

## Deciphering the 2014 drought

Prediction: Moisture flux should be taken into account for accurate prediction of climate, says Ramakrishna (sitting). | Photo Credit: [Special Arrangement](#)

In 2014, India recorded a 12% seasonal rain deficit with a record drought in the month of June. Scientists from the Department of Meteorology and Oceanography at Andhra University studied the climate data and found that divergence of water vapour was one of the main reasons for the drought. The analysis of the moisture transport patterns revealed that convergence and divergence of water vapour are important factors governing the Indian summer monsoon rainfall (June to September). The results were recently published in *Climate Dynamics*.

Data from June 1 to September 30 for the period 2000-2014 were collected from the Climate Forecasting System model at the Pune's Indian Institute of Tropical Meteorology (IITM) and National Centre for Environmental Prediction (NCEP) final analysis from the U.S. The data showed that all parts of the country had received scanty monthly rainfall at least once during the four months in 2014. The overall seasonal rainfall over India was 775.5 mm which is a 12% less than the normal.

The researchers examined the water vapour transport as earlier studies by others had shown it could affect rainfall. "We measured the water vapour transport along the surface layer of the earth to the region of troposphere with 300 millibar level of atmospheric pressure," explains Dr. B.R. Srinivasa Rao, research associate at the university and co-author of the paper.

The divergence of moisture flux could have caused the low rainfall in June which was only 57.5 % of the average. In August 2014, there was a break in monsoon with rainfall only over northeastern and central parts of India. The regions with rainfall showed convergence of moisture and in the areas with no rainfall there was divergence. In September, the rainfall over many parts of India showed significant increase and also excess in some parts. The overall rainfall was 108.1% of the average. These values support the contention that over the land, moisture flux has a major influence on rainfall.

"Our oceans are getting warmer and the temperature gradient between land and ocean is becoming increasingly less. So we need to study and analyse the mechanism of moisture availability to land from sea. Our study shows that by measuring the convergence and divergence patterns of the water vapours we can predict the rainfall and drought trends," says Prof. S.S.V.S. Ramakrishna from the Department of Meteorology and Oceanography at Andhra University and first author of the paper.

The other physical processes that cause drought were analysed. The El Nino effect on 2014 monsoon rainfall was very small as the air-sea coupling weakened the effect, resulting in ENSO neutral conditions.

Earlier studies had shown that there is only very small relationship between Indian monsoon seasonal rainfall and other factors. The intrusion of western Asian desert air towards central India was an important feature for the dry spells. This partially explains the lack of rainfall but not the normal or above average rainfall.

Thus the results of this study suggest that the process of water vapour transport is an important physical process influencing the monsoons. The magnitude of convergence agreed with the rainfall in quantity and divergence caused drought. The study emphasises that moisture flux should be taken into consideration for accurate prediction of future climate.

A study of nearly 300 people living in different parts of India found that nine single-base variants (single-nucleotide polymorphisms or SNPs) account

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## Coal is still the secret of our energy

With India embarking on an ambitious journey to achieve renewable energy capacity of 175 gigawatt (GW) by 2022, questions have been raised on the relevance of coal in the present context. Does coal, the principal source of energy for now, face a dark future?

“No, it can’t be. If the future of coal is dark, then the future of the country will be dark,” said Partha Bhattacharya, former chairman of Coal India Ltd.

“You can’t live without coal. Coal is at the centre of everything. With all this hype [about] renewables, today in power generation, 81% is out of coal,” he pointed out. “Going forward, the share will definitely come down. But the growth in renewable does not mean the generation from coal will come down. It will never come down, at least in next few decades,” he said emphatically.

According to analysts, renewable energy sources and coal will coexist, as the availability of coal is abundant in India and it can provide affordable power to propel India’s growth and light every household.

Despite the rapid growth in renewable energy, legacy coal plants will continue to generate thermal energy. However, most additional capacity in the country will come from renewable sources.

### ‘Auctions as barometer’

“If coal had a bleak future in India, then the coal block auctions could not have happened or succeeded,” Sushil Kumar Jiwrajka, chairman, Renewable Energy Mini Grid Committee, FICCI, said.

This is evident from the fact that captive power plants purchased 80% of the coal offered on a five-year contract at an auction at an average premium of 25% over the notified price. At a similar auction held last year, Coal India had managed to receive a premium of 19% over the notified price.

“In India we cannot do without coal. Despite the ramping up of renewable capacity, both solar and wind energy cannot go beyond 40% of the energy mix. So, coal has no problem for the next 20 years in India unless some new source of energy is invented overnight,” Mr. Jiwrajka added. The abundance of coal in India makes it the most important fuel. In power generation today, the share of coal in total capacity is about 62% but the share in generation is about 80%.

