanitation management

COURSE FEES:

For Indian Participant

₹20,400

(for double occupancy accommodation)

₹26,400

(for single occupancy accommodation)

For International Participant

\$590

(for double occupancy accommodation)

\$760

(for single occupancy accommodation)

FELLOWSHIP AVAILABLE!

Full fellowship includes travel, boarding & lodging costs and training fees & kit.

Part fellowship includes boarding & lodging costs and training fees & kit.

Only short-listed candidates will be informed

COURSE COORDINATOR

Dr. Mahreen Matto

Email: mahreen@cseindia.org
+91-11-40616000 (Ext: 257)

Dr. Suresh Kumar Rohilla

Senior Director and Academic Director
Email: srohilla@cseindia.org

Ode to consensus politics: Sheilaji

SHEILA DIKSHIT, Delhi's three-time chief minister who passed away on July 21, must be remembered for her politics of consensus and negotiated settlement. This is even more important in today's age of highly polarised politics. It is also important if we consider that the objective of a government is to ensure delivery of development. And this is not possible without the ability to manage the contested realities and to seek a collaborative solution. For me, this is the real art of politics. Unfortunately, we seem to be losing this art as hate and loud noise takes over the airwaves and our world.

My encounter with Sheilaji (as she was known) began with a fight. In the late 1990s we were in the Supreme Court, arguing that Delhi's public transport must switch over to cleaner compressed natural gas (CNG) fuel to combat its then deadly air pollution. This had become adversarial and contentious. The Union government was dead against it; the diesel lobby was arguing that CNG was explosive and untested. The Delhi government—then headed by Sheilaji—was dragging its feet to make the transition. Queues at petrol pumps were getting longer and longer as CNG was not being delivered; buses were being burnt to show how CNG wouldn't work. In the Supreme Court, the then Solicitor General of India Harish Salve was hauling up the government for its deliberate inaction. The top court was getting more and more incensed and called for contempt proceedings to start against the Delhi Chief Minister.

Then all this changed. Sheilaji walked into the court personally. She didn't stand on ceremony; she didn't join the acrimony. She just ensured that orders were to be followed. As they say, the rest is history. We worked closely with her government through this period of transition to CNG. She didn't blink when the going was tough. She had the ability to make her bureaucrats deliver, not as sovereigns, but by including words and ideas from the "outside". She joined worlds effortlessly and with grace. This is another art in politics we are losing.

In the decade of 2000 attention shifted to public transport to reduce vehicles on the road, and so pollution. I distinctly remember that she came to one of our meetings where we discussed the second-generation reforms after transition to CNG. She didn't hesitate to chide us. She disagreed that the city could move towards public transport at the scale needed. She didn't think this was the way ahead. But she didn't shut the door on us. We persisted and she listened.

Sheilaji joined worlds effortlessly and with grace, a losing art in Indian politics

I believe it is we who failed her. Not the other way around. When she supported the now-dismantled Bus Rapid Transit System (BRT), it was because she gave chance to seemingly impossible ideas. It is our collective inability to design a system for the complexity of Delhi, which would negotiate with the different road users and not antagonise needlessly, that made the system fail. But she again did not give up on the ideas. She dismantled the notorious Blue Line bus service, even though it was owned by many of her compatriots. She supported the purchase of a new generation of low-floor and air-conditioned buses—all new and all untested. She understood the need for massive investment in public transport—metro, bus and cycle—to reinvent mobility. Again, it was her governance abilities combined with persuasive powers, without angst and without finger-pointing that brought these changes.

I am writing this not to call out to the current leaders of my city or country. But to reminisce so that we can, perhaps for one moment, think of how politics of consensus will deliver. I know she lost the popular vote in 2013; I know that air pollution and many other problems of this ungovernable city with multiplicity of authorities, grew in her tenure. But the fact is that she never stopped trying. She never shunned responsibility. She mastered that elusive art of pushing for change without fuss.

One of the last times I met her was when she called to ask what she could do about the growing pollution in the city. She had lost the election a few years ago. But she was concerned, even agitated. She wanted to know what more governments could do; what advice could she give. I told her frankly that she should not try. She would be attacked for not doing enough in her tenure. The blame-game machinery would go on over-drive. But she wrote to governments with her advice. I know, because she called to tell me, with some bemusement that she did not get any responses. What could I say? The courtesy of a response was old-fashioned; her fashion. It would be really unfortunate if we let the Sheila Dikshit way of politics go out of fashion.   @sunitanar



Down To Earth

Founded in 1992 to arm you with knowledge critical to shaping a better world

FOUNDER EDITOR Anil Agarwal

EDITOR Sunita Narain

MANAGING EDITOR

Richard Mahapatra

ASSOCIATE EDITORS Vibha Varshney, S S Jeevan, Deepan Joshi, Snigdha Das, Sonalika Sinha (Copy), Arnab Pratim Dutta (Multimedia)

CREATIVE DIRECTOR Ajit Bajaj

GRAPHIC EDITOR Sorit Gupta

REPORTING TEAM Jitendra, Kundan Pandey, Ishan Kukreti, Akshit Sangomla, Meenakshi Shishma, Banjot Kaur, Shagun Kapil

COPY DESK Aditya Misra, Rajit Sengupta, Deepanwita Gita Niyogi

DESIGN TEAM Chaitanya Chandan, Sanjit Kumar, Shri Krishan, Vijayendra Pratap Singh, Tarique Aziz, Ritika Bohra

PHOTOGRAPHER Vikas Choudhary

PHOTO LIBRARY Anil Kumar

PRODUCTION Rakesh Srivastava, Gundhar Das

WEB EDITORS Joyjeet Das, Rajat Ghai, Isha Bajpai, Rachel V Thomas

TECH SUPPORT Rajendra Rawat, Jaidev Sharma

MULTIMEDIA Srikant Chaudhary, Sunny Gautam, Adithyan P C

INFORMATION AND RESEARCH SUPPORT

Kiron Pandey, Susan Chacko, Madhumita Paul, Sheeba Nair, Dhanbir Thapliyal, Lalit Maurya, Dayanidhi Mishra

CONSULTING EDITORS Chandra Bhushan, Anumita Roychowdhury

Vol 28, No 6; Total No of Pages: 80

Editorial, subscriptions and advertisements:
Society for Environmental Communications,
41, Tughlakabad Institutional Area,
New Delhi 110 062,

Phone: 91-11-40616000, 29955124,
29956110, 29956394, 29956399
Fax: 91-11-29955879.
Email: editor@downtoearth.org.in

© 2019 Society for Environmental Communications. All rights reserved throughout the world. Reproduction in any manner is prohibited. Printed and published by Richard Mahapatra on behalf of Society for Environmental Communications. Printed at International Print-o-Pac Limited, B-204, 205, Okhla Industrial Area, Phase I, New Delhi-110020, India, and published at 41, Tughlakabad Institutional Area, New Delhi 110 062.

To subscribe, sms 'dte Subscribe' to 56070 or visit www.downtoearth.org.in/subscribe

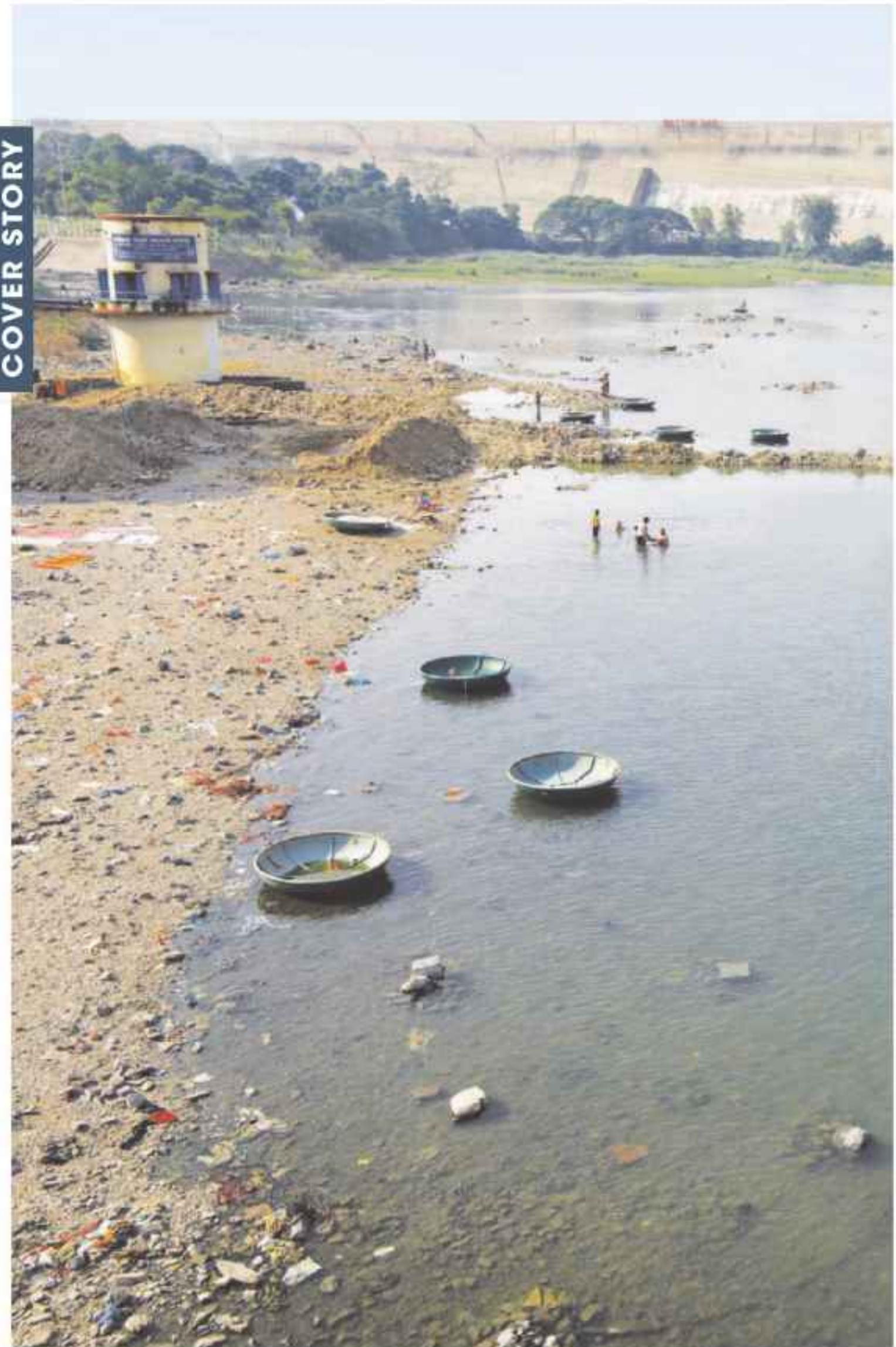
FOR ADVERTISEMENTS Jyoti Ghosh
jghosh@cseindia.org

FOR SUBSCRIPTIONS
KCR Raja, raja@cseindia.org



◀ Cover design: Ajit Bajaj

COVER STORY



20

Dying river basins across India are decimating our critical source of water

22 **Changing Cauvery**
Tracking the river from its source to the mouth

30 **Debate**
Should new constructions be banned in Bengaluru to tackle water scarcity?

33 **River basins**
How deforestation, urbanisation, illegal mining has battered India's river basins

38 **Flood check**
Had India and Nepal exchanged information, the scale of destruction would have minimised

कोचिंग के नोट्स TELEGRAM पर मिलेंगे-

Telegram Channel कैसे Join करें-

1. गूगल प्ले स्टोर से Telegram App डाउनलोड करें
2. अपना मोबाइल नंबर डालकर telegram को चालू करें
3. फिर निचे दिये link पर विलक्ष करें

PDF Ka Adda Click करें

[CLICK HERE](#) - यहाँ पर विलक्ष करें

हमारे साथ सरकारी EXAM की तयारी करें

JOIN Telegram - [Click Here](#)

Note लेने के लिए [Telegram](#) जरूर join करें

Contents



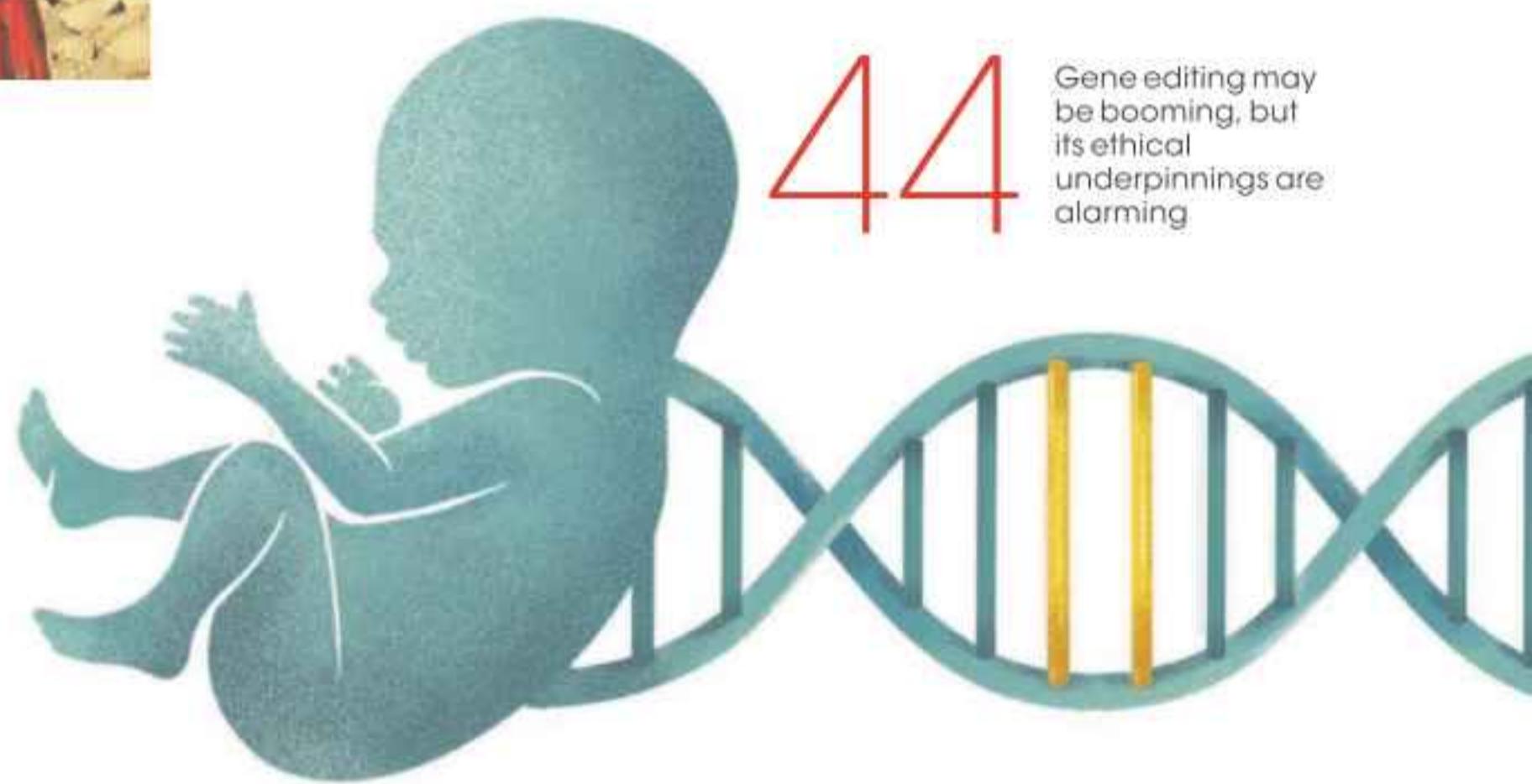
16

How online tracking of MGNREGA can help gauge rural distress in real time



54

The Mumbai Coastal Road Project is an ecological disaster we need to wake up to



- 12 Digest**
A Haryana woman ignites a cooperative farming movement
- 42 Patently absurd**
Why is WIPO putting the UN stamp of approval on a system that is flawed, unjust and dangerous?
- 56 Food**
Miniature brinjals from the Northeast
- 58 Civil Lines**
Indian farmers are ageing, but the new generation is not interested to replace them. So where will our food come from?

20-PAGE SUPPLEMENT
WITH SUBSCRIPTION COPIES

GOBAR TIMES
59-78



SUPPLEMENT EDITOR
Sorit Gupta

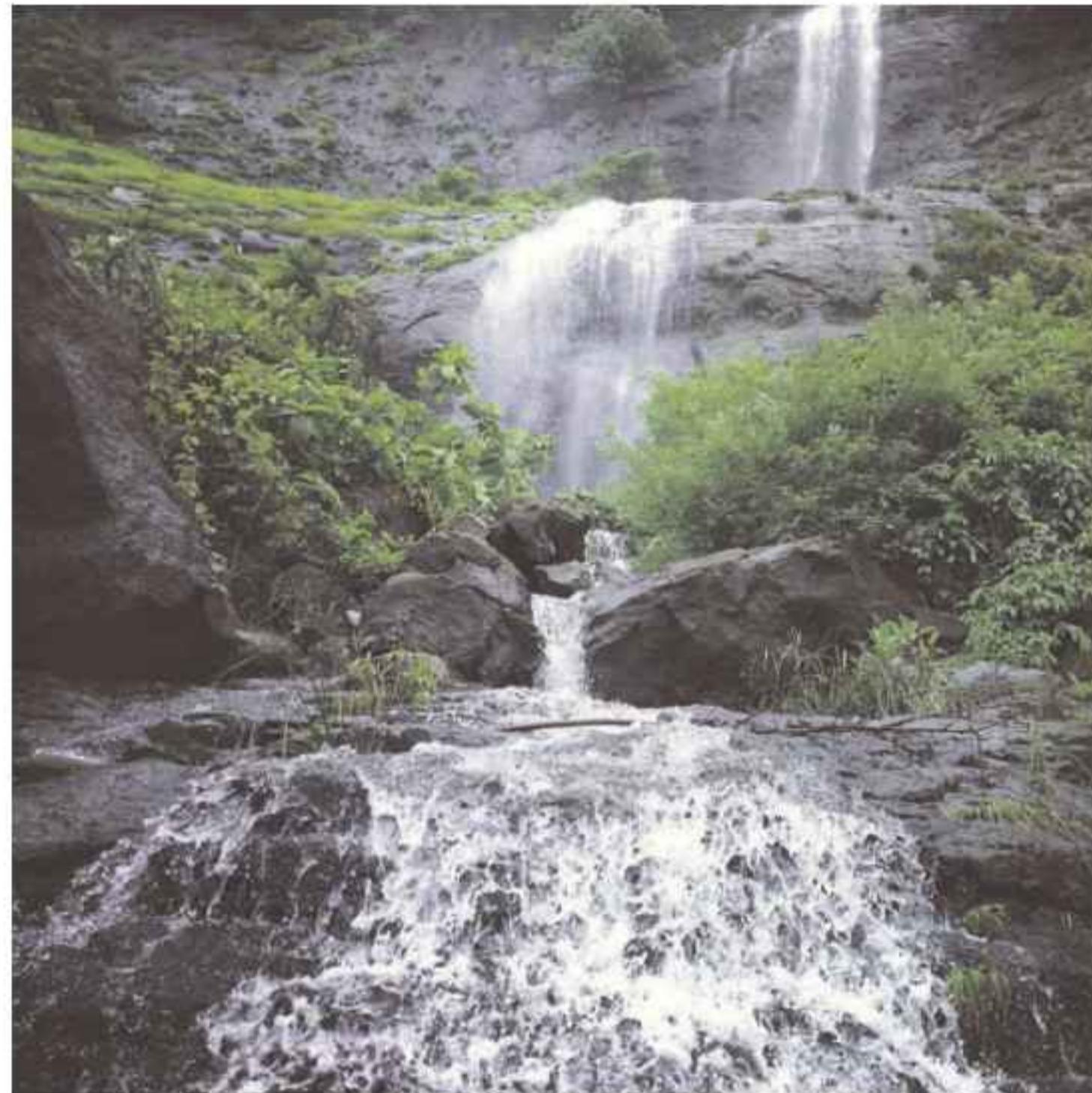
COPY DESK
Aditya Misra,
Pallavi Ghosh

DESIGN
Ajit Bajaj, Ritika Bohra
and Surender Singh

ILLUSTRATIONS
Sorit Gupta, Tarique
Aziz and Ritika Bohra

Engage

editor@downtoearth.org.in
@down2earthindia
@dtemagazine
www.downtoearth.org.in



Are they serious about water?

This is with reference to "Shimla, Udupi and Mangaluru: India's soon-to-be Cape Towns" published on the website on June 28, 2019. Though water crisis is a human-made calamity, people in India are not serious about rainwater harvesting. I live in Kharghar, a suburb of Navi Mumbai. During monsoons, a number of waterfalls appear across the hills in the city, offering a picturesque view. Pandavkada Falls, for example, is one of the biggest on the hill range. I have written to several authorities to build a check dam around the falls to catch the water, but no one considers it seriously.

SRIKANT KUMAR MAHAPATRA
VIA EMAIL

» Rainwater harvesting should be made compulsory. The authorities concerned should be held responsible if silt is not removed from catchment areas. The Union Ministry of Environment, Forest and Climate Change should closely monitor water-related projects. Waterbodies must be regularly cleaned and encroachments should be checked. These small measures have the potential to avert a much bigger problem.

RAVINDRA
VIA EMAIL

Change strategy to manage water

The current water crisis in the country is a matter of grave concern not just because of the climate change emergency, but also due to the fact that water is grossly mismanaged. Water management is the need of the hour. I suggest a few strategies that the government must urgently follow to manage the vital resource. For instance, the rich and the powerful should not have unlimited access to water, even if they are willing to pay. Water distribution to affluent colonies should be rationed. The government must ensure that all schools, offices and residential areas, with substantial catchment area, have rainwater harvesting structures. The government should minimise the subsidy on water supplied to rich farmers who grow water-guzzling cash crops like sugarcane and paddy. The government should also promote technologies that minimise water usage in urinals.

Meghalaya, which receives copious rainfall, has passed a bill to regulate water usage. It's time the rest of the country followed suit.

AISHANEE PATTNAIK
BIRLA INSTITUTE OF TECHNOLOGY,
MESRA

Down To Earth wins award

Our correspondent Ishan Kukreti has won the prestigious Prem Bhatia Memorial Award for Outstanding Environment Reporting.



DTE TV

Risks of being traffic cop

A study conducted in two Delhi hospitals found that 33 per cent of traffic police personnel suffer from asthma, lung congestion, throat irritation and thick sputum.



Catch rain where it falls

A calculation shows 7 million litres of water can be harvested from one hectare of land in Chennai. But water harvesting structures in the city are in a shambles.

FOR MORE VIDEOS, SCAN



DATA CENTRE

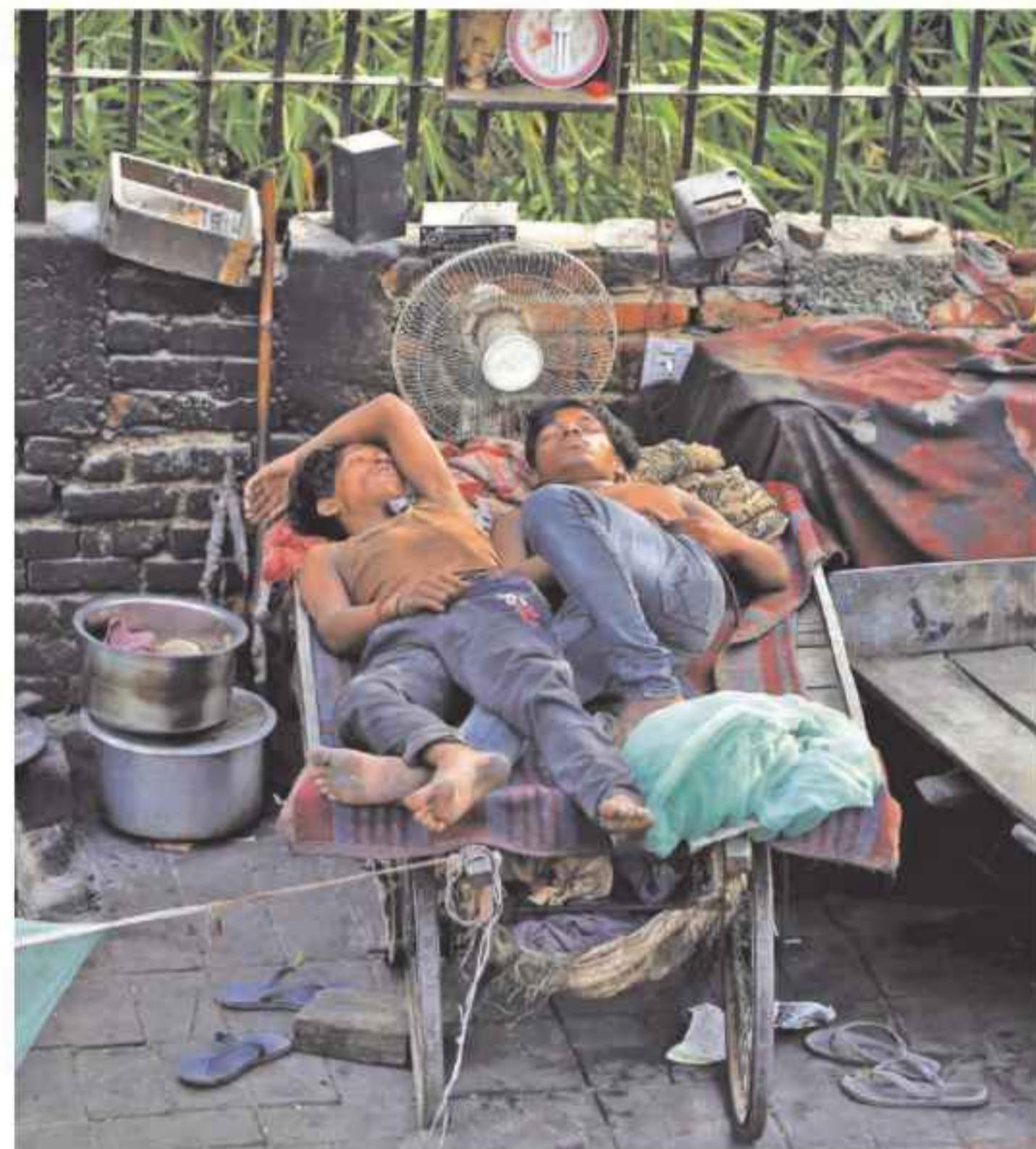
Hygiene in slums

Slums are found in 65 per cent of towns in India. Yet slum-dwellers are the most overlooked section of society. Six of 10 slum dwellers live close to unsanitary drains and almost four of every 10 do not get treated water.

Fallout of disasters

Extreme weather events displaced 10.3 million people in China, India and the Philippines in 2018. Such a massive exodus hits the economy badly. Economic losses in the Asia-Pacific due to natural disasters exceeded \$89 billion that year.

FOR MORE INFOGRAPHICS, SCAN



Heat wave: deal with it

This refers to the article "Scorcher" (1-15 July, 2019). Too many global phenomena are behind the rising temperatures and the resulting heat waves. While we are yet to act on curbing global warming, a few simpler steps can help mitigate the effects of extreme weather events. For instance, to mitigate the impacts of heat waves, governments must announce the closure of all schools in the afternoon. Vulnerable sections of society, such as the sick and the aged, should be given special attention to avoid heat stroke and resulting illnesses. Hospitals and nursing homes must be equipped to deal with heat-related sickness.

D B N MURTHY
JAYANAGAR, BENGALURU

Critical to save the critically endangered

This refers to "Noise pollution: an ignored element in Great Indian Bustard conservation", published on the website on June 20, 2019. The author brings out an interesting aspect about the conservation of the bird that policymakers and conservationists have overlooked. The finer details regarding the survival of the rarely sighted bird could not have been understood without the author visiting the field, observing and learning about the real threats. If youngsters are given such opportunities, they can help the government change its policies with their keen observation and concern for their surroundings.

ARATI KHATU
VIA EMAIL

Stop violating rights

This refers to "Odisha on FRA claims: no time to collect evidence, no hearing, just rejection", published on the website on July 9, 2019. It is disheartening to see the blatant violation of people's rights. The political class has stooped to the lowest ebb and therefore, a mass movement is essential. I sincerely hope that the civil society rises to the cause of the poor tribals and presents the ground realities to the Supreme Court. We should adopt the slogan of Digital India and expose the wrongdoings through live broadcast.

MITRON
VIA EMAIL

Misleading report on street dogs

The article "Labelled rabid" (1-15 August, 2018) is not well-researched and presents a skewed perspective. It does not present the dog feeders' perspective and portrays street dogs in a dangerous light. Thousands of street dogs are being fed by people daily and there is no danger from them. The danger mostly arises from human provocation.

The article talks about culling of street dogs as the solution to reduce bite cases. But it fails to point out that the real cause of rabies is not dogs or cats, but open garbage dumps on which these animals feed. It leads not just to rabies but to many other diseases of which animals are not the carriers. Culling or relocating street dogs is illegal as per a Supreme Court ruling. Dogs are scavengers and help in the natural controlling of the rodent population. I am shocked that the article fails to provide a balanced analysis.

ASHISH MUKHERJEE
VIA EMAIL



FACEBOOK

Union Budget 2019-20: hardly any mention of health sector

Posted on July 5, 2019

Education and health should be free for all citizens and accessible to all.

DIPANKAR SAHA

This is the situation even after so many innocent lives were lost to AES (acute encephalitis syndrome), who could have been saved.

LUCKY GOYAL

Funny things happen when you find once again the same old political leaders caring less for the masses.

RAJIV MATHUR

facebook.com/down2earthindia

NOTICE BOARD

CENTRE FOR LEARNING, ORGANIC AGRICULTURE AND APPROPRIATE TECHNOLOGY (CLOAAT)

P.O. Box 57, Kodaikanal 624 101

MATURE STUDENT PROGRAMME

Inspired by the philosophy of J. Krishnamurti, CLOAAT is located in a beautiful unspoilt valley at 3800 ft. altitude. Students having a good knowledge of English of 18 years plus may apply for courses including hands-on and theoretical: Bio-dynamic Organic Agriculture, English Literature, Appropriate Technologies, World Affairs, Art and Design, Computer Applications etc..

We incorporate those wishing to study distance learning University Degrees and A levels but the focus for students from India and abroad is on learning to understand oneself and life through our daily relationships and in meaningful discussions. Fresh lacto-vegetarian organic fare, no smoking.

Apply for brochure and application form to:
Brian Jenkins BA (Hons.,) Sussex University.
Email:cloaat@yahoo.com Website:www.cloaat.com

Korakundah

Highest Organic tea garden in the World

Green, White Oolong & Speciality Teas

For trade enquiries
The United Nilgiri Tea Estates Co. Ltd.,
Chamraj Estate, The Nilgiris - 643 204, India.
Ph: +91-423-2258737, Fax: +91-423-2258837
e-mail: chamrajtea@gmail.com
www.unitednilgiritea.com

Shop online at
www.chamrajtea.in

Since 1922



PREPARING A CITY SANITATION PLAN

A web-based tool for preparing
city sanitation plans



For queries contact water@cseindia.org

kindly visit cseindia.org or scan the QR code



MOUNT is an online aggregator platform disseminating knowledge on sustainable technologies and good practices for wastewater and faecal sludge management.



Explore on [www.cseindia.org/mount/home](https://cseindia.org/mount/home) or scan the QR code

Digest

WHAT'S INSIDE

A 60-year-old who inspired women in her community to create self-help farming groups in 16 Haryana villages **P12**

Predatory journals release a fake website days before University Grants Commission announces its list of reputed journals **P14**

1,000 WORDS

VIKAS CHOUDHARY



Yanpal is one of the few wood carvers left in the Konyak tribe of Nagaland. Once revered across the Indo-Myanmar border as a warrior community, most people in the tribe today depend on shifting cultivation, handicrafts or remittance sent by their migrant relatives for sustenance

FOR MORE PHOTOS, SCAN



Liberated hands

A 60-YEAR-OLD woman inspires an entire village in Haryana to take up community farming. It ensures them food security and also gives them the much-needed dignity of being self-sufficient.

Meera Devi had dedicated most of her life to earning two meals a day. She was born in a socially marginalised community in Bahu village and worked for a gruelling 18 hours a day in the fields. "My mornings would start at the landlord's house and end in his farm," she grieves. In 2013, an inner calling told her to do something meaningful. She also wanted to ensure "a proper wedding" for her granddaughter, which meant breaking away from bonded labour and making a good living. Farming is what she knew and the only capital she had for investment was labour. A state government livelihood support scheme came as providential help.

Under the Haryana State Rural Livelihood Mission, the government helps self-help groups (SHGs) undertake cooperative farming. It provides technical assistance as well as a financial aid of ₹5.5 lakh a year to SHGs. She decided to give it a shot. But the mission also requires a village to have at least seven SHGs to be eligible for the benefits.

When Devi reached out to the women of her community, they resisted saying the landlords would ensure that nobody buys the produce. But she had persistence and determination to move forward. She managed to convince enough women to register eight SHGs. Using money from the scheme, each SHG took some 1.6 hectares of village common land on lease from the panchayat and started growing cotton.

From toiling 18 hours a day in the fields to helping 264 women grow their own food and trade in it, Meera Devi has triggered a movement of sorts at a tiny village in Haryana

ANIL ASHWANI SHARMA

But the challenge was to compete with the big farmers in the village. The state officials suggested they should grow crops using only natural fertilisers. This would set them apart from the big farmers, who mostly rely on chemical inputs. It worked. "Our crops are now in demand from a select group of traders who deal with organic produce," says Devi.

Seven years on, the SHGs grow two crops a year, alternating between wheat and cotton. While most farmers' earnings get affected by market fluctuations, traders always buy their produce at the minimum support price set by the government. Every member now earns over ₹50,000 a year from cooperative farming. The success has given confidence to other women of the community as well. The village now has 22 SHGs formed by 264 women. In 15 nearby villages also, women have set up SHGs. Nobody from her community in the village works for the landlords anymore.

Apart from economic independence, women in the community are today more aware of government schemes meant for their welfare. Everyone in the community has a house built under the Pradhan Mantri Gramin Awaas Yojana. In 2017, the village elected its first sarpanch from the Scheduled Caste community. People's health has improved as every member keeps a part of the produce for personal consumption. The most important change, however, is every child from the community now goes to school. "We made the start. The next generation will make us prosperous."



**LEADING THE
RENEWABLE ENERGY MOVEMENT
IN THE STATE**



**MAHARASHTRA ENERGY
DEVELOPMENT AGENCY**

**Capacity installation of Renewable Power
Projects in Maharashtra (March-2019) -**

- Wind Power - 4792.01 MW
- Small Hydro Power - 284.30 MW
- Biomass base power - 215 MW
- Solar Power - 1058.45 MW
- Urban and Industrial Waste - 38.83 MW
- Bagasse based Co-generation - 2283.55 MW

Maharashtra Energy Development Agency

(A Govt. of Maharashtra Institution)

MHADA Commercial Complex, 2nd Floor, Opposite Tridal Nagar, Yerwada, Pune - 411 006.

Ph. 020-26614403 Fax : 020-26615031 E-mail :pub@mahaurja.com Website :www.mahaurja.com

New and Renewable Energy means a New and Renewable Environment



Population bill, a political rhetoric

DURING THE recent Parliament session, Rajya Sabha member Rakesh Sinha introduced a private bill to curb the growing population of India. The bill came a week after the Economic Survey 2018-19 said that the country is witnessing a sharp decline in population growth. The Population Regulation Bill, 2019, seeks to bar adults with more than two children from contesting elections and denies them benefits under government schemes. It also said government employees must give an undertaking that they would not procreate more than twice.

The Economic Survey highlights that Indian population is reaching the replacement rate of 2.1 children per woman, which is required to stabilise the population growth.

The total fertility rate (TFR), or the average number of children born to a woman, had reduced to 1.3 per cent in 2011-16 from 2.5 per cent during 1971-81. States like Bihar and Haryana, which were lagging, will rapidly move towards achieving the replacement level, says the survey. "Not a single state out of the 24 that have achieved the replacement level TFR of 2.1, has used any coercive methods. It has been achieved by empowering women and providing better education and health care facilities," says Poonam Muttreja of non-profit Population Foundation of India. So instead of demanding coercive methods, Sinha should ask the government to take steps that fulfill the unmet need for contraceptives, she says.

UGC hit by bogus claim

IN ITS bid to weed out predatory journals that publish bogus research for money, the University Grants Commission's (UGC's) Consortium for Academic and Research Ethics (CARE) recently released a new list of quality journals that will be considered for publication of all academic work. But days before the announcement, a fake website (carejournals.in) emerged claiming to be hosting the CARE list. The fake website, against which UGC has issued a public notice, appears much before the CARE website (ugccare.unipune.ac.in)

when one searches for "UGC CARE list" on Google. UGC's attempt to prepare a list of credible research journals began in 2017. But a 2018 study, published in *Current Science*, shows "88 per cent of the non-indexed journals" (not indexed with reputed citation databases) on the UGC-approved list are of low quality. Predatory journals mushroomed in India in 2013 after publication of two research papers was made mandatory to complete PhD. The country has over 900 universities with about 160,000 research students.

BITS

Comptroller and Auditor General report lists India's underperformance

INDIA'S SUSTAINABLE Development Goals (SDGs) roadmap, developed by the NITI Aayog, "is yet to be aligned with defined milestones for SDG targets to be achieved in the years 2020, 2025 and 2030". It adds that efforts to raise awareness around SDG have not been "comprehensive, focussed or sustained".



OIL AND Natural Gas Corporation Ltd (ONGC) has violated safety norms that have put its sea-bound vessels at risk. According to the rules, ONGC should report any safety violations and accidents within 500 metres of its installation, but it informed just 13 per cent of the accidents during 2012-13 and 2016-17. This means that the vessels involved in undetected accidents remained operational during this time.

NATIONAL ALUMINIUM Company (NALCO) started operations without environment clearance compliance at its south block mines in Odisha's Koraput district. The public sector undertaking received the clearance in 2010 after it promised to set up a conveyor system to transport crushed bauxite downhill to the aluminium refinery. Instead, it used dumpers as the conveyor was never built. The plant discharges 6,723 tonnes of red mud per day against the allowed 6,087 tonnes per day.

One tool to track it all

IT IS a tool of unparalleled proportions and potential. It draws on data generated to track the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), links it to rural distress in real time and enables quick delivery of relief measures.

MGNREGA employs at any point in time over 100 million people across the country. This is half of Uttar Pradesh's population. By design it is a distress reduction scheme implemented in half-a-million villages. By default, it mirrors the state of distress at the village and district levels. But its use as an index to gauge real-time rural distress has only just been recognised and spoken about at the national level.

In 2018, four management researchers found the link. Prasanna Tantri, Shradhey Parijat Prasad and Nishka Sharma from the Indian School of Business (ISB), Hyderabad, and Sumit Agarwal from the National University of Singapore had been researching MGNREGA.

Can the humongous online data generated in the job guarantee scheme be a real time index for rural distress?

SHAGUN KAPIL
NEW DELHI

They correlated India Meteorological Department's drought data with the demand for and supply of MGNREGA jobs at the block level and realised that whenever a district faced drought, there was a spike in the number of people employed. They analysed data for 2012 to 2017, expanded the study to 600-odd districts in the country, and found that the trend was valid almost everywhere. Since MGNREGA data is up-

dated daily, it could be used to highlight a problem in real time. They used parameters like job demand and developed an Index for Localised Distress (ILD) and an online interactive map to show areas facing normal, moderate and critical distress from 2016 to 2018.