With reliable supply of energy becoming critical to provide round-the-clock electricity across the country and to achieve 100% electrification by December 2018, super thermal power plants and other modern thermal plants are being nudged by the Centre to produce more energy from the same capacity.

The NITI Aayog, which had sought suggestions from experts for meeting the electricity demand under the current circumstances, was advised to allow thermal plants to enhance output without adding any capacity.

### ‘Only variable cost’

“Demand for coal will go on increasing. For existing plants, coal-based generation is the cheapest mode and most affordable [source of] power in the country. One is only [incurring] variable cost. The capacity is already there,” said Mr. Bhattacharya, who had advised the NITI Aayog.

Though the latest prices of solar and wind energy do throw a question mark on whether further thermal power capacity would come up, analysts said coal would continue to dominate in the absence of cost-effective storage of renewable energy that has been generated.

Today, the plant load factor (PLF) for India's thermal power capacity has dropped to 52% from 79% in 2007-8 but the country's thermal plants are equipped to operate at about 85 to 90% PLF. Assuming the PLF is scaled up from 55% to 85%, one can see a 50% increase in output from the same capacity. The only cost involved here is the variable cost of coal.

This variable cost is far lower than that for solar power. It is expected to be about Rs. 1.50 per unit and the price difference is expected to be in the range of Rs. 0.70 to Rs. 1 per unit with solar or wind energy, according to industry players.

"It makes eminent sense for the country to increase the output from existing plants. The additional generation will be close to 500 billion units. With an average cost saving of Rs. 0.80 is Rs. 40,000 crore. This benefit will go to discoms and consumers if the country adopts this kind of a strategy," Mr. Bhattacharya said indicating that this had been suggested to the think tank.

To produce 500 billion units, 350 million tonnes of coal would be required — this is the additional demand. Even at a requirement of 300 million tonnes of coal, coal demand will increase by 7% a year from now.

India uses about 800 million tonnes of coal. The current coal production in the country is 650 million tonnes, while the balance is imported. The additional demand for coal to fire up power plants would contribute a substantial Rs. 12,000 crore annually to the Clean Environment Fund at the rate of Rs. 400 per tonne.

### **Conflict with the West?**

Will the developed world tie our hands given their own interests? No, they cannot, said industry analysts. India's share in pollution is far less than its share of the global population. Developed countries did want to club India with China and said that what applied to China, applied to India too. Fortunately, India has not succumbed to that. "They cannot put on us that kind of pressure," said an analyst at an Indian brokerage, citing developed countries.

Using more coal to meet the energy demand from the same thermal capacity for the next 20 years will not put India at disadvantage given its commitment to meet the Climate Change COP 21 obligations.

As per the obligations, India's renewable capacity should be 40% of the total capacity by 2030. Including hydro-based power, that capacity is currently at 28%. Once India implements the 175 GW renewable programme, the 40% criteria will be achieved. Besides, India is well within the COP 21 obligation till it uses 1,500 million tonnes of coal a year as compared with 800 million tonnes now to generate energy. Analysts also said India could continue with a coal-based growth plan, which is cost effective. This is what China has done to place its economy on a solid footing, said an analyst with a foreign brokerage firm.

The Chinese share in global emissions is now close to 30%, whereas its share in global population is just about 17%. India's share in global population is 16%, while its share in emissions is only 6%-7%, said an analyst, highlighting the contrast.

"That is in COP 21, our obligation is not as stringent as China's. China is obliged to provide for green alternatives to counter pollution from the burning of 4 billion tonnes of coal. We are in a

different situation altogether,” said Mr. Bhattacharya. Even though the NITI Aayog energy policy mentions 330 GW of thermal capacity as target by 2040, it is unlikely to be achieved because of the sharp correction in solar power prices, said an analyst. The International Energy Agency (IEA) in a recent report titled India Energy Outlook has said, “The rapid change anticipated for the Indian energy system in the New Policies Scenario does not translate into a dramatic shift in the energy mix. Coal retains a central position in the mix, increasing its overall share in primary energy from 44% in 2013 to 49% in 2040.”

It said coal-fired power contributes substantially more to output than to overall costs, helping to keep electricity tariffs affordable for consumers in a period when India is adding more costly sources of power.

In India, coal has always been thought of as the raw material for power. Because the demand from the power sector was much more than the availability of coal in the last 10 years, no serious thought has gone into any other use for coal.