The map can be a great device in a country that has no other mechanism to gauge rural distress. The Union Ministry of Statistics and Programme Implementation calculates monthly consumption expenditure at the rural household level, which can reveal local distress, but the data is released with a lag of two years. Even the district-level GDP it releases is irregular. "By then, the time to do something for areas under stress has already passed. We shouldn't have to wait for data for three or four years for taking action," says Tantri.

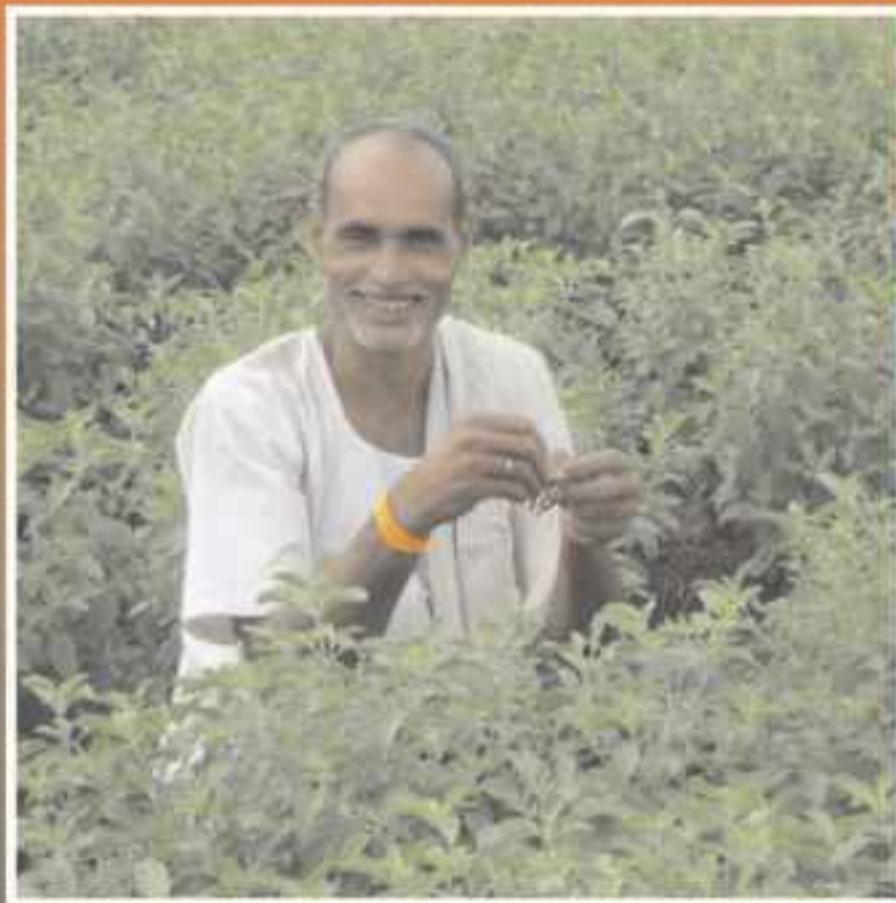
Last year, the researchers approached the Cabinet Secretariat with their tool, after which ILD found a mention in the Economic

Demand for jobs under the government's employment guarantee scheme rises whenever there is distress in an area



Contract Farming with NAAM Foundation

Himalaya is supporting the empowerment of marginalized farmers in the Marathwada and Vidarbha regions of Maharashtra. We have collaborated with NAAM Foundation to help farmers in these regions through contract farming and herb cultivation. Himalaya is creating a cost-effective system by providing free seeds, packaging materials, and transportation. Through this initiative, we are helping farmers achieve financial stability by buying back the herbs at a predetermined price. Our cycle of engagement helps eliminate market price fluctuations and dependence on intermediaries by bringing the assurance of an ensured buyer and a fair price.



TIMELY INTERVENTION

How the Index for Localised Distress (ILD) works in real time

Online monitoring of MGNREGA involves geo-tagging of 3 million structures annually and over 100 million workers. From panchayats to the Union government, all have access to this data real-time



Starting from district authorities to state-level officials, all can probe this spike and figure out the reasons. Since, the monitoring data is accessed by all, the index can lead to a convergence of efforts



Any spike in demand for jobs alerts about a local situation. In case of an untimely weather event, it takes months to detect and declare relief measures. This real-time data will immediately be worked upon

Survey 2018-19 released on July 4. "As an economic shock significantly reduces consumption expenditure of the household, it is important to provide assistance to the household at the right time," says the Economic Survey, citing the study, and adds that skilful use of technology can make a difference on the ground.

Geo-tagging of works under MGNREGA and online monitoring of workers already provide a platform to flash alerts in real time for areas under distress. For example, *Down To Earth* monitored the real-time data to look at level of distress in July 2019. As per the Union Ministry of Rural Development, in drought-struck Amravati and Nagpur districts of Maharashtra, for instance, 0.18 million people have demanded work under MGNREGA, while in Kolhapur and Raigad, which were relatively better off, the number is just 18,798. Similar is the case of Andhra Pradesh, where drought-hit Kurnool and Prakasam districts have 1.6 million people demanding work while in Kadapa and Visakhapatnam, the figure is less than 0.8 million.

The researchers have used drought as primary source to gauge rural distress because the rural poor, who are the target beneficiaries of MGNREGA, mostly depend on agriculture, and adverse weather becomes a natural indicator for economic distress. This, however, does not mean that drought is the only event it can be associated with. The demand for work under MGNREGA can also be correlated with other real-time measures of weather, such as untimely rain, hail or snow that destroys crops and lead to rural distress. Moreover, drought is not the only trigger for an increase in MGNREGA numbers. A pest attack that destroys crops could force people to opt for MGNREGA, so could land acquisitions for a big infrastructure project. All these could be gauged through the portal. Once the government notices a rise in MGNREGA numbers, it can launch a probe to find the cause and provide relief (see 'Timely intervention').

Though the government has not yet decided how to use the tool, it is accepting its utility. Raghvendra Pratap Singh, director, MGNREGA,

Department of Rural Development, says that since all data under the scheme is being captured online, an assessment about rural distress can be made.

Still, the concept is not without flaws. "The records for jobs demand under MGNREGA are underestimated. The law says that if the government does not provide job to an applicant within 15 days, it must give him/her an allowance. Since governments do not want that, they do not register demands. Whenever they are able to give a job, they work the dates backwards and say the application came 15 days ago. So we are working on the assumption that the work provided is the work demanded," explains Mihir Shah, member of the erstwhile Planning Commission. K S Gopal, former member of the Central Employment Guarantee Council, a Central body that oversees the progress under MGNREGA, also says the demand for work will not be an efficient indicator for distress. Tantri concedes that there may be problems with the tool but says it is still better than waiting for data for years. @shagun_kapil

THE GAME IS ALWAYS ON WITH THE RIGHT NUTRITION.

Goodness of Vitamins & Minerals,
Protein and Omega-3 fatty acids.



"Health fit toh everything hit. For my health, it is important to create the right foundation, which I do with the help of a balanced diet, regular exercise and the goodness of Nutrilite's Protein, Vitamins, Minerals and Omega-3 everyday of my life. I take Nutrilite All Plant Protein Powder. Protein helps me be strong and active. Nutrilite Daily provides 13 vitamins and 11 minerals which support me with the nutrition to go through the rigours of the day. Through my acting, writing, singing and direction, I step into your hearts and for supporting my own healthy heart I get Omega-3 fatty acids from Nutrilite Salmon Omega-3 everyday."




(Farhan Akhtar)

CUSTOMER SATISFACTION
★ 100% ★
OR MONEY REFUNDED

To connect with us - Log on to www.amway.in,
Join us on facebook@ [/amwayindiaofficial](https://www.facebook.com/amwayindiaofficial) or follow us on twitter@ [@/amwayindia.
Nutrilite range is under Nutraceutical/health supplement categories. Nutrilite products are not for medicinal use. Not to exceed recommended daily usage. Nutraceuticals are not to be used as a substitute for varied diet. Products are required to be stored out of reach of children. Images shown are for pictorial representations only. Please refer individual product label for product category & further information.](https://twitter.com/amwayindia)



Talakaveri, the origin of the Cauvery river, is way too still

LET CAUVERY BE

Deforestation, urbanisation, illegal mining and dumping of effluents along the river has left the basin battered and bruised. Decades of degradation has led to an unprecedented crisis for the 15 million who live on its banks.

Jitendra travels along the course of one of India's biggest rivers to understand why its level hit a record low this year

MOVE ON, AND live long, Oh Cauvery!" For some 15 million people living on the banks of this river and its 21 tributaries, the ode by Prince Ilango Adigal in the Tamil epic *Silappadikaram* is the mantra of life. More so, because barely a trickle now remains in the 805-km river that flows through Karnataka and Tamil Nadu. There's not more than knee-deep water in Talakaveri, the source of the river in Karnataka's Kodagu district. Water here is so still that it has turned green with algae. It is mindboggling how this is possible in the Western Ghats, one of India's highest rainfall zones.

Last year, the Cauvery basin received 4 per cent above normal rainfall. By August, all the dams were overflowing and soon both the states were drowning in floods. This year, the two states are reeling under a severe and unprecedented water crisis. In Kodagu, every lane is dotted with water tankers. Water crisis forced schools to extend their summer vacation in Dakshina Kannada and Udupi districts of Karnataka. In a locality in Chennai, Tamil Nadu, residents complained that sewage water was flowing out of hand pumps, the only source of water in their area. The situation forced the Cauvery River Management Water Board to ask the Karnataka government to release water to Tamil Nadu.

Monsoon broke in Karnataka a week late, on June 8 this year. The drying riverbed hoped to be agush with water. The season has completed half its cycle, but registered 46 per cent deficit rainfall. A reprieve for the river seems unlikely. "The river stagnates every year in May. This year, it stopped flowing in March itself. I have never seen such a miserable state of the Cauvery," says 57-year-old Choomi Puvaya, a big farmer who owns 35 hectares (ha) in different parts of Khardigone village in Kodagu.

This year, the river's water level hit a record low, shows data of the then Ministry of Water Resources, River Development and Ganga Rejuvenation. On June 13, it was 1.06 billion cubic metres (bcm), just 12.68 per cent of the river's storage capacity. Last



▲ Tourist resorts have replaced natural paddy fields that recharge groundwater

year on this day, it was 1.90 bcm, which is 22.83 per cent of the river's storage capacity. The Cauvery's tributaries, Harangi and Lakshmantirtha, are absolutely dry. Other rivulets emanating from it are also drying up fast. Only a thin stream remains of the Iruppu Waterfall that once gushed down the Brahmagiri hills in Kodagu. Nagarhole and Keerehole lakes have simply disappeared.

Rainfall trends in the area show a sharp decline over the past few decades. Between 1956 and 2016, in Madikeri taluka, where the river originates, rainfall reduced by 8 mm per year. The situation has befuddled experts: why is rainfall in the Cauvery river basin inconsistent, causing floods as well as droughts?

REASONS START UNFOLDING as Puvaya points at his 9 ha farm below the Kurubara Matte mountain range, just about 60 km downstream from Talakaveri. On one side are natural paddy fields. During monsoons, rainwater flows down the hills to the fields. Puvaya has made arrangements to hold this water for four months during the kharif season, from July to November.



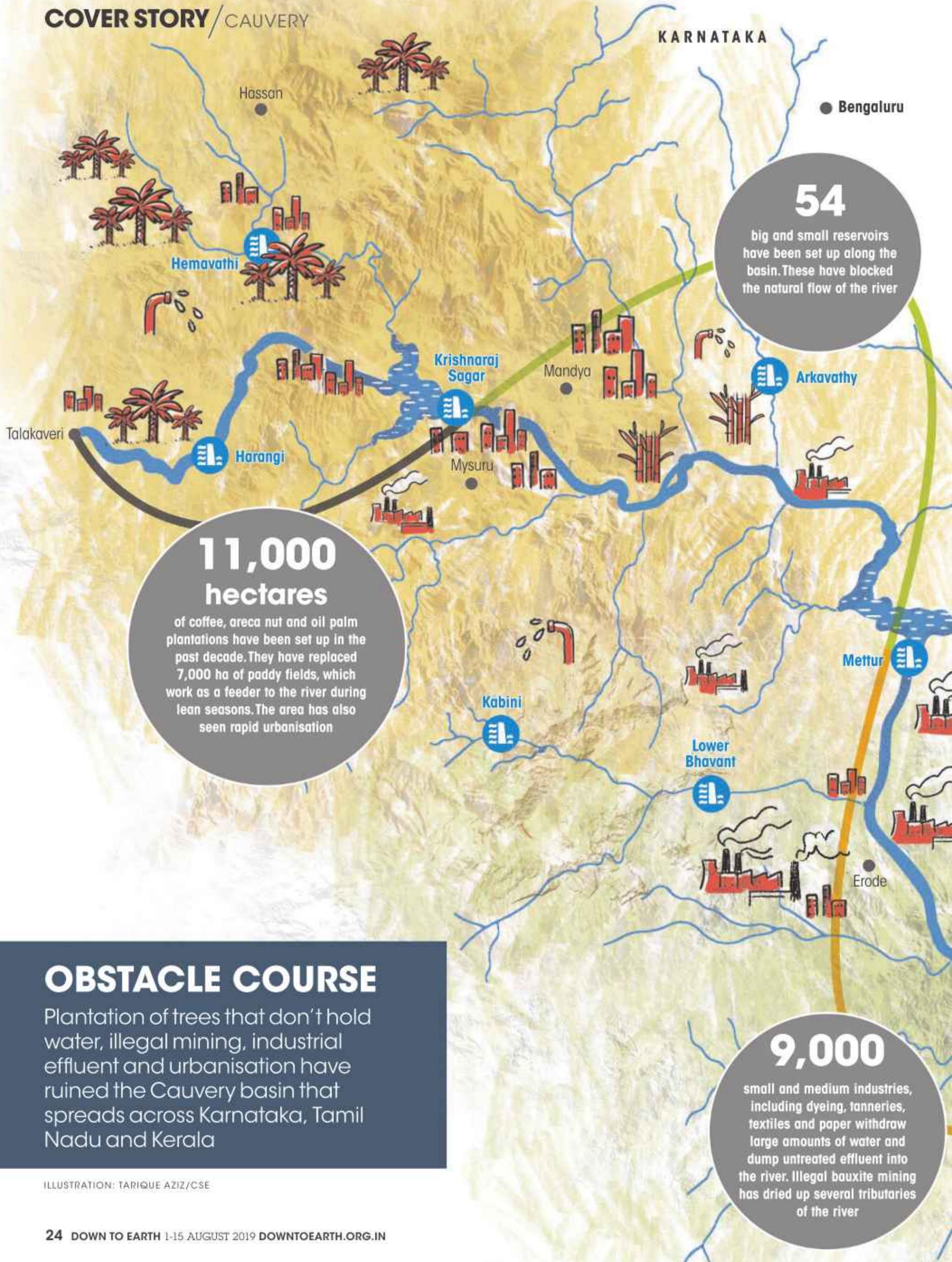
When the crop is ready, he releases it to the many natural streams that fall into the Cauvery. Farmers here have been traditionally practising this method for centuries as it recharges groundwater and also acts as a natural feeder to the river.

But as paddy stopped giving returns, Puvaya decided to build a sprawling tourist resort on a large part of the natural paddy field, drastically changing the land use. A tarred road makes accessibility to the resort easy. He also grows silver oak, areca nut and oil palm trees that fetch him quick money. Silver oak is used as plywood, areca nut is grown for its fruit (*supari*) and palm for its oil. The size of Puvaya's paddy field has shrunk from 9 ha to 4 ha, while plantations and concretisation have increased. Puvaya no longer needs the huge amount of water he once required to irrigate his paddy field. When it rains, he lets the water flow down directly to the natural streams. Result: in November-December when the river is water-starved, it barely gets any water from the paddy fields. And when it is bulging during monsoons, the river gets huge amounts of water, creating floods.

Mindless growth of coffee plantations caused landslide in Kodagu, Karnataka

Puvaya earns ample profits from the resort and the plantations, but he realises that he has added to the environmental problem. "People planted new species of trees replacing the traditional jackfruit, rosewood, *nandi* and *hone* trees, and all varieties of bamboo. These are endemic to the area. They have thick and deep roots, and hold water underground," says Roy Bopanna, an environment activist. Between 2013-14 and 2017-18, land area under areca nut in Karnataka increased by 61,000 ha, and the total acreage in the state reached 0.28 million ha (see p24 'Obstacle course'). In Kodagu alone, oil palm is being cultivated in over 1,100 ha. These trees cannot hold water, but grow fast and bring good money.

THE STORY OF the water crisis in the Cauvery's basin was scripted decades ago. In the 1980s, people cut down traditional trees and replaced them with coffee plantations. As land here is ideal for its growth, coffee proved to be a huge success. From 2007 to 2017, land under coffee plantation increased by 4,000 ha in Kodagu. Now, Kodagu has 43 per cent of India's coffee



plantations, and 80 per cent of India's total coffee comes from Karnataka. Kerala, too, is growing coffee over 86,000 ha and boosting its economy.

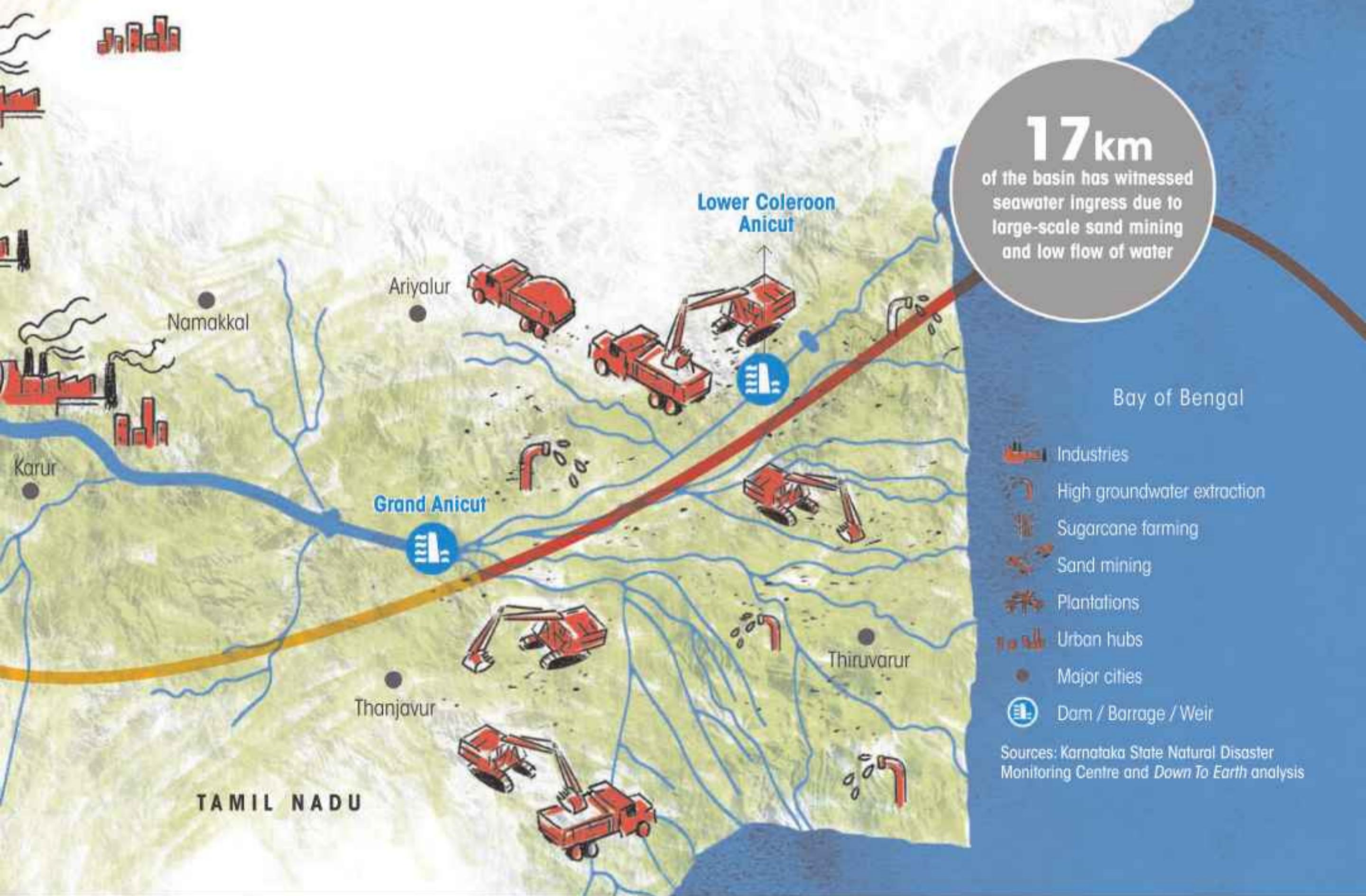
"But coffee plants cannot hold water or soil as they have small roots. They neither conserve nor restore rainwater," says S Janakarajan, former professor at Madras Institute of Development Studies, Chennai (see p28 'Delta distress'). Growing coffee excessively on steep slopes that have loose soil and are heavy with water result in landslides, says Bopanna. Small wonder, Kodagu witnessed a land-slide last year, destroying coffee plantations, nearby houses, and also choking river streams. Now even a year later, the area has not recovered from a water crisis.

Excessive plantation of coffee reduced groundwater levels, and soon the area witnessed a sharp rise in the number of borewells. "About 15 years ago, there were less than 20 borewells within 5 km radius. Now, the number has risen to 100 plus,"

says Sreenivas Reddy, director, Karnataka State Natural Disaster Monitoring Centre.

Coffee Agroforestry Network, an international project funded by the European Union to study the loss of diversity, directly links the drop in forest cover to changes in the coffee-growing system which shifted from stream-fed shady plantations to irrigated plantations. In Kodagu, forest cover decreased by 28 per cent between 1977 and 1997. Data with Global Forest Watch, which does real-time monitoring of forests, shows that in the past 17 years, the Western Ghats, one of the world's top eight biodiversity hotspots, lost 20,000 ha of tree cover in four Karnataka districts—Uttar Kannada, Dakshin Kannada, Udupi and Kodagu. In 2015, about 50,000 trees were cut in Kodagu to set up electricity lines for industries. Another 300,000 trees are going to be cut to widen national highways 4A, 75 and 13, and for a railway project to connect Kodagu with Mysuru.

Also, the new coffee plantations have



blocked the forest corridor which elephants used earlier. At one point in the Virajpet taluka near Kerala's Wayanad district, coffee planters have spared only 2-3 metres for elephants. The Cauvery touches Kerala at Wayanad in the form of Kabini, the river's tributary, and flows till Mysuru. "How will a herd cross the thin bypass without destroying the plantations?" asks Colonel Mutthana, president of Coorg Wildlife Society. In the past few years, incidences of human conflict with wild boars, porcupines, anteaters, leopards, elephants, monkeys and peacocks have increased, says Puvaya.

But the government, it seems, is not bothered that land use changes have deeply impacted the environment, and thus people's lives. "Government documents categorise coffee estates and the new trees as forest area, so according to them there has been no loss of green cover," says Mutthana.

Moreover, at least 2 million tourists visit Kodagu every year, in addition to half a million residents. "Big resorts like Tamra, Taj Vivanta and Club Mahindra have come up which either block or divert the perennial streams for their own use," says Bopanna. "Club Mahindra extracts 0.25 million litres of water every day from Koothole dam, the main source of drinking water for at least 12 surrounding villages. The resort also has a huge private reservoir," he adds.

"The waste the district generates goes directly into the Cauvery, the sludge further restricting the flow. Almost 0.5 million litres of untreated waste water and human faeces is dumped in the Cauvery in Kodagu itself," says M N Chandramohan, convener of Kaveri Nadi Samrakshaka Sangha, a non-profit working to clean the river. Reports of Karnataka State Pollution Control Board and Tamil Nadu State Pollution Control Board show that the total dissolved solid (TDS) level in water increases as the river flows downstream. The TDS level in Madikeri is 57 mg per litre, 67 in Kushalnagar, 201 as it reaches Mysuru, and 301-487 at Mekedatu Sangama. As per WHO guidelines, TDS level of potable water should be below 300 mg per litre.



There is hardly any water at Salem district as the Stanley reservoir upstream restricts the Cauvery's momentum

AT KUSHALNAGAR, NEAR Mysuru, the Cauvery is bone dry. Illegal sandminers work fearlessly on the riverbed, digging beyond permissible levels severely depleting the water table. "The permissible mining limit is 1 metre, but illegal miners excavate the riverbeds up to 6 metres creating huge pits," says Chandramohan.

Indiscriminate mining has adversely impacted aquatic life. The river had 148 species of fish, of which 17 are endemic to the river, shows Biodiversity Board of Karnataka data. This is the highest in the country. But many species have either disappeared or are under threat of extinction. The hump-backed mahseer, once a common Cauvery fish, has now been categorised critically endangered by the International Union for Conservation of Nature. Red-tipped halfbeak, slender stone loach, mrigal carp,



Wayanad mahseer, Korhi barb, Nilgiri barb, Nilgiri mystus, Bhavani barb and Cauvery barb are all facing the risk of extinction.

The river recovers its water at Mandya, the last Karnataka district it flows through. But it also faces the onslaught of industrial pollution here. The Krishna Raja Sagara Dam, also called KRS Dam, minimises its pace, as it moves towards the Bay of Bengal.

THE CAUVERY ENTERS Tamil Nadu at the semi-arid Dharmapuri district, and for the first time it flows freely. As the river dives 20 metres, it creates the Hogenakkal Falls. But its freedom is short-lived. Stanley, the largest dam in Mettur, again restricts its momentum. Mettur, a small town in Salem district, dumps untreated effluent from tannery, paper and textile units, increasing toxicity. And by the time it reaches Erode

PHOTOGRAPH: VIKAS CHOWDHARY/CSE

district, the Cauvery is nothing but a sewer. “A landfill on the dry riverbed gets submerged during the monsoon, converting the river into a waste stream,” says Adhavan Ashokan, a resident who works in a textile firm.

Pollution levels here are the highest in the country, shows a government-funded study conducted in December 2017 by the Anna University in Tamil Nadu. In Mettur and Erode, TDS level is an astounding 1,750 and 1,450 mg per litre. The average TDS level in the Cauvery is 753 mg per litre.

“Toxic water has made many women of the region infertile, so people don’t marry women from in and around Erode and Karur,” says Thambaya Sitaramani, a farmer who is also the coordinator of Kaveri Surplus Water Action Committee in Salem.

“Salem takes the industry’s filth, Erode takes the garbage from Salem, while Trichy accepts Erode’s filth. Till the Bay of Bengal, the journey is not that of the river, but that of filth,” says Peeyush Manush of Salem Citizen Forum who is working to rejuvenate the waterbodies in Salem district.

As the Cauvery enters the plains of Tamil Nadu, it widens and forms a delta. Large-scale groundwater extraction for farming and sand mining have sealed the river’s fate. “Every day, illegal miners dig the riverbed and supply 10,000 lorries of sand to the construction industry,” says Vetriselvam Muthuraj, a Chennai-based lawyer. “Sand mining erodes river’s banks and the bottom, while also damaging the bedrock which is responsible for self-distillation,” says Janakarajan.

The basin is already starved of sediments. As many as 96 dams, 10 barrages and 16 anicuts, besides 54 irrigation projects and 15 major hydroelectric projects upstream, have blocked silt from flowing downstream. Silt helps create delta at an elevation, which differentiates riverwater from that of the sea. But absence of enough silt has shrunk the Cauvery’s mouth. Now, the river’s flow has reversed: instead of the river water flowing into the sea, the Bay of Bengal has entered 17 km into the delta and turned the water saline.

@journojitendra

DELTA DISTRESS

In Tamil Nadu, the river faces manifold threats of destruction

BY S JANAKARAJAN

THE CAUVERY delta is heavily stressed. Its contribution to the food security of Tamil Nadu and to the nation is critical. But admittedly, irrigation in the delta area is extremely inefficient, facilities for it are poorly maintained, and therefore, productivity per unit of water used is low.

Climate variability and the resulting changing monsoon conditions and extreme coastal events have a cumulative impact on farmers in the delta area. These have endangered fresh and brackish water resources, coastal freshwater aquifers, land and soil, rivers and streams, mangroves and human settlements. Use of groundwater as an alternate source of irrigation is increasing in the delta area. In the entire Nagappattinam district and a substantial part of Tiruvarur and parts of Thanjavur districts in Tamil Nadu, groundwater has turned completely saline due to severe seawater ingress.

The irrepressible inter-state water dispute has increased risks and uncertainties. At the worst affected Nagappattinam, a district at the tail end of Tamil Nadu, it takes weeks or even a month to get water. The short-duration *kuruvai* crop, grown from June to September, has steeply declined. Cracking clay soil in most areas here inhibits farmers from shifting to other crops. Therefore, the main crop is still paddy, contributing to over 30 per cent of rice

production in the state.

Dairy as a secondary occupation is almost disappearing in the delta districts. Cattle population has registered a steep decline in the past few decades. The delta districts have witnessed a drastic decline in goat and sheep breeding, and poultry, which provide an alternative source of livelihood. This means the degree of delta farmers' dependence on agriculture is higher than in other districts in Tamil Nadu.

The ramifications of pollution, both from industries and municipal waste, are now more severe. All the major tributaries of the Cauvery in Tamil Nadu such as Bhavani, Noyyal, Amaravathi and Kodaganaru are heavily polluted due to the discharge of industrial effluent. The towns located along the river dump domestic sewage into the river. Sand mining on the riverbed goes on ruthlessly destroying the riverbed, riverbed filtration and riverbed aquifers.

The delta is facing subsidence threat due to lack of sediment flow from the upstream as well as due to seawater ingress, increasing coastal flooding and coastal erosion. The entire Nagappattinam district is facing the threat of submergence due to global warming induced sea-level rise and ongoing coastal erosion.

(The author is a retired professor at the Madras Institute of Development Studies)

The ramifications of pollution, both from industries and municipal waste, are now more severe

CEM INDIA



USE PROMOTIONAL
CODE CSEFREE
TO GAIN FREE ENTRY
TO CEM INDIA

CONFERENCE AND EXHIBITION FOR EMISSIONS MONITORING IN INDIA

24th-26th September 2019

The Leela Ambience Convention Hotel, Delhi, India

CEM India will provide delegates and visitors in-depth information on Indian regulation and policy, monitoring guidelines, calibration and quality control. There will be case study presentations from International speakers, the Central Pollution Control Board and the Centre for Science and Environment on best practice, installation, procedures, data capture and much more.

Running alongside the conference will be an Exhibition of CEM Domestic and International equipment manufacturers and suppliers who will be able to demonstrate and give technical advice on the latest CEM and CEQMS products and services.

The CEM India conference follows on from the highly successful series of CEM events which have been held in Europe since 1997.

Visitors and delegates to CEM India will be able to meet all major domestic and international CEM manufacturers and suppliers to compare products, prices and technology all at one time and in one place - CEM India.



REGISTRATION NOW OPEN

CONFERENCE TOPICS INCLUDE:

- Pollution monitoring regulations and practices
- Manual stack monitoring, technological innovations and experiences
- Guidelines for continuous emission, water and effluent quality monitoring
- Monitoring Techniques and their suitability: Particulate
- Monitoring Techniques and their suitability: Combustion gases including NOx, SO₂, CO and CO₂
- Monitoring Techniques and their suitability: Trace species for metals, mercury and dioxins
- Monitoring Techniques and their suitability: Water and effluent quality parameters
- Quality assurance regulations and practices for continuous emission and effluent quality monitoring system
- Calibration and operation and maintenance of continuous emission, water and effluent quality monitors
- Real-time data collection, handling, interpretation and utilisation
- Industry case studies on pollution monitoring

www.cemindia.com

Capital conundrum

At the peak of Karnataka's water crisis, the state's deputy chief minister, G Parameshwara, made a desperate suggestion. He said the government was mulling over a moratorium on the construction of new residential complexes in Bengaluru for five years to tide over the water crisis. But are restrictions on construction or population an effective way to resolve the problem? Or are there simpler ways to strengthen water conservation?

SUSHMITA SENGUPTA spoke to a range of experts



"Imageries of Bengaluru's future are in conflict"

LEO F SALDANHA
Environmentalist and coordinator of Environment Support Group, a Bengaluru-based non-profit

MASSIVE APARTMENT blocks have sprung up all across Bengaluru, especially in peri-urban areas, and particularly in the IT belt straddling across the eastern and southern extents of the metropolis. Much of this region does not get piped water from the Cauvery and so residents and commercial complexes depend on groundwater, which, over the past two decades, has seen rapid depletion.

To milk this perpetual demand, the unregulated tanker

suppliers extract water from distant villages and supply it to the city. The carbon, financial and social footprints of this demand-supply phenomenon are unfathomable. The adverse impacts are extensively evident in the emergence of fallow agricultural fields around the city, as farmers prefer to sell water instead of farming. High labour costs and lack of labour in any case have made farming highly unviable.

Encroachment, contamination and destruction of lakes and canals in recent decades, and the extensive concretisation of the city, have fundamentally reduced the potential of groundwater recharge. As a result, even a small burst of rain—precious water that should have percolated into groundwater aquifers—floods

the city. This is when groundwater dependence is growing exponentially.

There is also talk of diverting water from the faraway Yettinahole, Sharavathi, Netravathi and other Western Ghats rivers. People here have clearly stated that they will fight any diversion of water. When the Karnataka government proposed to build a dam at Mekedatu, where the Cauvery dives into an amazing gorge and creates a complex riverine forest, downstream Tamil Nadu lodged its protest with the Prime Minister. So expanding Bengaluru finds itself between a rock and a very hard place.

Meanwhile, various planning and development agencies have promoted densification of urban areas through a transport corridor and

expansion of the city's north beyond the airport. This is to create an Information Technology Investment Region and the Aerospace SEZ. This will effectively urbanise the watershed of the Arkavathy river, that once fed the city. Now the river is mostly dry.

Clearly, the imageries of Bengaluru's future are in conflict. The highly financialised real estate and commercial sectors see no end for the city's growth and expansion, and argue this is good for the regional economy and in creating a "world class" city. But then there is the environmental limit imposed by water, and this scarcity will intensify existing water conflicts. With upstream farmers conditioned to intense (and quite wasteful) water use to grow sugarcane and paddy—much of which is exported—people have begun to contest this as export of "virtual water" and denial of drinking water.

Such acute water stresses have been emerging for a while. And this should have compelled civic and state agencies to force rainwater harvesting for all houses, businesses, industries and corporate and public institutions. Despite a compulsory rainwater harvesting law being in place for over a decade, the fact remains that only about 150,000

buildings are rainwater proofed—a fraction of over 2 million buildings in the city. And as the Karnataka High Court recently observed, the state government and civic agencies seem to have done nothing at all to implement the directions of a 2012 petition initiated by the Environment Support Group. These guidelines have recommended that all lakes and their canal networks should be rehabilitated so that surface water flows are harvested and secured to supply water for the metropolis.

Real estate and infrastructure is primed to receive a massive boost from foreign direct investment through policies introduced in the 2019 Union Budget. Such centralised interventions, promoted with an ambition of a \$5 trillion economy, appear to have little understanding of the ground realities, especially the implications for cities like Bengaluru, which have already over-stepped their environmental boundaries. For Parameshwara to wish to restrict Bengaluru's growth, at least for a brief period, he needs to contend with capital flows into real estate and aspirations of high returns on investments that operate agnostic to environmental and social realities.

the international best practice of less than 10 per cent.

It must be noted that most cities have norms that do not allow "water for construction purposes" to be sourced from municipal supplies. Water for construction, even for large housing complexes, is almost entirely groundwater, whether such projects are located within the municipal water supply network or outside it. Given the reality that cities don't have any system of accounting for water being extracted from these private bore wells, it is highly presumptuous of them to punish construction industry for water crisis.

But the construction industry is no saint either, they over extract and waste water. Take the example of Gurugram, which has been sucked dry by developers. Part of the blame also falls on the government which failed to account for the collective impact of hundreds and thousands of construction projects being approved in close vicinity. The city has now outlawed groundwater extraction for construction and only allows the use of recycled wastewater.

Construction can consume between 3,000 and 8,000 litres of water for every square metre of built up area, according to a 2016 study by



"It is a myopic reaction"

AVIKAL SOMVANSHI

Programme manager, sustainable cities programme, Centre for Science and Environment, New Delhi

BANNING CONSTRUCTION and restricting urbanisation is a myopic reaction to increasing water stress in the country. The crux of the problem is not consumption of water. Most Indians (urban or rural) are prudent about water usage as they don't get enough. It is the criminal wastage of water and pathetic management of wastewater due to poor planning and design of city and its infrastructure that has caused the shortage.

Delhi reportedly loses as much as 40 per cent of the city's water input, mostly due to old and leaking pipes, as compared to

Jadhpur University, Kolkata. Lesser usage was reported from Pune, which is a water stress city and higher usage was from Kolkata, a water abundant city. This indicates the construction industry's ability to manage water, depending on the availability and the economics of the resource. Water consumption for construction can be further optimised by adopting water-efficient materials and technology.

With the ongoing clamour for housing in cities, it is insensitive to blanket ban all residential projects. Not to discount the fact that construction is the biggest employer of unskilled labour in this country and any kind of ban affects the sole source of their livelihood. Cities need to encourage better management of construction practices and enforce or facilitate the use of recycled wastewater for construction. If a need arises to stop construction, it ought to be based on the projects' water performance, and not just typology. Shutting down a water-efficient residential project while letting water guzzling commercial projects function is just not done.

If we need to ban, we should start with indulgence. Ban all grass lawns and water-

intensive greening (like vertical gardens) in the city, just the way many water-stress places around the world, including California, have done. Grass in the lawns of the rich of Lutyens Delhi and Bengaluru's Koramangala can be replaced with succulents.



"I agree with the restriction policy"

SHYAMALA K MANI

Former professor,
National Institute of
Urban Affairs, New Delhi

THE COMPOSITE Water Resources Management 2018, published by NITI Aayog, states that "droughts are becoming more frequent, creating severe problems for India's rain-dependent farmers (about 53 per cent of agriculture in India is rainfed). When water is available, it is

likely to be contaminated (up to 70 per cent of our water supply is contaminated), resulting in nearly 200,000 deaths each year. Interstate disagreements are on the rise, with seven major disputes currently raging, pointing to the fact that limited frameworks and institutions are in place for national water governance". The baseline map on water stress shows that Karnataka, Tamil Nadu and even Andhra Pradesh, are in extremely high stress categories. The report has predicted that 40 per cent of India's population will have no access to drinking water by 2030, and 21 cities including New Delhi, Chennai, Bengaluru and Hyderabad will run out of groundwater by 2020. This year, Chennai is bringing water through trains from the Mettur reservoir, which itself is showing depleted levels until November when the rains will set in.

It is also a well-known fact that next to agriculture, construction industry consumes the maximum water, whose outcome will also lead to increased consumption of water as a large number of people reside in housing complexes. Although, it is mandatory for all housing societies to have rainwater harvesting structures to either capture rainwa-

ter for treatment and reuse or to recharge groundwater, such structures are useful only if the rains do not fail or the precipitation is at a certain manageable rate. Either prolonged periods of drought or very high precipitation within two or three days, as is happening these days due to climate change, render these water conservation structures unhelpful.

Construction of decentralised sewage treatment plants within housing complexes are being promoted and enforced through incentives and penalties to increase reuse of treated black and grey water for flushing, gardening and other non-potable uses. However, the likelihood of tertiary treatment of such water for potable uses has not found much success even in city states like Singapore and will remain a challenge for Indian cities.

Therefore, I agree with the decision of Karnataka on wanting restriction on construction of residential complexes to tide over water scarcity especially because their Water Management Index of performance indicators, which are a measure of their overall performance on water conservation is only in the range of 50-60 per cent.