Once the power sector begins to use increasing amounts of power from solar and other renewable sources, then coal can be put to use elsewhere: eg, coal can be deployed in the manufacture of ammonia and for conversion of ammonia to fertilizer.

With the government’s plans to usher in a second green revolution, the demand for domestically-made fertilizer will be high. Thoughts are being channelised now to come up with methods to produce chemicals such as methanol and others of its ilk from coal.

India’s total coal reserve is estimated at a little more than 300 billion tonnes. If 50% of that is extractable, a 1-billion-tonne annual consumption will translate into availability for 150 years.

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## The numbers game: IMD forecast for farmers

With the India Meteorological Department getting its monsoon forecast wrong this year, its modelling has necessarily come under the spotlight. In April, the IMD had predicted “near normal”, or 96%, rains and then upgraded the figure to 98% a couple of months later. These percentages refer to the proportion of rains to 89 cm, a 50-year average of monsoon rains. However, the country finally ended up with “below normal” rains (that is, less than 96% of the 50-year long period average). In itself, this is not a problem. Crop sowing is expected to be only a little less than last year, which saw a record harvest, with more districts posting deficient rain. Better drought management has over the years weakened the link between rain shortfall and food production, but the IMD continues to persevere with the meaningless practice of assigning a catch-all number to the quantum of rain expected during the monsoon. While initially conceived as a measure to bring rigour to the task of warning the government about a drought or weak rains, it has now become a numbers exercise, couched in statistical error margins and pedantic definitions, to ward off blame for getting its forecast wrong. While a single number, 96 or 95, has the power to brand rainfall as “near” or “below” normal, the IMD never admits to being in error. It relies on the security of generous error margins. Thus, a 98% forecast, say, implies a range from 94% to 102% and so could span “below normal” to “above normal”.

The fallout of focussing on numbers to gauge a phenomenon as geographically and quantitatively varied as the Indian monsoon is that it has ripple effects of tricking everyone from policymakers to the stock markets that a ‘normal’ monsoon implies all will be well with rainfall distribution. So this year’s floods in Mumbai, Assam and Bihar, and the months-long drought in Karnataka and Vidarbha were all merged under an umbrella number. The Indian monsoon has over the centuries stayed remarkably consistent at around 89 cm during the monsoon months, give or take 10%. The challenge lies in capturing intra-seasonal variation or forecasting a sudden change in global weather (such as typhoons) that can affect rainfall over specific districts. Therefore, simply getting these blanket four-month forecasts right doesn’t really help. While more and more farmers are opting for crop insurance and have far greater access — via mobile phones — to news on weather patterns, what they seek are localised, actionable inputs to guide them on sowing or harvesting decisions. The IMD is increasingly relying on supercomputers and sophisticated models to warn of weather changes at the district level. These localised estimates aim to warn of threatening weather — and are operationally useful — rather than reduce rain to numerical jugglery. The IMD must give momentum to this shift.

Rajasthan’s ordinance shields the corrupt, threatens the media and whistle-blowers

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**Interlinking and protection of rivers is a sacred duty of everyone: Vice President**

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### **Lays foundation stone for National Highway projects and Inland Water Ways in Andhra Pradesh**

The Vice President of India, Shri M. Venkaiah Naidu has said that interlinking of rivers and protection of rivers is a sacred duty of everyone in the country. He was addressing the gathering after laying foundation stone for the improvement of National Highways project and Inland Water Way project, in Vijayawada, Andhra Pradesh today. The Governor of Andhra Pradesh, Shri E.S.L. Narasimhan, the Chief Minister of Andhra Pradesh, Shri N. Chandrababu Naidu, the Union Minister for Road Transport & Highways, Shipping and Water Resources, River Development & Ganga Rejuvenation, Shri Nitin Gadkari, the Minister of State for Science & Technology and Earth Sciences, Shri Y.S. Chowdary and other dignitaries were present on the occasion.

Vice President laid foundation stone for six national highway projects and dedicated seven national highway projects, costing Rs. 4153 crore in Andhra Pradesh. He also laid foundation stone for development of an Inland Water Way in the Krishna River between Muktyala and Vijayawada in the Andhra Pradesh capital region of Amaravati.

The Vice President said that in Andhra Pradesh till 2014, the total length of National Highway was 4193 km and 3720 km of New NHs have been declared after 2014 and now the present the length of NH in Andhra Pradesh is 7913 km. A total investment planned in Andhra Pradesh is Rs 1 Lakh Crore for development of National Highways under various Schemes, he added.