@down2earthindia



Assi, the Ganga's tributary, is barely visible as residents of Varanasi have constructed buildings and dispose all their waste here

Nowhere to flow

Over 60 years after the country got its first plan to rejuvenate the rivers, not a single basin has been spared from overexploitation

SUSHMITA SENGUPTA & RASHMI VERMA

ALL THE 20 river basins of the country share the story of the Cauvery: how human interference has changed every river's form and flow pattern over the past few decades.

Water in the country's three major rivers—the Indus, the Brahmaputra and the Ganga—has plummeted drastically. Central Water Commission's 2017 data shows that between 1984-85 and 2014-15 water in the Indus dropped by 27.78 billion cubic metres (bcm), almost equal to the average water available in the Cauvery during this time. In the Brahmaputra it dropped by 95.56 bcm and in the Ganga by 15.5 bcm. The report shows another disturbing trend: between 2004-05 and 2014-15, the catchment area of the Indus reduced by 1 per cent, that of the Ganga by 2.7 per cent, and of the Brahmaputra by 0.6 per cent. The per capita surface water availability also dropped from 5,200 cubic metres in 1951 to 1,588 in 2010.

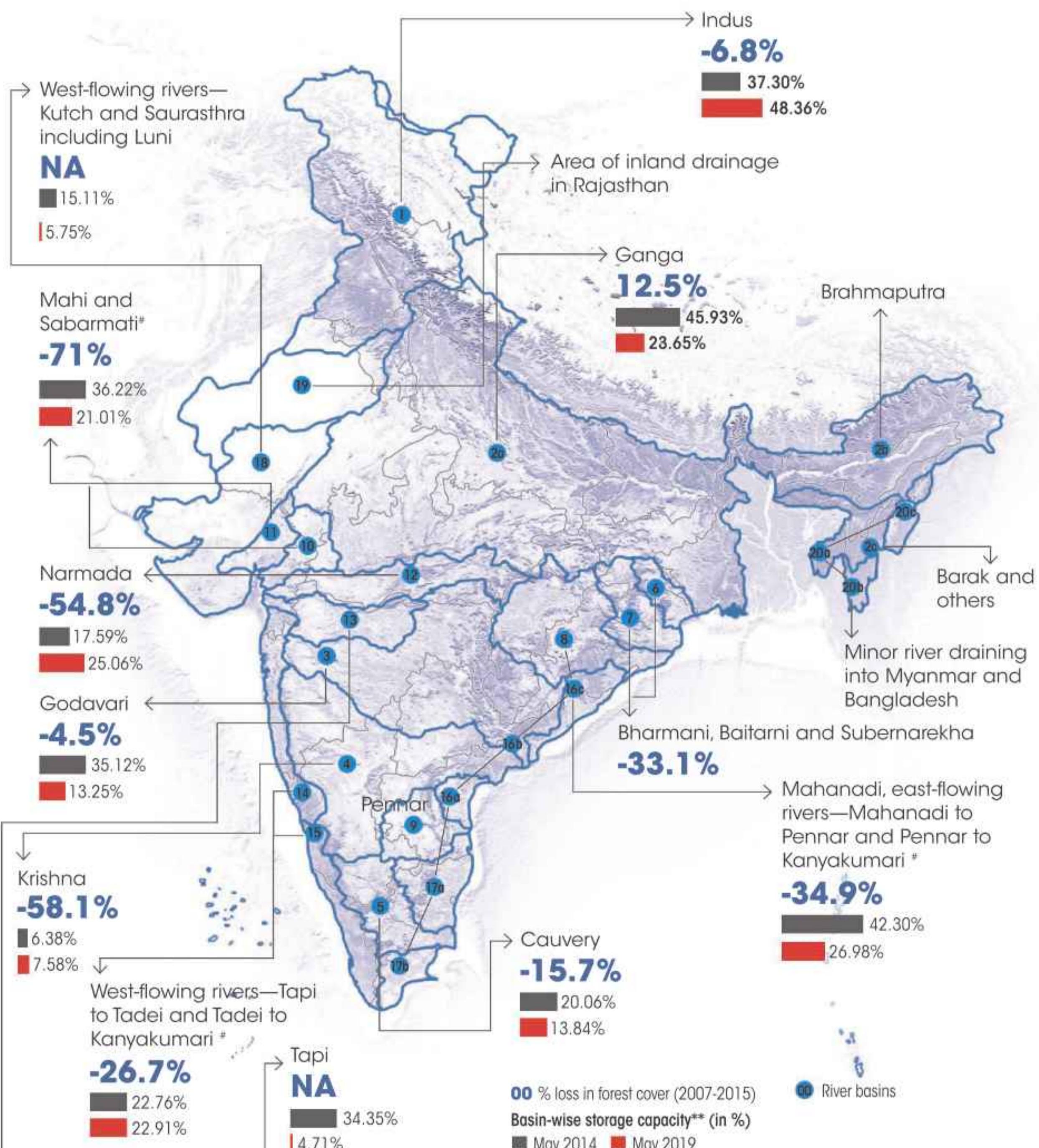
The Ganga basin, the country's largest river basin, is degraded as forest areas are rapidly transforming into agricultural and urban lands. It is alarming that in the lower parts of the basin—in Madhya Pradesh, Rajasthan, Jharkhand and West Bengal—land in many areas has turned barren.

Rampant deforestation has cost the Ganga over 1,500 billion cusecs water near the Himalayas, says Prakash C Tiwari, lead author of a 2015 study on the Himalayan basin conducted along with the Australian National University of Canberra. It is, therefore, not surprising that along with the Ganga, the flow of its major tributaries has also slowed down. Between 2005-2006 and 2014-2015, the flow of Sone and Ramganga reduced the most—69 and 55 per cent respectively, shows an analysis by Delhi-based think tank Centre for Science and Environment.

Tiwari's study shows 45 per cent depletion of natural resources in the Kum-

DRY RUN

Ten of the 15* monitored river basins have registered a dip in their reservoir water levels between May 2014 and 2019



Source: *Integrated Hydrological Data Book (Non-Classified River Basins)* by Central Water Commission; 2018 research paper "Driver based statistical model for simulating land use/land cover change in Indus river basin" by Yajnaseni Palchoudhuri and Parth Sarthi Roy; and, 2018 research paper "Assessing land transformation and associated degradation of the Ganga River Basin using forest cover/land use mapping and residual trend analysis" by S. Martin, S. Ghosh and M.D. Roberts.

* Data of the remaining rivers is not in public domain; # Data of some river basins have been combined by CWC

aun region, 39 per cent in Garhwal, 47 per cent in the Yamuna catchment area, 37 per cent in the Beas catchment area in Himachal Pradesh and 37 per cent in the Teesta catchment area in Sikkim. The region is now turning arid and has repeatedly witnessed flash floods and landslides in the past 15 years. In the past 30 years, many springs in the region have dried up. The springs in Shilma dried by 25 per cent, in Hamirpur by 31 per cent, in Solan by 39 per cent and in Almora by 41 per cent.

A study by the National Institute of Technology, Karnataka on the Netravathi river basin shows how urbanisation-driven change in the land cover can negatively impact a river's hydrological parameters. Netravathi originates in the Western Ghats of Karnataka and flows into the Arabian Sea in Mangaluru. This river basin witnessed increased runoff and lowered evapotranspiration—when water from the soil and other surfaces transferred to the atmosphere by evaporation and by transpiration from plants.

The devastating impact of rampant degradation of rivers and their basins has hardly evoked a debate or policy changes. "The government should understand that if catchment areas are not protected, it will have a huge impact on the health of the Ganga, Yamuna and other such rivers," says environmentalist Ajay S Rawat who is fighting to save the waterbodies of Uttarakhand. But governments since Independence have failed to formulate a concrete plan to manage India's water basins.

THE COUNTRY'S FIRST Five-Year Plan (1951-56) stressed on the importance of soil conservation and protecting soil from floods and erosion. It proposed the establishment of Central and state soil conservation boards. It also advised the states to enact their own legislations on soil conservation. But both the Central and state governments ignored all the suggestions.

In 1956, the River Board Act was framed. Every state was to have a river board to regulate and develop inter-state river

In 1956, the River Board Act was framed to develop inter-state river basins. Over 60 years later, not one river board has emerged as a basin development body

basins and valleys. They were supposed to advise the Union government on development opportunities, coordinate development activities and resolve disputes, while promoting basin development projects. More than 60 years later, not a single river board has emerged as a river basin development body. Instead, the focus has been only on building dams and other development projects using the river water.

In 2013, the Ministry of Water Resources formulated the National Water Policy, calling for better governance, planning and development of water resources. The objective was to protect the rivers and waterbodies by identifying and protecting the flood plains, removing encroachments, checking illegal sand mining and pollution and improving the maintenance of water infrastructure.

"But the policy is fundamentally flawed," Archana Vaidya, environment law consultant told *Down To Earth*. It treats preservation of natural water sources and water infrastructure in the same manner. "While preservation of natural water sources is the fundamental duty of every citizen, building infrastructure is a function of financially viable organisations responsible for the work," she says. On the one hand, the policy advocates that water resource planning should be done at the basic level, and on the other, it says we need to have a national perspective while planning. The policy states that Integrated Water Resources Management, which promotes coordinated development and management of water, should take into account river basins and sub-basins as the unit for development. It also states that local bodies like panchayats, municipalities and corporations and water user associations should be involved in project planning and implementation. But the policy does not clarify how these two can be merged.

In 2015, the erstwhile Ministry of Water Resources, River Development and Ganga Rejuvenation brought out the draft National Water Framework Bill. It provided an overarching national legal framework for the



protection, conservation, regulation and management of water as a vital but stressed natural resource, while including the management of river basins. But the draft Bill does not focus on critical aspects of water management.

The re-elected Narendra Modi government launched the Ministry of Jal Shakti by integrating all the water-related ministries—the Ministry of Water Resources, River Development and Ganga Rejuvenation and Ministry of Drinking Water and Sanitation—along with the National River Conservation Directorate. The prime minister called it a symbol of his commitment towards solving India's water crisis. But will this convergence solve any purpose?

"Evidently, no great improvement has been sighted in the status of the Ganga," says Manoj Mishra of Yamuna Jiye Abhiyan, a consortium of organisations that aims to revive the Yamuna. "The government took no initiative to generate public awareness on the threats of river pollution, or in involving local communities in the project," says R S Lal Mohan, chairperson of Conservation of Nature Trust and convenor of the Nagercoil chapter of the Indian National Trust for Art and Cultural Heritage.

"An umbrella ministry sounds good, but saving a river basin needs terrain-specific

Rampant sand mining has affected the flow of rivers

planning which has always been ignored," says Rawat. Uttarakhand, for instance, has six river catchments and 1,120 micro watersheds. Planning for these should start from micro watershed level and accountability should be fixed on high-level officials, he adds.

No country can attain self-sufficiency in food production, water availability and distribution of water resources unless the fundamentals are addressed, says Mohan. It is essential to form a river basin protection board which has the power to regulate the development of river basins and to protect rivers from over-exploitation and pollution. The health of people is intimately intertwined with the health of the rivers and the river basins, he adds. "Premium should be on conserving whatever evergreen and semi-evergreen forests we are left with now through appropriate conservation and management practices," say researchers of Energy and Wetlands Research Group, Centre for Ecological Sciences, Indian Institute of Science, Bengaluru.

The prime minister's focus on water conservation in his second term surely gives hope of cleaner rivers, but for this the country needs to protect its catchments and the channels that feed them. For this, strict laws and their implementation are of utmost significance. @lakewarriors

Jal Shakti as an umbrella ministry sounds good, but saving a river basin needs terrain-specific planning, which has always been ignored

Ajay Rawat,
Environmentalist

PRESERVE OR PERISH

Assam shows how water needs can be met without disturbing river's ecology

BY ARUP KUMAR SARMA

THE STATE of a river basin can be evaluated using parameters such as its water yield, sediment yield, quality and quantity of ground and surface water, vegetation health, soil productivity and climate resiliency.

The hydrological response and climate resiliency of the river basins change due to the variations in precipitation, temperature, topography, lithology, vegetation and other climatic characteristics. While many sub-basins with subtropical climate and montane ecosystems in the Brahmaputra and the Ganga are experiencing increased flooding, other rivers are water stressed due to anthropogenic and climatic factors. Studies on the impact of climate change on precipitation indicate the possibility of high intensity rainfall of short duration and long dry spells that lead to flood and drought.

A river basin can be called degraded if the natural productivity, water availability and its capacity to absorb impacts of extreme events deteriorate from that of pre-industrial time. To evaluate degradation, one needs to compare the response of the basin with its response before human interventions. But human beings are a part of nature and their actions to meet their needs are natural.

With these philosophies, the concept of optimal ecological management practices (EMP) was developed, which aims to revert sediment yield, water yield and water quality parameters of a degraded basin by using ecologically sustainable and economically

viable management practices. EMPS include afforestation and are a judicious combination of vegetative and other traditional measures. To estimate the affordable basin population of flood-prone cities, SAFE (sustainable accommodation through feedback evaluation) carrying capacity was developed. Sustainable approach of rainwater management and application, or SARMA system, helps in climate-resilient rainwater management using multi-utility ponds. It is implemented in tea gardens. Assessment of settlement in ecosensitive areas, or ASEA, assist in understanding settlements in the eco-sensitive wetlands and hills near or within urban areas. ASEA helps in policy making on urban development.

Some of these initiatives were supported by the Ministry of Housing and Urban Affairs. The Assam government implemented it in two pilot watersheds with encouraging results. The concepts can well be used to manage all river basins. The Union government's afforestation efforts can be effective if plantation locations are identified using EMP concept.

River basin degradation is a socio-economic problem. The challenge lies in finding ways to satisfy our needs without disturbing the ecological balance. As a river basin spreads over many states, a holistic project prepared with a win-win situation to all riparian states can form the basis for political negotiation and can pave the path for a better future.

(The author is a professor at IIT Guwahati)

The concept of ecological management practices was developed to revert sediment yield, water yield and water quality of a degraded basin

Time to talk

Gap in communication between India and neighbouring Nepal is an endemic problem that worsens Bihar floods

AKSHIT SANGOMLA New Delhi

Over 100 lives lost, 0.1 million displaced and 7.2 million people affected. That's the human cost of the flood that deluged Bihar for close to two weeks this July. Many lives could have been saved, losses averted, and people and livestock evacuated had the communities known beforehand that heavy rains were also lashing the Terai (lowland) region of the neighbouring Himalayan country, Nepal, and that the rivers flowing from across the border were in spate. But weather-related information takes an average 48 hours to travel through the Indian and Nepalese bureaucratic circuit, say experts. And that's way too long for a gushing river that can obliterate villages overnight.

Between July 7 and 13, heavy rainfall in Bihar caused flash floods in six districts (see "Knockout spell", p41). People started picking up their lives as the intensity of rainfall reduced by July 14. But suddenly, the authorities of Koshi Barrage, located on the Kosi river just before it enters India, opened the floodgates. Though heavy rains in the state stopped by July 17, some 12 districts were declared flood-hit.

The delay of information sharing is alarming because every time Nepal has received heavy rains, Bihar has recorded flash floods. "In the recent past, this happened in 2008, 2011, 2013, 2015 and 2017," says Narayan Gyawali of Lutheran



THE DELAY IN INFORMATION SHARING IS ALARMING BECAUSE EVERY TIME NEPAL HAS RECEIVED HEAVY RAINS, BIHAR HAS RECORDED FLASH FLOODS

NARAYAN GYAWALI
LUTHERAN WORLD RELIEF FOUNDATION

World Relief (LWR) foundation, a non-profit that runs a community-based project in India and Nepal on early flood warning systems. The two countries have a circuitous communication channel that means the information is either critically delayed or unclear, and of little use to most riverbank communities in downstream Bihar. This is when the Nepal government has a dedicated Water and Energy Commission Secretariat for trans-boundary water issues, established way back in 1981. Both the countries have also constituted a Joint Committee on Inundation and Flood Management.

Talking to *Down To Earth*, C K L Das, a member of the joint committee and chairperson of the Ganga Flood Control Commission, Patna, said the committee members do interact with communities that live in flood-prone areas in both the countries on a regular basis to assess their concerns and address those. But they do not issue flood warnings to communities as "there is no official requirement for us to do this".

Just like Nepal, India too has a body, the Central Water Commission, which monitors floods in the country. But it looks only at the rivers and does not take into account the rainfall data for flood predictions. "Though bringing together rainfall data and river monitoring to do better flood forecasting has been talked about by both the countries, there is no



specific plan put in place for this to happen," says Das.

Poor transborder information sharing has been a long standing problem for India. Last year, Arunachal Pradesh got flooded due to heavy rainfall in China. There are also fears that the ongoing rains in China might soon affect Assam, where 4.4 million people have already been affected by floods due to incessant rainfall. "With the past political crisis during the Doklam standoff (the 2017 India-China border standoff), the data sharing (between the two countries) has been limited," says Giriraj Amarnath of the International Water Management Institute, a non-profit research organisation based in Colombo, which works on sustainable use of water and land resources.

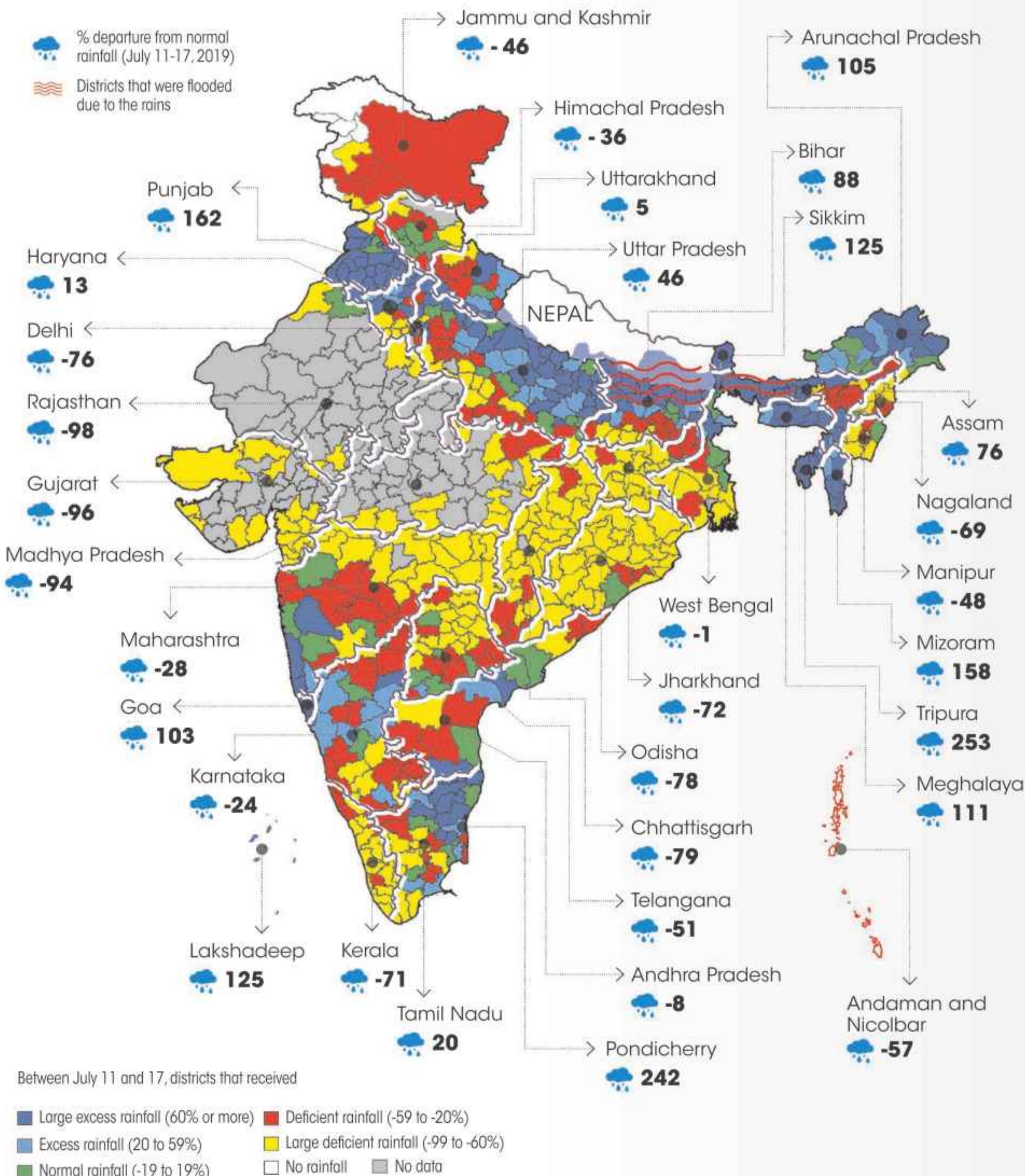
WHILE THE GOVERNMENT has failed to create a system to warn the people, several community-level initiatives across India and Nepal are seamlessly sharing timely information. The people of Bihar's Birpur village in Supaul district, for example, received a flood warning on July 13. "I got a call from Nepal about the rising water levels in the Kosi. We imme-

diately shifted our families and livestock to safer zones," says Chandan Roy from the village which is just a few kilometres from the Indo-Nepal border. The village was drowned a day later when Koshi barrage was opened. "We had zero casualties because of the timely warning. We even communicated the information to nearby communities," says Roy, who is part of LWR's transborder citizen forum, an initiative started in 2013 where communities across the border regularly meet to discuss flood mitigation measures. The non-profit claims that the initiative issued timely warnings to 48 communities in India that benefitted over 25,000 people in Supaul and Madhubani districts.