The Vice President said that a two lane with paved shoulder of Rayachoty to Angallu section of NH-340 in a Length of 57.98Km costing Rs.319.28Cr will be taken up. He further said that construction of 4-lane bypass to Vizianagaram Town on NH 43 in a length of 17.2 Km costing Rs.429.43 Cr will also be taken up under these projects. A two lane with paved shoulder of Eppurupalem-Ongole section of NH 216 in a length of 57.87Km costing Rs.574.19 Cr is also under consideration, he added.

The Vice President said that the Pattiseema Lift Irrigation Scheme which linked Krishna and Godavari rivers saved Krishna delta from a drought-like situation arising from water scarcity in river Krishna. He further said that more and more interlinking of rivers will be beneficial for farmers who feed the nation. Everyone should take active part in this noble cause, he added.

The Vice President congratulated the Chief Minister for making Telugu language mandatory in schools. He advised the state government to make knowledge of Telugu compulsory to get jobs in Andhra Pradesh and also to make it as mandatory subject for all students irrespective of medium of language the school adopts in the state. He was not against learning other languages but only want people to be proficient enough in their own mother tongue before pursuing other languages, he added.

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## Yamuna pollution: Religious rites cannot clash with our ecological responsibilities

In what has become a sad annual feature, the [Yamuna is once again in a terrible state](#) as a result of the immersion after the Durga puja festivities. There more than 200 puja pandals in Delhi and in spite of the guidelines issued by the National Green Tribunal (NGT), most continue to flout them with impunity. It is the same case with other festivals and immersions such as Ganesh pujas as well. The [NGT guidelines](#) for idol immersion state that only clay should be used for idol making, and not baked clay or plaster of paris, etc. It also discourages the painting of idols, and goes on to say that the “use of toxic and nonbiodegradable chemical dyes for painting idols should be strictly prohibited.” All cloth, flowers, decorations made of paper, plastic and other non biodegradable materials should be removed before immersion. The 22-page document lists in detail the rules to be followed, the responsibilities of the state pollution control boards (SPCBs) and the pollution control committees (PCCs).

Since there is no testing of materials that are used in the manufacture of idols and puja committees are not under pressure to conform to the guidelines, every year the problem recurs, causing even more damage to a river that is already in its death throes. There are easily implementable solutions to the problem of festival debris in the river. Since it is impossible to police every last inch of the river to ensure that immersion of idols is taking place with adequate ecological sensitivity, it would be prudent for implementation agencies to take with them as partners the Durga puja committees and the idol manufacturers. Ensuring that harmful chemical dyes and non-biodegradable materials are not used in the manufacture of idols will be an excellent step in ensuring that they don't end up in the river.

It is also important for citizens to remember that they have a stake in ensuring that these guidelines are followed. The river is a lifeline of the city, and their contribution to preserving it will only help them in the long run. It is the responsibility of the citizens and committees to ensure that the pandals they visit and endorse take into account these vital considerations before they fulfil their religious obligations. It appears as though law enforcement officials may be somewhat reluctant to stop or punish those performing religious rites. It is our duty to ensure that our religious rites do not end up clashing with our ecological responsibilities. If our religious rites are to be sustainable, they must be ecologically responsible.

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## Global March for Elephants and Rhinos (GMFER) in Hyderabad, 2017

In a movement to celebrate the beauty of the world's wildlife, groups in over 130 countries including India, Kenya, New Zealand and the United States organise local demonstrations known as Global March for Elephants and Rhinos (GMFER). The march is symbolic of the proverbial last straw the world has had against poaching.

It is difficult to acquire exact statistics for poaching as many countries are afraid to give away how their protection schemes may have had loopholes, no matter what measures they have taken to protect the wildlife.

### Challenges

On September 29, three elephant poachers were arrested for allegedly culling an elephant for ivory in Bonai Forest, Orissa. However, reports later turned up that the elephant had died from natural causes, but the 1kg ivory derived from the body was found with one of the suspects.

Nevertheless, the ivory trade resulting from the deaths of animals is a huge part of the battle GMFER is fighting. GMFER also calls for the end of *phajaan*, the crushing of an elephant's spirit, the use of elephants in temples and parades, and elephant trekking, practices commonly used on Asian elephants.

Additionally, Kanha and Pench's tiger reserves have seen the use of tiger and leopard paws, claws and whiskers for tantric rituals. Earlier this month, a forest superintendent went undercover as a tantric priest to catch poachers who culled tigers in Kanha for such products, proving the forest divisions in India are doing everything they can to prevent the senseless commercialisation of the deaths of endangered species.

### Bringing the fight home

GMFER is grateful for the international efforts taken in India. Bangalore and Chennai had a march last year on October 4, World Animal Day. In fact, over 160 cities across the world participated in the movement last year. Hyderabad is the only city in India to do so this year, according to GMFER's website. The event in Hyderabad has been placed for October 7 to allow for maximum participation from the city.

The march in Hyderabad will allow people to sign letters to international governments, known as Group 19, calling for a universal ban on animal product trade; these countries include New Zealand and Australia. The event will also feature donation boxes for anyone willing to pitch in for the greater efforts of the organisation. Additionally, the march in Hyderabad run by Visala Katamneni and Nikhita Patibandla will be supplying placards, banners and stickers for the march.

"Nikhita and I have been organising the marches for the past four years. If we don't encourage people to take pride in our wildlife heritage and act on it as a global community, within the next ten years, these species will be extinct; and museums will be the only way to actually see these animals," Visala explains, "Additionally, we have to fight corruption which is furthering the money-making side of it. Many poachers don't see any other way to have an income, so we want to direct an interaction with local communities about other options for a sustainable income and about conservation."

*On Saturday October 7, the Global March for Elephants and Rhinos will take place at KBR National Park from 4pm till 6pm. For more information visit the [event page on Facebook](#), or the*

[main wesbite for GMFER.](#)

Jaggi Vasudev's Rally for Rivers claims they will, but this is not based on the most nuanced science

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## Turtle Sanctuary to be set up in Allahabad

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In order to protect the rich aquatic biodiversity of river Ganga from escalating anthropogenic pressures, development of a Turtle sanctuary in Allahabad along with a River Biodiversity Park at Sangam have been approved under Namami Gange programme.

The project at an estimated cost of Rs 1.34 crore would include development of River Biodiversity Park at Sangam (confluence of Ganga, Yamuna and mythical Sarasvati), establishment of a Turtle Rearing Centre (Permanent nursery at Triveni Pushp and makeshift annual hatcheries) and awareness about the importance of river Ganga and imperativeness of its conservation has been approved.

This project will provide much needed platform to make the visitors aware of their place in the ecosystem, their roles and responsibilities, improve their understanding of the complexity of co-existence with the environment and help generate awareness for reducing the impact of human activities on critical natural resources. The task of dissipating knowledge about river Ganga will be taken up ardently in this project, which is 100% centrally funded.

The sustenance of more than 2000 aquatic species including threatened gharials, dolphins and turtles in river Ganga exemplifies the rich biodiversity of this lifeline to over 40 per cent of the country's population. Rivers Ganga and Yamuna at Allahabad are home to some of the most endangered fauna like turtles (Batagur kachuga, Batagur dhongoka, Nilssonia gangetica, Chitra indica, Hardella thurjii etc.), the National Aquatic Animal - Gangetic dolphin (Platanista gangetica), the Gharial (Gavialis gangeticus) and numerous migratory and resident birds.

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## Coal-fired projections: on the draft energy policy

The [NITI Aayog's Draft National Energy Policy](#) (DNEP) predicts that between now and 2040, there will be a quantum leap in the uptake of renewable energy together with a drastic reduction in fossil fuel energy intensity. Because of economic and population growth, India's annual per-capita electricity consumption is expected to triple, from 1075 kWh in 2015-16 to over 2900 kWh in 2040. The DNEP assumes 100% electrification throughout India in the near term — Prime Minister Narendra Modi recently announced that the government will invest \$2.5 billion to provide electricity connections to every home in India by the end of 2018 — and steadily improving energy efficiency. But the DNEP fails to consider several critical issues involved in the ongoing energy transition.

Despite the fact that existing coal plants are running at low efficiencies, the DNEP relies on coal power to sustain the nation's base load requirement to meet rising energy demand. It proposes that coal will fuel 67% of India's power generation in 2022.

The first anomaly is that while India claims it will make a big push for renewables, it will continue to rely on coal for its baseload generation. While renewables grow, coal power grows too. This duality is possible because India did not commit to any actual reductions in its greenhouse gas emissions at the Paris climate meeting in 2015.

The second anomaly is that even with this target, India will need only 741 million tonnes of coal in 2022 and 876 million tonnes in 2027. But the Ministry of Coal continues to push its ambitious targets to raise coal production to 1.5 billion tonnes by 2020, of which 500 million tonnes is expected to be produced by private coal mines and about 1 billion tonne by the public sector.

The DNEP does not say what would be the fate of new allottees of coal mines which have bid aggressively and won rights to mine coal for captive power generation. What would they do with their coal if they can't generate power with it? Generation of power is licence free under the Electricity Act of 2003, so private miners do not need any licence to set up generating plants. All they need is a connection to the grid. Since the grid is State-owned, the Central government has adequate leverage to defer or delay connections.