"Community-based flood early warning system utilises local resources to enhance the community's resilience," says Neera Shrestha Pradhan of the International Centre for Integrated Mountain Development, which runs a similar initiative in the Hindu Kush Himalaya. The upstream community generates the flood information using a low-cost transmitter-receiver unit and disseminates early warning to the communities. The transmitter is placed on the river

A week of rains wreaks havoc

Twelve states in India received over 60 per cent surplus rains in the second week of July this year. The resultant floods in Bihar and Assam affected over 10 million and claimed 168 lives



KNOCKOUT SPELL

Within a span of 11 days, seasonal rainfall in Bihar went from deficit to surplus

July 7

171.5 mm

rainfall recorded in Bihar. Till then, 27 of its 38 districts had more than 40 per cent deficient rains



INDIA CURRENTLY ALLOWS BHUTAN TO USE THE BRAHMAPUTRA TO SHIP GOODS TO BANGLADESH. SUCH ECONOMIC ASSOCIATIONS HELP IN ESTABLISHING EFFECTIVE WARNING SYSTEMS ACROSS INTERNATIONAL BORDERS

GIRIRAJ AMARNATH
INTERNATIONAL WATER MANAGEMENT INSTITUTE

6 districts

in Bihar—East Champaran, Sitamarhi, Madhubani, Kishanganj, Araria and Sheohar—flooded due to incessant rainfall

July 14

0.3 million

cusecs released from the Koshi Barrage in Nepal that gushes to downstream Bihar

July 16

10 districts

in Bihar reel under floods. The four additional districts are Purnia, Katihar, Saharsa, Darbhanga

July 17

12 districts

in the state report floods. Bihar becomes a monsoon-surplus state. The two additional districts are Supaul, Muzaffarpur

Map not to scale
Source: India Meteorological Department; International Water Management Institute; and media reports

bank, and the receiver is placed in a house of the nearest village. The homeowner monitors the unit and disseminates information to communities, local government agencies, and other stakeholders through mobile messages and WhatsApp groups.

TRANSBORDER INFORMATION

sharing is imperative because the frequency of extreme rainfall events is on the rise. "Some of the most sophisticated forecasts with climate change models suggest that as the globe warms, more rains will fall in the form of severe, intermittent storms rather than in the kind of gentle soaking showers that can sustain crops," says a report in the journal *Nature*. This trend was at play in July.

Till July 7, as many as 27 of the 38 districts in Bihar recorded over 40 per cent deficit rainfall. Over the next week, seven of these rainfall-deficit districts were under flash floods. Nepal too was waiting for the onset of monsoons till July 10, when its Department of Hydrology and Meteorology issued a sudden warning of floods in the next 20-36 hours. Over the next 24 hours, mid and eastern parts of Nepal received the heaviest rains in the past 30 years. The long term (1981-2010) precipitation data of Nepal highlights that Terai regions are becoming more prone to high-intensity rainfall events than the highland regions, according to a research paper published in the journal *Climate* in January 2017.

Given the climate pressures, Amarnath says India should bring an economic focus to its transborder flood warning policies. "India allows Bhutan to use the Brahmaputra to ship goods to Bangladesh. Such economic associations help establish effective warning systems across international borders." Political will along with community-driven initiatives is an effective way to prepare for such floods, he adds. @aks7489

(With inputs from Rajesh Ghimire in Nepal)

WIPO's flawed piracy blacklist

BUILDING RESPECT for Intellectual Property Database has a solid ring to it. As a project of the World Intellectual Property Organisation or WIPO, a UN body, the BRIP Database as it is called, offers the prospect of cleaning up online piracy globally by putting together a giant blacklist of websites that infringe copyright. The project is based on “follow-the-money” approach to copyright infringement which aims to choke the flow of money to illegal website operators.

This approach has been tried by industry groups and by various agencies in different countries but with mixed results. So although one might believe WIPO’s initiative is a good way of cleansing the Internet of pirate websites by denying them advertising, experience shows that blacklists and “follow-the-money” projects are fraught with problems. WIPO itself notes that “online advertising is complex and hard to control” but appears to think it has the solution.

Apart from the scepticism over how databases help in combating online piracy, tech experts worry over the ways such inherently flawed lists are compiled and how these are utilised. WIPO describes its BRIP Database as “a secure, access-controlled online platform, to which authorised agencies in WIPO member-states may upload lists of websites which deliberately facilitate the infringement of copyright”. Only authorised players in the advertising industry are permitted to use the database.

Not so simple, warn the critics, going by what has happened in the past. In 2011, advertising giant GroupM, a part of marketing WPP conglomerate, brought out a huge list of sites that it said were pirate

sites. The entries were bizarre, as TorrentFreak discovered when it got hold of the list. Among the websites on the list were Internet Archive—which is a US-based non-profit digital library with the stated mission of providing universal access to all knowledge, the popular web video site, Vimeo—which can by no means be termed a pirate site—and SoundCloud—which is widely used by musicians to promote their own music. In short, the list showed not just lack of due process in the way it was compiled but clear signs of bias. GroupM said those who analysed the list had selected websites the agency did not approve of even though these were not in any way involved in piracy.

WIPO’s blacklist raises the same concerns. It is secret, open only to “authorised

contributors” and “authorised users from the advertising sector”. Critics say there is no process to ensure the sites on the list are actually engaged in

ongoing infringement and no clarity on how “authorised contributors” are vetted and approved. Neither are the sites notified of their blacklisting nor is there any provision for allowing any appeals against it.

To all such concerns, WIPO maintains that the BRIP Database platform is merely a central repository for national authorities, such as Agcom in Italy, Hadopi of France and Russia’s Roskomnadzor. These agencies, unfortunately, have a reputation for wrongly claiming infringement and, according to some IP experts, are notorious for declaring even items not under their jurisdiction as guilty of piracy. The overarching question: why is WIPO putting the UN stamp of approval on a system that is patently flawed, unjust and dangerous? **DTE**

Compiling a global database of copyright infringing websites through a secretive process is flawed and dangerous

Palette

WHAT'S INSIDE

The promise, the boom and the ethical concerns of gene editing **P44**

Ecological and livelihood impacts of the proposed Mumbai Coastal Road **P54**

Miniature brinjals from the Northeast that can be cooked in a myriad ways **P56**

RECOMMENDATIONS

EXHIBITION



Keith Haring (1958–1990) was an integral part of the legendary New York art scene of the 1980s. His works were inspired by the environment, pop art and underground club culture. He responded to social issues such as political dictatorship, racism, homophobia, drug addiction, AIDS awareness and capitalism. The exhibition, featuring more than 85 of his artworks, will be on at the Tate Liverpool Gallery in London till November 10.

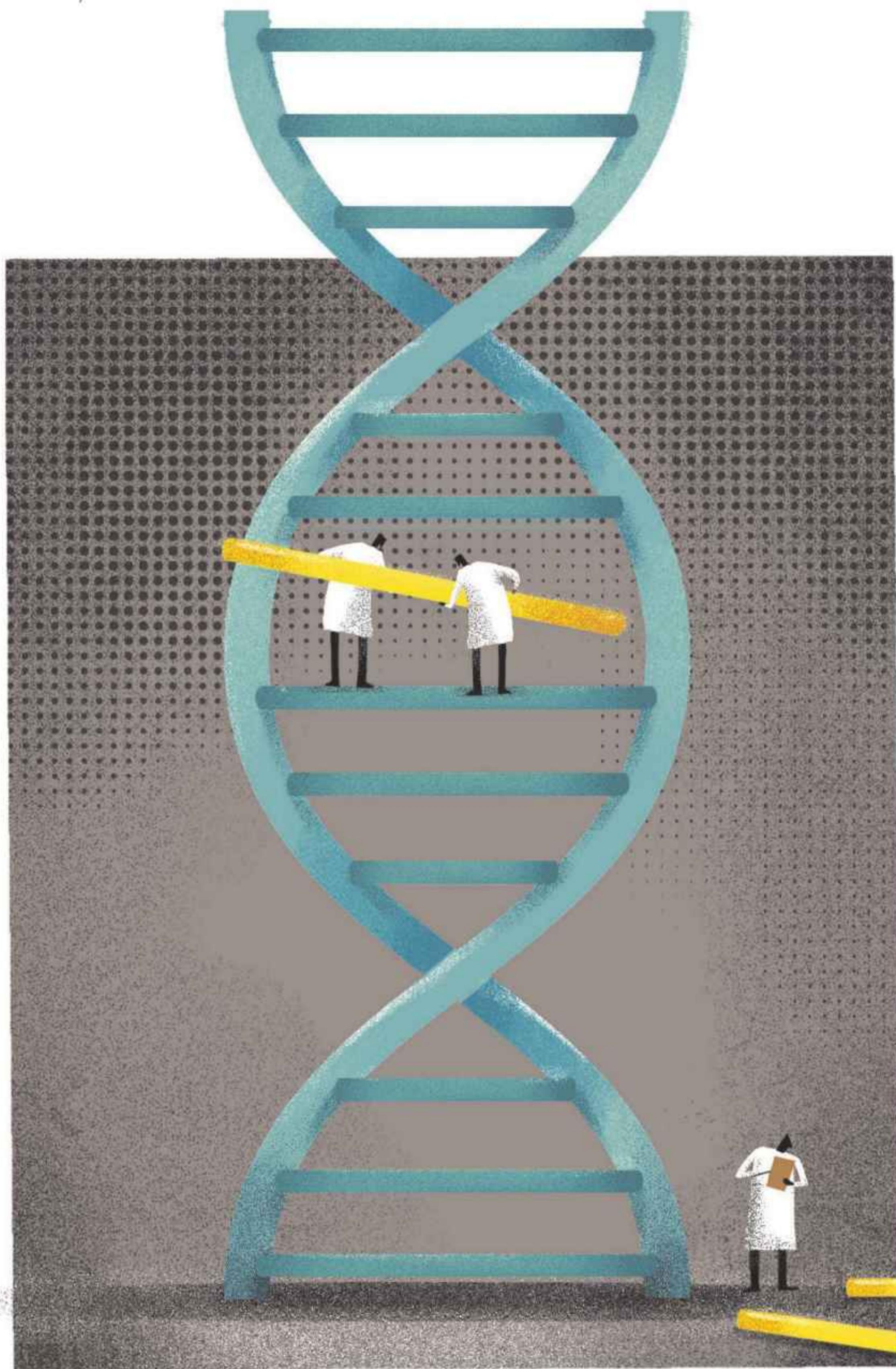


Radical young chef Douglas McMaster maps out a plan to create zero food-waste restaurants—a food system for the future—in *Silo: The Zero Waste Blueprint*. McMaster wants to wean us from our entrenched and over-processed food habits, encouraging us to go for the purest, most natural and efficient way to cook and eat. "Closed-loop systems, radical suppliers, off-grid ingredients, waste-free prep and clean farming" are some of the raw ingredients deftly chopped and mixed into an irresistible and intoxicating reading.

DOCUMENTARY



"Humans move about 156 million tonnes of rock and soil each day, making our species the most decisive geological factor of our time," says Nikolaus Geyrhalter, whose documentary on large-scale mining is getting rave reviews. *Earth* observes people in mines, quarries and at large construction sites, engaged in a constant struggle to take possession of the planet. The film is an alert to the vast changes to terrain and geology that are extracting the Earth's contents.



HERE COME THE GENE HACKERS

Interventions to make heritable changes to the human genome are fraught with uncertainties. There are legitimate concerns about using a still imperfect technology that can rewrite the very blueprint of life. Also, the debate on whether it's ethical to do so is far from being settled. However, would-be baby tinkerers around the world have failed to get the message

DEEPAN JOSHI

"The scientist does not study nature because it is useful to do so. He studies it because he delights in it, and he delights in it because it is beautiful. If nature were not beautiful it would not be worth knowing, and life would not be worth living."—Henri Poincaré, French mathematician

TWINS LULU and Nana were born famous. They are the pseudonyms of the world's first genetically edited babies. And if they become the subjects of the medical as well as the journalistic community then they will remain prisoners of their fame for as long as they live. The twin sisters are outliers who risk the chance of never experiencing the beauty of an anonymous life. Chinese scientist He Jiankui—a biophysicist at the Southern University of Science and Technology in Shenzhen, China—announced the result of his experiment on November 26, 2018 in an exclusive interview to the Associated Press. The experiment using the simple yet powerful technology CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) has, in just a few years, shaken the scientific community with its medical potential and ethicists for fear of its abuse.

"The implications go beyond just these twins," Kiran Musunuru, professor of cardiovascular medicine and genetics at the University of Pennsylvania Perelman School of Medicine told *Time* magazine. "If we talk about the sanctity of human life, and the inherent dignity of human life, not much has been gained here. These babies were treated as subjects in a grand medical experiment, and we have to believe that they will be studied for the rest of their lives; it's sad actually."

CRISPR-Cas9 genome-editing systems (also CRISPR in short, and pronounced CRISPER) are molecular machines that can target specific sections of DNA in the genome and



cut both strands of the double helix molecule. CRISPRs are specialised stretches of DNA and the protein Cas9 is an enzyme that acts like a pair of molecular scissors. CRISPR allows genes to be knocked out or, in some cases, added. There are many concerns about the CRISPR technology that need to be dealt with before it can be used widely in treatments for the sick—let alone meddle with healthy embryonic humans. (see ‘Technology Trail’ on p48)

Jiankui’s edit targeted gene CCR5 that codes for a protein which HIV uses to enter cells. The biophysicist was trying to create a specific mutation in the gene, CCR5-delta32 (CCR5-Δ32), that few people naturally have—that possibly confers innate resistance to HIV. Many scientists have questioned Jiankui’s choice of gene because of concerns about evidence suggesting that the CCR5-Δ32 mutation makes people more susceptible to the effects of infection by influenza and the West Nile virus.

A study published this year on June 3 in the science journal *Nature* says that Jiankui might have inadvertently shortened the life expectancy of the twins in an attempt to make them resistant to HIV. This procedure casts further doubt on the wisdom of disabling the gene to protect

against HIV, says Philip Murphy, a molecular immunologist at the US National Institute of Allergy and Infectious Diseases in Bethesda, Maryland. “If you’re unlikely to make it to your third birthday, and could go beyond it if you simply edited a specific gene, that would be a risk worth taking,” he says. But current treatments for HIV allow many people with the virus to live into old age.

THIS IS PARTICULARLY important in the case of germline editing—introducing heritable changes into human sperm, egg, or embryos to make genetically altered children—because it’s so unlike most conventional therapies. As the UK Nuffield Council has pointed out, it is incorrect to call it a therapy. If one were undertaking gene therapy in a baby, or even a foetus, to address a life-threatening genetic disease, it would be appropriate to accept a certain amount of risk because the alternative is much worse: living with a life-threatening disease.

But in the case of embryo editing, there is not yet a child that is sick and needs to be healed. Because the genome editing molecules are delivered into the egg at the same time as the sperm, one brings the “patient” into being in the same moment

TRAINING PROGRAMME ON ENVIRONMENTAL AUDIT FOR SUSTAINABLE INDUSTRIALIZATION



Many Industrial sectors in India are resource intensive and polluting and are inadequately equipped with pollution control measures leaving a huge negative footprint on the environment. Reduction of these impacts is need of the hour. 'Environmental Audit' is a paramount approach to perform this activity. It is a tool to evaluate the impact of industrial processes on the environment, to identify possible solutions to reduce or eliminate such impacts and to assess the status of compliance to regulatory and other requirements. Environmental Audit also helps to identify solutions for efficient use of resources and greater adoption of clean and environmentally sound technologies for sustainable industrial development.

Centre for Science and Environment (CSE) recognizes this need and offers a four-day training programme on 'Environmental Audit for Sustainable Industrialization' at its training campus Anil Agarwal Environment Training Institute (AAETI). The training programme consists of lectures from experts, discussions, case studies and class exercises.

COURSE HIGHLIGHTS

- Approach, Scope & Methodology for conducting Resource, Energy & Water Audits
- Preparing material, energy and water balance
- Industrial stack emission monitoring and water audit instrumentation with practical demonstration
- Practical skill building for developing extensive check-list & questionnaire for auditing
- Case studies on energy and water efficient practices and technologies for various industries
- Understanding the concept of Environment Management Systems like ISO 14001
- Cost-benefit analysis of recommended technologies and solutions

WHO CAN APPLY

Consultants and Auditors, Environmental managers from various industrial sectors, Environmental regulators, Students and Researchers

For registration, visit www.cseindia.org.

COURSE FEES

Rs 23,000/- per participant
for Double Occupancy accommodation

Rs. 30,000/- per participant for Single Occupancy accommodation (Fees Includes training material, boarding and lodging, travel from New Delhi to AAETI and back)

COURSE DURATION

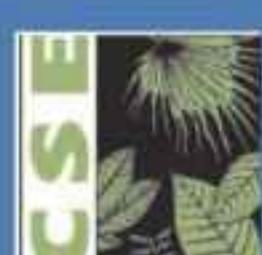
August 20 to 23, 2019

COURSE VENUE

Anil Agarwal Environmental Training Institute (AAETI), Nimli, Rajasthan.

LAST DATE FOR APPLYING

August 14, 2019



FOR QUERIES CONTACT:

ISHITA GARG, Senior Research Associate,
Centre for Science and Environment,

41 Tughalakabad Institutional Area, New Delhi- 1100 62

Ph.no: 011-29955124, 299956394, Ext no. 251

Email- ishita.garg@cseindia.org

Mobile- +91-9899676011

TECHNOLOGY TRAIL

First detected in the late 1980s, the potential of CRISPR-Cas9 became evident in mid-2012. The technology's promise in curing chronic and hereditary diseases has grown phenomenally in this decade.