In the past three years, with slow industrial growth, independent coal producers have been faced with reduced demand for their power. Power plants, both public and private, have been running at merely 60% plant load capacity utilisation. Coal producers await respite and look to the ministries of coal and power for support. Such support may not be forthcoming. The conventional power industry already suffers a high level of bank loan defaults, insolvency and other legal proceedings. It is not surprising that new energy investors are crowding the nascent solar space.

The DNEP fails to highlight the gradual substitution of internal combustion engines with electric vehicles. Several European nations have announced their plans to go for 100% electric vehicles in the next two decades. This transformation in the automobile sector could be accompanied by grid- and consumer-level electricity storage at homes, offices and factories. While storage and electric vehicles are cursorily mentioned, the DNEP does not focus on these crucial subjects.

The DNEP acknowledges that India's oil consumption has grown 63% from 2005 to 2016 whereas refining capacity has grown only 15%. Gas consumption has increased 38% while production has actually fallen since 2012. India's energy security does require a large strategic storage of oil to take care of any vagaries in its international supply chain. India has been building up its stored reserves while international oil prices have dropped in the past couple of years. But the strategic storage of oil does not tackle the systemic causes of this high dependence on oil.

The peaking of India's oil demand could have been envisaged but has not been identified in the DNEP. On the one hand, the draft policy recognises that by 2040, India's oil import dependence may reach 55% from the current level of 33%. On the other hand, it offers nothing to curtail such dependence. All that the DNEP offers is to promote use of public transportation and railways to reduce oil consumption. Unless electric transport is carefully planned, India's dependence on imported oil is likely to continue.

The drafting committees need to examine the paradigm shifts occurring in storage and electric vehicles to promote new technologies in renewable energy, such as smart grids, smart homes, battery storage and concentrated solar heat and power. Why has India missed the revolutions in these technologies? India has also missed opportunities in the manufacturing of equipment. New institutions, organisations and funding mechanisms for promoting renewable technologies need to be created not later than this year's end.

*Armin Rosencranz is a professor of law at Jindal Global University, where Mitakshara Goyal is a fourth-year law student and Rajnish Wadehra is a master's candidate in public policy*

The new U.S. Fed Chairman is unlikely to opt for policies that might upset the President's plan

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## IIT team develops system to monitor drought in South Asia

Saran Aadhar, left, and Vimal Mishra at Indian Institute of Technology Gandhinagar. | Photo Credit: [Special Arrangement](#)

Near real-time monitoring of drought at a 5-km scale that will help policy makers in water management at a district level is now possible, thanks to tools developed and made available online by researchers at the Indian Institute of Technology (IIT) Gandhinagar.

The researchers offer precipitation and temperature datasets and drought indicators available from 1980 to April 2017 covering the entire South Asian region. The data will be updated weekly. Besides drought, the datasets can also be used for monitoring heat and cold waves in South Asia.

“We don’t know whether a particular region is in drought as we don’t have real-time rainfall and temperature data at appropriate scale. IMD [Indian Meteorology Department] provides daily rainfall data mainly during the monsoon season. There’s no real-time information at high-resolution about drought after the monsoon season,” says Prof. Vimal Mishra from the Civil Engineering department at IIT Gandhinagar and one of the two researchers who developed the dataset.

Also, IMD’s drought information is based only on rainfall data and does not incorporate the role of air temperature. But higher temperature after the monsoon season can cause drought-like situation due to increased evaporation and transpiration losses.

At the district level

The team wanted to provide information in near real-time on whether a region of interest is under drought and what part of a district or sub-basin is under drought.

The emphasis was to develop a dataset at a finer resolution (5 km) as the data provided by IMD and other agencies is coarse (resolution of 25 km). The researchers used CHIRPS global rainfall data which are available at 5 km resolution and corrected the data for bias and errors. CHIRPS stands for Climate Hazards Group InfraRed Precipitation with Station. “The corrected data compares well with the IMD data once we aggregate our data to the IMD scale,” says Prof. Mishra.

The precipitation dataset at a finer resolution of 5 km over the entire South Asian region was evaluated against a standard rainfall database (APHRODITE) that is available for South Asia and satellite-based information. Earlier studies have shown that the Aphrodite database matches the IMD rainfall data quite well. The results were published in the journal *Scientific Data*.

“The drought indices — standardised precipitation index and standardised precipitation evapotranspiration index — were estimated using the bias-corrected, high-resolution data and evaluated against satellite-based drought products. The validation gives us the confidence that our dataset can indicate the severity and extent of drought at a district and sub-basin level in south Asia,” says Saran Aadhar from the Civil Engineering department at IIT Gandhinagar and the first author.