US National Academies of Science and Medicine grant green light to use CRISPR in germline experiments

Term CRISPR-Cas9 published for the first time by Dutch scientists at Utrecht University

Experiments demonstrate the role of CRISPR together with Cas9 genes in protecting bacteria against viruses

Dec 1987

Mar 2002

2005

23 Mar 2007

Mar 2011

CRISPR mechanism observed for the first time by Japanese scientists at Osaka University

US scientists publish new base editing technique to alter genome without needing to cleave DNA or for a donor DNA template

Scientists Jennifer Doudna and Jillian Banfield start investigating CRISPR

US scientists improvise CRISPR/Cas 9 with less risk of off-target DNA breaks

Scientists Emmanuelle Charpentier and Jennifer Doudna join forces to investigate Cas9 enzyme

Jun 2016

May 2016

Feb 2016

Jan 2016

Dec 2015

National Institutes of Health gives green signal for first clinical trial using CRISPR/Cas 9 to treat patients

Research shows possibility of editing gene defect in pre-implanted human embryos for preventing inherited heart disease

UK scientists authorised to genetically modify human embryos using CRISPR-Cas 9

Base improvements for CRISPR allows changing individual chemical letters of DNA without the need to cleave DNA

First International Summit on Human Gene Editing held in Washington DC

First gene-edited babies announced by Chinese scientist

Aug 2017

Sep 2017

Oct 2017

Aug 2018

Nov 2018

DNA of human embryos edited using CRISPR-Cas9 to study cause of infertility
Chinese researchers report correction of gene linked to beta thalassaemia

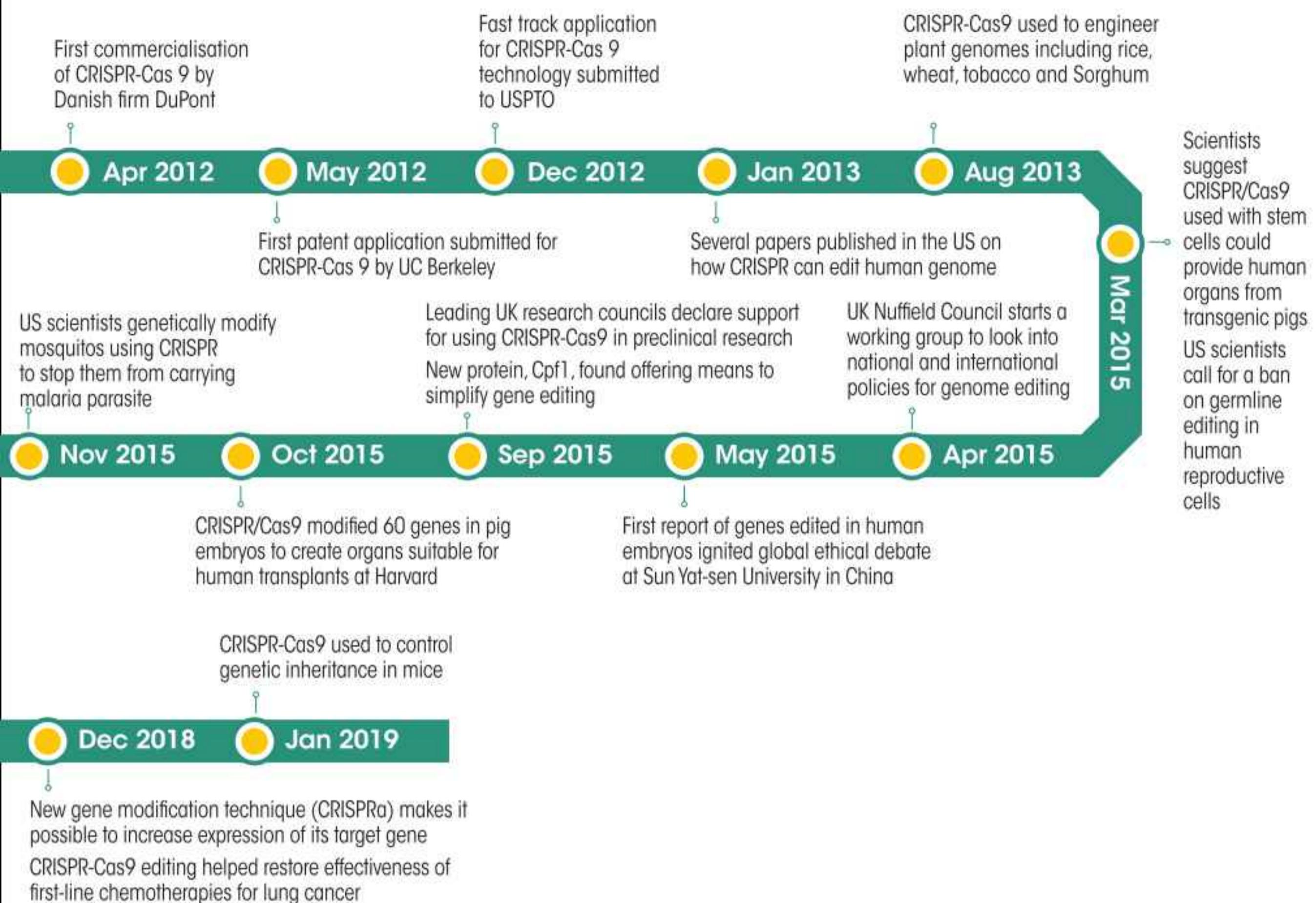
First CRISPR-Cas9 clinical trial launched

as one undertakes the "therapy". So, when the experiment is being contemplated, there is no child to heal.

The mutated gene *per se* is not necessarily dangerous, the contentious issue is that scientists are not sure that protection from HIV is the only thing the CRISPR edit might do to the twins' genomes. For instance, it's not clear that CRISPR is as accurate as researchers would like it to be. It makes mistakes, like off-target effects. In some cases, CRISPR may make unintended changes in arbitrary parts of the genome, like an autocorrect feature of a word processor that erroneously corrects "typos" to produce a different word. In other cases, CRISPR may not make the edits as unfailingly as needed, so some cells may be edited while others are not, and some cells may even be partially

edited, leaving a patchwork result that scientists call mosaicism.

This is where the problem lies as nothing can be said prospectively. We will have to wait and watch in the case of Lulu and Nana. In cases like this the difficulty is that a) you do not know beforehand where the map will go wrong; and b) the mistakes can lead to severe consequences. You can draw a comparison with potentially helpful medicines that carry random but very severe side effects. Jiankui promised to follow up with the girls until they are 18, but it is unlikely that the Chinese health ministry will allow him to be involved in the evaluations. It is not known what, if any, special measures are being taken to monitor the girls' health or to track the third pregnancy that is on its way also due to Jiankui's experiments.



SCIENTISTS AND BIOETHICISTS

are divided on whether there should be a moratorium on germline editing. There is much less ethical resistance for intervention in somatic cells—any cell of a living organism other than the reproductive cells—which would not affect future generations. The young Chinese American biochemist Feng Zhang, one of the inventors of CRISPR, called for a global moratorium on germline gene editing, a day after Jiankui announced the result of his experiment. “Given the current state of the technology, I am in favour of a moratorium on implantation of edited embryos,” Zhang, a member of the Broad Institute of MIT and Harvard, said.

Where does one draw the ethical line or a logical and acceptable boundary? The most compelling argument about the

ethics of germline gene editing or more precisely about the Chinese twins has been made by J Benjamin Hurlbut, Associate Professor of Life Sciences, Arizona State University and Jason Scott Robert, Director of the Lincoln Center for Applied Ethics, Arizona State University.

Jiankui surely broke many rules. The paperwork doesn't seem to be as rigorous as the nature of the experiment required. Nothing has been published in any peer review journal and questions are being raised about an informed consent process. These issues are important as compliance with established standards of practice is vital for public trust in science. But public debate about the experiment should not make the mistake of equating ethical oversight with ethical acceptability. Research that follows the rules is not

CHINESE SCIENTIST HE JIANKUI MIGHT HAVE INADVERTENTLY SHORTENED THE LIFE EXPECTANCY OF THE TWIN SISTERS IN AN ATTEMPT TO MAKE THEM RESISTANT TO HIV

necessarily good by definition.

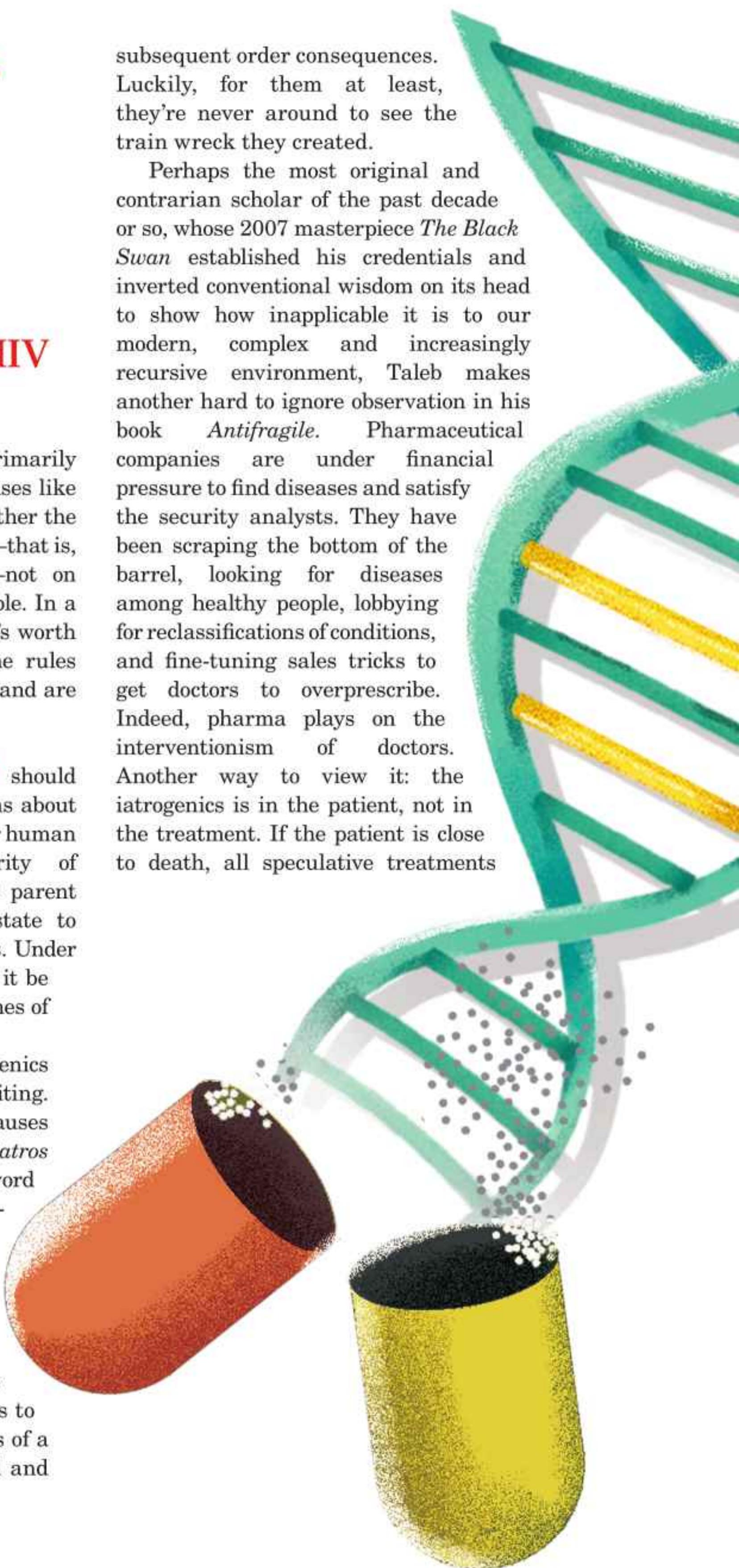
"One risk of locating ethics primarily in research oversight is that in cases like this, the focus tends to be on whether the research was ethically compliant—that is, whether it followed the rules—not on whether it was ethically responsible. In a profoundly novel case like this, it's worth questioning not only whether the rules were followed, but what they are, and are not, designed to protect against."

HE'S (JIANKUI'S) WORK should cause people to ask hard questions about this technology, its implications for human identity and for the integrity of foundational social relationships: parent to child, medicine to patient, state to citizen and society to its members. Under what circumstances if any might it be appropriate to tinker in the genomes of our children-to-be?"

We also need to consider iatrogenics when it comes to germline gene editing. Iatrogenics is when a treatment causes more harm than benefit. As *iatros* means healer in Greek, the word means "caused by the healer". Distinguished Professor of Risk Engineering at the New York University Tandon School of Engineering and writer Nassim Nicholas Taleb calls these people interventionistas. Often these people come armed with solutions to solve the first order consequences of a decision but create worse second and

subsequent order consequences. Luckily, for them at least, they're never around to see the train wreck they created.

Perhaps the most original and contrarian scholar of the past decade or so, whose 2007 masterpiece *The Black Swan* established his credentials and inverted conventional wisdom on its head to show how inapplicable it is to our modern, complex and increasingly recursive environment, Taleb makes another hard to ignore observation in his book *Antifragile*. Pharmaceutical companies are under financial pressure to find diseases and satisfy the security analysts. They have been scraping the bottom of the barrel, looking for diseases among healthy people, lobbying for reclassifications of conditions, and fine-tuning sales tricks to get doctors to overprescribe. Indeed, pharma plays on the interventionism of doctors. Another way to view it: the iatrogenics is in the patient, not in the treatment. If the patient is close to death, all speculative treatments





should be encouraged—no holds barred. Conversely, if the patient is near healthy, then Mother Nature should be the doctor.

Nature likes to overinsure itself. Layers of redundancy are the central risk management property of natural systems. Human beings have extra spare parts and extra capacity in many things (say, kidneys, lungs, neural system, arterial apparatus), while human design tends to be spare and inversely redundant, so to speak—we have a historical track record of engaging in debt, which is the opposite of a layer of redundancy. Redundancy is ambiguous because it seems like a waste if nothing unusual happens. Except that something unusual happens, usually.

LET'S ENTER THE CRISPR financials with the best advice that “Deep Throat”—the source of the Watergate scandal—supposedly whispered to journalist Bob Woodward of the *Washington Post*: “Follow the money”. Once a technology, dangerous or otherwise, that carries the prospect of being lucrative can be seen on a distant horizon, there is usually no shortage of adventurous gold diggers. Despite global condemnation of the Chinese experiment, a Russian scientist on June 15 this year announced his ambition to repeat the Chinese scientist’s gene-editing experiment on human embryos.

Just about three months before Jiankui made his claims, CRISPR co-inventor Jennifer Doudna had said that the field is probably five to 10 years away from having an approved therapy for patients. She said then that major questions remain about the safety and effectiveness of experimental therapies that aim to disrupt or repair defective genes but was optimistic about their prospects. In mid-June 2019 the optimism about the technology that has taken Wall Street by a storm resulted in a partnership. *Bloomberg* reported that University of California scientists led by Doudna would join GlaxoSmithKline in a five-year partnership aimed at cancer, the immune system and neuroscience. The

CRISPR ownership fight

Scientists Feng Zhang and Jennifer Doudna are the faces behind the fierce patent battle

MAY 2012 UC Berkeley filed a patent application with the US Patent and Trademark Office (USPTO) for the use of CRISPR-Cas9 to edit genes in various types of cells. The application was based on a landmark research, which was to be published a month later.

JUNE 2012 The research team from UC Berkeley published what many biotechnology experts cite as the first academic paper on CRISPR-Cas9. The study, published in the journal *Science*, detailed how CRISPR-Cas9 may be exploited to edit genes. The research team was led by UC Berkeley biochemist Jennifer Doudna, who some experts credit with creating CRISPR.

DECEMBER 2012 The Broad Institute and the Massachusetts Institute of Technology, also based in Cambridge, Massachusetts, filed a patent application for the use of CRISPR-Cas9 to modify DNA in eukaryotic cells. The patent is based on research conducted by Feng Zhang, a molecular biologist affiliated with both the Broad Institute and MIT.

APRIL 2014 The USPTO granted the patent filed in December 2012 to the Broad Institute, MIT and Zhang. The patent, titled “CRISPR-Cas systems and methods for altering expression of gene products,” covers a method of editing plant and animal DNA using CRISPR-Cas9. UC Berkeley contested the USPTO’s decision to grant the Broad Institute the patent. The Broad Institute has maintained the patent it received draws on Zhang’s original research.

FEBRUARY 2017 The USPTO ruled in favour of Broad Institute, upholding the institute’s patent on editing DNA in plants and animals. Doudna’s team appealed the decision.

APRIL 2018 The US Court of Appeals heard arguments from UC Berkeley, during which the university attempted to prove USPTO had not had “substantial evidence” to support its February 2017 finding. The court is expected to release a ruling on the case this summer.

JUNE 2018 The USPTO granted a team of UC Berkeley researchers the university’s first-ever patents related to CRISPR gene editing—one patent that covers the use of CRISPR-Cas9 to edit single-stranded RNA, and a second patent that covers the use of CRISPR-Cas9 for editing genome regions of 10 to 15 nucleotides long.

IN A PROFOUND CASE LIKE THE CHINESE TWINS, IT'S WORTH QUESTIONING NOT ONLY IF THE RULES WERE FOLLOWED, BUT WHAT THEY ARE, AND ARE NOT, DESIGNED TO PROTECT AGAINST

UK pharma company said that it will contribute as much as \$67 million to set up a new lab in San Francisco that will bring researchers from big pharma and academia together under one roof. (see 'CRISPR ownership fight' p51)

A great deal hinges on the accuracy of CRISPR. Since its discovery in 2012 it has become popular for tinkering with genomes of all kinds. Companies such as CRISPR Therapeutics, Intellia Therapeutics and Editas Medicine have been built on the idea that it could be used to develop treatments for human diseases. This is good news, as perfection of CRISPR can lead to cures for diseases that are currently only manageable. Verve Therapeutics, a biotech firm in Cambridge, Massachusetts, recently said that it wanted to use genetic editing to protect patients from coronary heart disease. CRISPR Therapeutics, based in Zug, Switzerland, wants to edit beta cells, which produce insulin, so that they can be transplanted into diabetics without rejection. In all these therapies, regulators will have to assess the risks and benefits. That will be easier when small risks of mistakes are set against the benefits of curing a fatal disease.

The flipside is that the rush to CRISPR is due to the possibility of potential millions in the business. It is exemplified by the topical advent of CRISPR start-up firms, initial public offerings and venture capital funding rounds that are rising at astounding rates. Global CRISPR market is estimated to grow at a compound annual growth rate of 33.26 per cent to reach a total market size of US \$3,086.69 million by 2023 from US \$551.24 million in 2017.

The Sage of Omaha Warren Buffett, admired for the wisdom he shares with young people around the world, has an apt quote for the gene editing boom: "Be greedy when others are fearful and be fearful when others are greedy." The rush for CRISPR is a classic case to be fearful.

CRISPR solutions are transforming four significant markets: therapeutic development, agricultural biotechnology, industrial biotechnology, basic and applied biological research and all of them are getting enormous investments from renowned firms. Large biotech companies and pharmaceuticals like Novartis, Vertex and Bayer AG have skin in the game exploring novel techniques to evolve their drug discovery and development processes, and establishing strategic alliances with crucial CRISPR technology companies to construct gene-based therapies for various genetic diseases.

Evolution of CRISPR technology has transformed gene editing playing field. Not limited to its use as a therapeutic tool, the pharmaceutical industry has found a silver bullet for drug discovery. CRISPR provides the opportunity to study and alter all types of cell in the human body at a commercially viable pace and cost.