The researchers used the drought indices to assess severity and extent of drought in 2015 for a four-month period from June to September. “The developed dataset and drought indicators performed well over the South Asian region. Apart from IMD, this is an additional effort to provide more real-time information on drought that can be used for decision-making,” says Prof. Mishra.

A study of nearly 300 people living in different parts of India found that nine single-base variants

(single-nucleotide polymorphisms or SNPs) account

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**India gets Lowest Wind Tariff of Rs. 2.64 per kWh in second Wind Auction of 1000 MW****India gets Lowest Wind Tariff of Rs. 2.64 per kWh in second Wind Auction of 1000 MW**

The wind tariff in India **touched lowest level of Rs.2.64 per kWh in the second wind auction** conducted by the Solar Energy Corporation of India (SECI) on behalf of Ministry of New & Renewable Energy, Government of India yesterday. The tariff discovered is much lower than first wind auction concluded at Rs. 3.46 per kWh in February this year. With improving technology and reducing tariffs Ministry is not only confident of achieving the target of 175 GW by 2022 but exceeding it.

**Against the 1000 MW capacity SECI received 12 number of bids totalling to 2892 MW capacity of which 9 bids with a cumulative capacity of 2142 MW were shortlisted for e-reverse auction. The auction started at 3 pm on 4 October and continued for over 13 hours. Five winners selected for total 1000 MW capacity wind power projects include ReNew Power for 250 MW projects quoting Rs.2.64/kWh, Orange Sironj for 200 MW projects quoting Rs.2.64/kWh, Inox Wind for 250 MW projects quoting Rs.2.65/kWh, Green Infra for 250 MW projects quoting Rs.2.65/kWh and Adani Green for 50 MW projects quoting Rs.2.65/kWh. These wind projects are to be commissioned within 18 months from the date of issue of Letter of Award by SECI to successful bidders.**

As per provisions of scheme additional 100 MW capacity can be allotted to Central Public Sector Enterprises (CPSEs) willing to undertake development of inter-state transmission system (ISTS) connected wind power projects at the lowest bid tariff of Rs.2.64/kWh, for which they have to submit their proposal within 30 days from the declaration of results of e-reverse auction.

The power from these projects will be supplied to obligated entities for fulfilment of their non-solar RPO obligation at pooled price of capacity selected.

**BACKGROUND**

After success of first wind auction resulted in discovery of record low wind tariff of Rs. 3.46 per kWh in February 2017, the Ministry of New & Renewable Energy sanctioned second wind auction Scheme for setting up of 1000 MW ISTS connected Wind Power Projects on 4 May 2017. SECI

issued bids on 30 May 2017 and bids were closed on 14 July 2017. Auction was earlier scheduled for 19 September 2017 and the same was postponed to 4 October 2017 as CERC order on the issue of grid connectivity that is being faced by the successful bidders in the first wind auction was awaited.

**RM/VM/AS**

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**President to Inaugurate India Water Week 2017****President to Inaugurate India Water Week 2017****Five Day International event to be attended by 1500 delegates from 13 countries**

President Shri Ram Nath Kovind will inaugurate India Water Week – 2017 on October 10, 2017 in New Delhi in the presence of Union Minister of Water Resources, River Development and Ganga Rejuvenation Shri Nitin Gadkari and Union Ministers of State for Water Resources, River Development and Ganga Rejuvenation Shri Arjun Ram Meghwal and Shri Dr. Satya Pal Singh. About 1500 delegates from India and 13 other countries will attend the five day international event. The theme of India Water Week – 2017 is “Water and Energy for Inclusive Growth”.

The 5<sup>th</sup> edition of India Water Week (IWW) will be celebrated with a multi disciplinary conference and a concurrently running exhibition enriching the theme and showcasing the technologies and solutions available for the areas under deliberation of the meet. The event will have the following major components:

- Water, Food and Energy Security – Essential requirement for sustainable development.
- Water for inclusive Growth
- Sustainable energy development – Key for all round economic growth.
- Water and Society

A large group of international and national persons of eminence are being invited for sharing their experiences in the field of Water and Power Management, Technical and Sociological interventions for achieving water and energy security in their individual areas and manage the assets created on a participatory basis. In addition, there will be special sessions involving dignitaries, delegates, politicians, experts from the fields related to the event. Expert professional bodies and think tanks are invited to put up Side Events addressing specific issues under the theme.