At this momentous time of change, CRISPR technology firms and pharmaceutical giants could do well to have some faith in the Bible. Matthew, Chapter 6, Verse 24: "No one is able to serve two masters, for either he will hate the one and he will love the other, or he will be devoted to the one and he will despise the other. You cannot serve both God and Mammon." **DTE**

 @JoshiDeepan

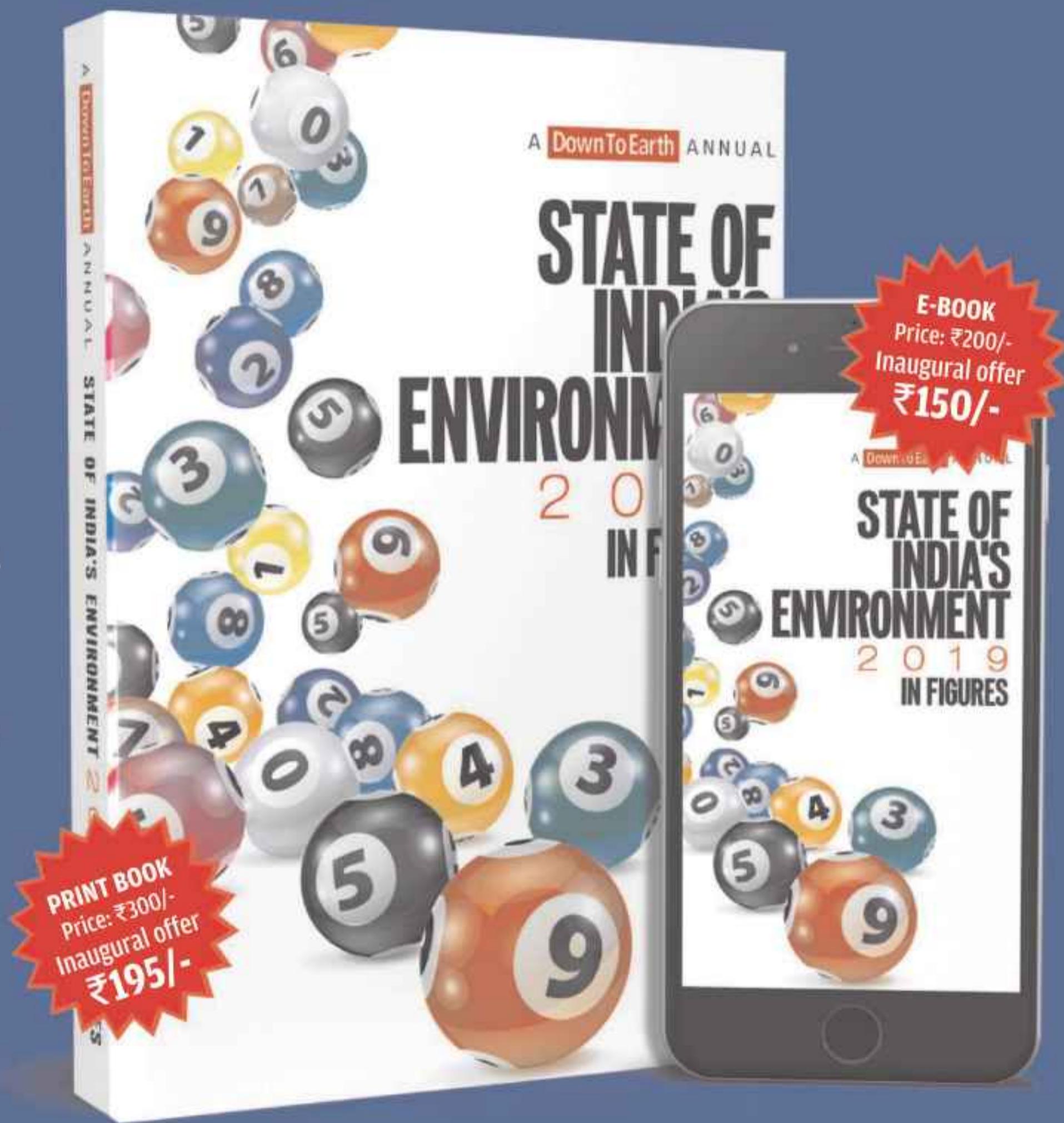
STATE OF INDIA'S ENVIRONMENT 2019: IN FIGURES

PRINT + E-BOOK COMBO OFFER

The annual **print & e-book editions** are the end result of analysing tons of data on India's environment and development, and using cutting edge tools to process them into sharp infographics.

Each and every dataset here is a stand-alone verdict on a specific subject/ development. Each and every one is a 360 degree annual assessment. With each dataset, we have tried to tell the complete story, in a secular manner but with lots of data wisdom.

Just to put on record, each data that you go through here is preceded by 12 months of careful tracking to not just make sense of the big data involved but also to make a credible statement.



COMBO OFFER
₹500 ₹325

GET YOUR COPIES TODAY

Please place your order online by visiting us at

www.downtoearth.org.in/books or mail your order to us along with a

Cheque for the required amount, drawn in favour of 'Society for Environmental Communications' and mail to: Society for Environmental Communications, 41, Tughlakabad Institutional Area, New Delhi - 110062.

Road to ruin

THE US \$1.7 BILLION MUMBAI COASTAL ROAD TO BE BUILT BY RECLAIMING THE INTER-TIDAL WESTERN COAST IS AN ECOLOGICAL AND LIVELIHOOD DISASTER IN THE MAKING. HERE'S WHY

SARITA FERNANDES

EXPRESSING CONCERN about the degrading state of environment, the Chief Justice of the Bombay High Court, Pradeep Nandrajog, on June 18, passed a notepad to lawyers with a caricature of a human being from the future affected with deformities as a result of pollution. Nandrajog was hearing eight petitions challenging the alleged lack of approvals for the Mumbai coastal road project. And on July 16, the high court quashed the coastal regulation zone clearances granted to the city's civic body and ordered construction to stop.

The US \$1.7 billion Mumbai coastal road project is one of the most expensive infrastructure development projects stretching 35.6 km and connecting the entire western coast of Mumbai city. The project aims to create 90 hectares of land by reclaiming the inter-tidal western coast of the city's shoreline. But citizens' groups and environmentalists have raised concerns that the project will destroy the

region's unique ecology and the livelihoods of traditional communities who depend on the inter-tidal zone for fishing.

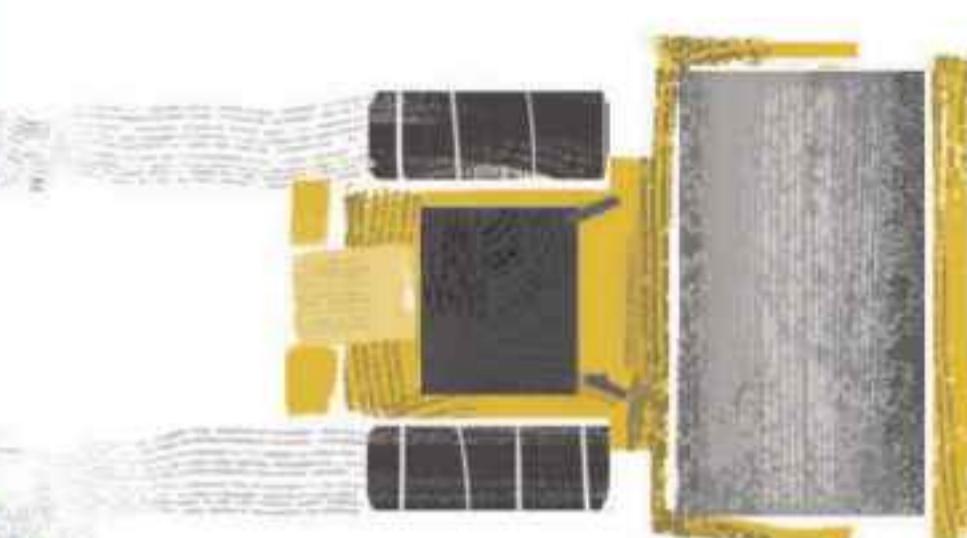
The project has been surrounded by controversies ever since the Union Ministry of Environment, Forest and Climate Change (MOEFCC) gave environmental clearance in 2017. The ministry submitted ambiguous reasons to give the clearance.

FIRST, MOEFCC SAYS the proposed project will reduce commuting time by 70 per cent and fuel saving per day of about 34 per cent. It says it will also reduce carbon footprint by 1,826 tonnes of carbon dioxide (CO_2) per annum. But the truth is that the vehicles plying on them mainly consume non-renewable fossil fuels, and are a major contributor to greenhouse gases, especially CO_2 . The government could have easily explored rail connectivity, but it

chose to back the contractors building this project. Here, it is important to note that 43 per cent of Mumbai's residents use the rail network. So, the proposed road will only cater to a small demographic of private vehicle owners. Second, MOEFCC claims the project will not have any adverse impacts on the tidal behaviour. But scientists say dumping of rocks on the inter-tidal space will increase daily high tides by up to 1.5 m, which will be detrimental to the survival of local fisherfolk. The court mentioned this while hearing the petitions.

Third, MOEFCC says the project will be carried out strictly in accordance with the provisions of the Environment Protection Act, 1972, and shall render the coastal ecology of the area, including flora





THE DAMAGE TO ALL INTER-TIDAL FAUNA AND FLORA WILL BE PERMANENT WHERE TIDAL WATERS WILL BE BLOCKED FOR RECLAMATION OF LAND. IT CANNOT BE REPLENISHED

and fauna, in its original state after completion of the project. In truth, the damage to all inter-tidal fauna and flora will be permanent where tidal waters will be blocked for reclamation of land. It cannot be replenished. There are no known methods to restore permanently destroyed inter-tidal habitats or shores and bring back the marine life back to its original state.

Several studies have identified the presence of a Deccan Plateau on which most of Mumbai's rocky shores today stand. The Deccan Plateau has been traced to the Mesozoic times—60 to 68 million years ago—and this is the natural heritage of Mumbai's rocky shore. Here, about 340 documented inter-tidal marine life species have been identified. Species like

sea cucumbers, Gorgonians and corals, which receive protection under the Schedule 1 species of the Wildlife Protection Act, 1972, are found here. The construction of this road will decimate this heritage ecosystem.

THE CITY'S INDIGENOUS
coastal communities, known as Kolis, are completely dependent on artisanal fishing within shallows of this rich, biodiverse rocky shore. There are about 2,000 fishing families living in Worli alone, who travel up to 2 km into the sea to catch fish. The government has said it would give monetary compensation, but the families have rejected this offer on the grounds of "intergenerational

sustainability of the shore".

What is needed is a comprehensive understanding to ascertain how to fund railway transport systems rather than building more roads. In the case of marine life and biodiversity, some species that have documented do not have a baseline data yet. So it is also imperative to study the plethora of marine wild found on the city's shores. We must first comprehend what kind of sustainable transport system Mumbai needs before building an expensive coastal road thereby permanently changing the identity of this unique ecological ecosystem. **DTE**

(The writer is conservation officer with Vanashakti, a Mumbai-based non-profit)

@down2earthindia

Small wonder

QUITE COMMON IN THE NORTHEAST, THESE MINIATURE BRINJALS CAN BE COOKED IN A MYRIAD WAYS

CHITRA BALASUBRAMANIAM

THE FIRST sight of the extremely cute little pumpkin-like green vegetables was exciting, to say the least. I wanted to buy them, but the people at the Manipur stall in the 2018 Pusa Organic Fair in Delhi refused, saying it had to be saved till the prime minister's visit to the event the next day. I somehow managed to convince them to part with one piece. It piqued my curiosity and a month later I had my friend from Manipur get me 200 g of it.

Khamen akhaba (*Solanum aethopicum*) or *khamen akhabi*, as

most Manipuris refer to it, is a variety of brinjal (*khamen* means brinjal in Manipuri). Just like brinjal, *khamen akhaba* is botanically a fruit. Slightly bitter in taste, it comes in three sizes, with the smallest one shaped like a cherry tomato while the largest being the size of *amla* (*Phyllanthus emblica*). The medium ones are most popular, but my favourite are the small ones, which are more bitter.

Khamen akhaba is grown extensively across the Northeast and is available during the summer months. It becomes red when

ripe but is usually cooked when it is still green. Diana Chingakham, founder-editor of *Happy Tipsy*, an online media platform covering the food and beverage industry, says, "Unlike most Manipuri dishes, *khamen akhaba* is sautéed well with oil and spices." It is also cooked during Cheiraoba, the Manipur new year of the Meitai community, which falls in April. "We cook it as part of our vegetarian dishes since we offer only vegetarian foods during the festival to the gods," Chingakham adds. It is also a part of the traditional Manipuri *thali* which



कोचिंग के नोट्स TELEGRAM पर मिलेंगे-

Telegram Channel कैसे Join करें-

1. गूगल प्ले स्टोर से Telegram App डाउनलोड करें
2. अपना मोबाइल नंबर डालकर telegram को चालू करें
3. फिर निचे दिये link पर विलक्ष करें

PDF Ka Adda Click करें

[CLICK HERE](#) - यहाँ पर विलक्ष करें

हमारे साथ सरकारी EXAM की तयारी करें

JOIN Telegram - [Click Here](#)

Note लेने के लिए [Telegram](#) जरूर join करें



RECIPE

STIR-FRIED KHAMEN AKHABA

INGREDIENTS

100 g bitter brinjals
½ tsp turmeric powder
½ tsp chilli powder
¼ tsp coriander powder
Salt to taste
3-4 tbsp oil for frying

METHOD

Wash the brinjals and slice them finely. Heat oil and add all the spices. Wait for a few minutes for it to heat properly. Add the brinjals and keep frying till they are done

indigenous medicine to treat asthma, allergic rhinitis, nasal catarrh, skin infections, swollen joints and in weight reduction medicines.

Another study published in the *Journal of Medicinal Plants Studies* in 2018 highlights the usefulness of *khamen akhaba* in mitigating hunger because it contains immense amounts of minerals, vitamins, proteins, carbohydrates and antioxidants. The study says it a resilient crop which can withstand the effects of climate change—a crop which is easy to grow; is resistant to pests and diseases; and, produces a good yield even under adverse conditions. It labels it as an “underutilized vegetable of North Eastern Himalayas”.

Such indigenous fruits need to be promoted. **DTE**

@down2earthindia

(The writer is a Delhi-based freelance journalist. Among other things, she writes on unusual food)

can have as many as 108 dishes.

Khamen akhaba is cooked in a myriad ways. It is cut in slices along the length and fried in *tadka* prepared with fermented fish popularly known as *ngari*; it can be cut into cubes and cooked dry with potatoes; and, it can be boiled and eaten too. “These tiny brinjals can also be consumed with vegetable stew or lentils. It is cooked dry like other *subzi*. Since it is tiny, it is appropriate that they are stir-fried. The large brinjals can be made into a vegetable stew or *eromba*, a traditional Meitei dish,” Chingakham adds. What do Manipuris do to reduce its bitterness?

“Nothing,” she says. “Manipuris like the bitterness. Unlike in north India, where people scrap bitter gourd, rub salt on it or immerse it in salt water to reduce its bitterness, *khamen akhaba* is consumed with the flavour intact. “My mother simply steams bitter gourd before tossing it to make the dish. The same goes for bitter brinjals,” she says.

THERE HAVE BEEN a few studies on the nutritional aspects of the fruit. A study published in the *International Journal of Current Microbiology and Applied Science* in 2017 says it is used in

Missing youth in farming

THIS IS a monsoon ritual, but of immense importance. The government unfailingly issues updates on the progress of the monsoon and sowing figures are regularly fed to the media. By July 22, seven monsoon updates, and an equal number of them on sowing were issued. Both updates point at a below normal monsoon, and the *kharif* coverage has not been optimum due to the late onset of the monsoon.

It may seem like a usual sight as one ventures into the countryside: farmers busy producing food. But if you probe a little more, what will strike you is the missing youth in farms. Invariably, most farmers today are above the age of 40. This brings out the next big challenge for India's agriculture sector, and for all of us surviving on food produced by them.

Indian farmers are ageing. In 2016, the average age of an Indian farmer was 50.1 years. This is worrying because the next generation of farmers are quitting farming. So we are nearing the critical situation of one of the biggest consumers of food, but with very few farmers. Today, both middle age and young people are shunning agriculture. Soon, there might not be any next generation farmer left in the country. In 2011, 70 per cent of India's youth lived in rural areas, where agriculture is still the main source of livelihood. According to Census 2011, every day 2,000 people give up farming. The income of a farmer is around one-fifth of a non-farmer. The young among the farming communities are hardly interested in agriculture. Moreover, a majority of students who graduate from agricultural universities switch over to other professions. This can be called the "great Indian agro brain drain".

What is emerging is that those who work in family farms or are involved with farming in some way are doing so due to compulsion. According to the 2017 Annual Status of Education Report, published by non-profit Pratham, of the 30,000 rural youth it surveyed

only 1.2 per cent aspired to be farmers. But 18 per cent of the boys preferred to join the army and 12 per cent wanted to become engineers. Similarly for girls, who play a major role in traditional farming, 25 per cent wanted to be teachers. "The percentage of students in agricultural or veterinary courses around India amounts to less than half a per cent of all undergraduate enrolment," says Madhav Chavan, founder of Pratham, adding that "although the percentage of population working in agriculture and related areas has now reduced to about 50 per cent, it is an area that could use a more educated and trained workforce considering that productivity lags far behind world's leading nations."

Indian farmers are ageing and the new generation is averse to take up farming. So who will produce our food?

It is not just India, worldwide the farmer population is ageing without an adequate replacement by the next generation. The average age of a farmer in the US is

58 years, while that of a Japanese farmer is 67 years. Every third European farmer is over 65 years. Like in India, farmers are quitting farming worldwide. In Japan, for instance, in the next six to eight years, 40 per cent of farmers will quit farming. In fact, the Japanese government has embarked on a massive plan to encourage people below 45 to become farmers.

Arguably, reviving India's agriculture is the country's most important agenda. Never before has India faced such a huge challenge to meet its food demand. By 2050, out of India's estimated 1.9 billion population, more than two-thirds will be in the middle income group. This will double the food demand. Advancing age of farmers is likely to influence the growth of agriculture in ways that are uncertain and unpredictable. But this demand can be converted into a huge income opportunity if the country has the farmers and the supporting technological wherewithal through its vast educational institutions.  @richiemaha



TRAINING PROGRAMME ON URBAN LAKE MANAGEMENT

VENUE: ANIL AGARWAL ENVIRONMENT TRAINING INSTITUTE (AAETI) NIMLI, RAJASTHAN

DATE: OCTOBER 15-25, 2019

ABOUT THE TRAINING

Lakes are an important component of the urban hydrological cycle, they act as source of water, run-off controller and play a significant role in enhancing groundwater recharge, regulating micro-climatic conditions and improved overall resilience of the area. Various ministries, departments, city-level public institutions, NGOs and research institutes are dedicatedly working on lake conservation but still the effort is inadequate given the scale of work required for lake management across the country.

AIM

To develop capacity of various stakeholders on conservation, restoration, planning and management of lake for water and environmental sustainability in urban areas.

OBJECTIVES

Improved knowledge on urban lake management – the concepts, tools and techniques.

Develop skills in mapping of lake (and its catchment) and cleaning of urban lakes/wetlands.

Understanding of lake as a source of urban water supply, groundwater recharge and wastewater treatment

Prepare Urban Wetland /Lake /Flood plain Management Plan.

**Opportunity for interaction
with the real implementers/
beneficiaries**

PART I

Basic - Theory, science, practice, tools, approaches, regulatory framework

Date: October 15 - 18, 2019

FIELD VISITS

Date: October 19-21, 2019

PART II

Advanced - Studio on Urban Lake Management Plan

Date: October 22 - 25, 2019

COURSE FEES:

FOR INDIAN PARTICIPANT

₹40,800 (for double occupancy accommodation)

₹52,800 (for single occupancy accommodation)

FOR INTERNATIONAL PARTICIPANT

\$1180

(for double occupancy accommodation)

\$1530

(for single occupancy accommodation)

APPLY NOW

For more information,
visit: <https://www.cseindia.org/training-ulmp-2019-9444>

SPECIAL OFFERS

- 15% off for group participation (2 or more) from the same organization
- 30% off for college students
- 30% off for full-time working representatives from registered NGOs

FELLOWSHIPS AVAILABLE!

- Full fellowship includes travel, boarding & lodging costs and training fees & kit.
- Part fellowship includes boarding & lodging costs and training fees & kit.
- Only short-listed candidates will be informed

COURSE COORDINATOR

Shivali Jainer, Email: shivali@cseindia.org +91-11-40616000 (Ext: 244)

Dr. Mahreen Matto, Email: mahreen@cseindia.org +91-11-40616000 (Ext: 257)

Dr. Suresh Kumar Rohilla, Academic Director, Email: srohilla@cseindia.org

Centre for Science and Environment

41, Tughlakabad Institutional Area, New Delhi-110062;

www.cseindia.org