State Governments of Andhra Pradesh, Goa, Karnataka, Maharashtra, Madhya Pradesh, Manipur, Gujarat, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh have confirmed their participation as sponsor. Department of Agriculture, Cooperation and Farmers Welfare, Department of Science and Technology, Damodar Valley Corporation from Central Government Ministries/Organisations/Departments have also confirmed their participation as sponsor.

The Business to Business Exhibition “India Water Expo 2017” co-located with the conference will also be organized from 11 to 14 October, 2017 to focus on the latest technologies providing solutions to the water management issues.

Water Resources are the prime input to the growth and prosperity of the nation. Keeping in view the vital role of water in all aspects of life and also in assuring the development of economy, the Ministry of Water Resources has been observing “**World Water Day**” on the national level. During the year 2011, Ministry of Water Resources decided that the national level of celebrations be transformed to international level on the lines of the events taking place at Singapore and Stockholm.

Water and energy are essential needs in day to day life. At the same time, these are most important inputs for any efforts for social upliftment and economic growth of the country. With the increasing demand by the growing population and improvement in economic status, the demands on the available resources are increasing and we have to constantly strive towards stretching the same water to satisfy larger needs. As a result, there is an urgency to conserve and utilize the limited availability of water resources in an optimum and efficient manner. As a community resources, water needs to be managed and deployed in an equitable manner. The effective and efficient water management is possible through better understanding of issues, mutual cooperation among all stakeholders and adoption of comprehensive and integrated approach.

In order to establish an international event focused on water resources of India, Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India has been organising India Water Week since 2012 as an annual international event. Four editions of India Water Week have been organised so far in 2012, 2013, 2015 and 2016.

The recommendations/action points emerged during earlier events of India Water Week have been sent to all concerned Ministries of Central Government as well as to all State Governments for their appropriate implementation.

It is planned to make the IWW-2017 event more participatory by involving farmers and Water User Association (WUA), NGOs, Experts and other stakeholders. The Inaugural function will be followed by Plenary Session. It is proposed to have a presentation of theme paper, presentation by Foreign Partner European Union, Platinum Sponsor Netherlands and presentations by invited speakers. Also World Water Forum will make small presentation on forthcoming 8<sup>th</sup> World Water Forum to be held in Brazil in March, 2018.

**Samir/jk**

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## There are no innovative ideas in the MoEF's new action plan

The new National Wildlife Action Plan (2017 – 31) that has been recently unveiled sets out goals and targets for coordination among various government agencies and attempts to chart a plan to increase the co-operation of communities with government agencies for the conservation and protection of wildlife and forests in the country. This is the third such plan, and it lays down the way forward for the next 15 years for the ministry of environment, forests and climate change. One of the focus areas in the new plan is the need to involve local communities into the conservation of wildlife. This spills over into the plans for management of tourism in wildlife areas.

As wildlife tourism becomes more and more popular in India, with the increasing popularity of national parks and wildlife sanctuaries, the problems of encouraging such interest without destroying the spaces that attract this attention has been a problem. Studies show that tourist facilities, many are privately owned, are often located too close to sensitive areas. A study published in Conservation India shows that 72% of tourist facilities near national parks were established after the year 2000, and 85% of them are located within 5 km of national park boundaries. These resorts and hotels use local resources, draw water and wood from the area around the park — sometimes at the cost of the animals themselves, and dump garbage with no regard for the environment.

The action plan makes the usual recommendations for making wildlife tourism viable, such as the need to “develop standards and guidelines to prevent damage to wildlife and habitats” and even delineates a “priority project” to “bring in a mechanism for implementation of sustainable tourism in Wildlife Areas, WPAs, CMPAs and the mountain eco-systems, in accordance with the prescribed guidelines.”

None of the recommendations are new, and given that successful implementation of each requires co-ordination between agencies, ministries and private players, it is hard to feel positive about the plan. Impact assessments of eco tourism plans, imposing a ceiling on the number of tourists and vehicles that enter a park, and framing rules for visitor behaviour within reserves, are all measures that should already have been in place. But even if these basic guidelines can be put in place now, and if inter-agency co-ordination can improve now, it will not be too late.

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## India's greenhouse gas emissions up by 4.7% in 2016

Smoked out: The emission figures of most major GHG emitters in the world, barring India and Indonesia, have gone down. Sushil Kumar Verma

Trends in global CO<sub>2</sub> and total greenhouse gas (GHG) emissions show that India's emissions have gone up by 4.7% in 2016, according to the latest report by PBL Netherlands Environmental Assessment Agency.

For most major GHG emitters in the world, the emission figures have gone down, barring India and Indonesia.

The Dutch strategic agency's report shows that emissions in the U.S. saw a fall of 2%, the Russian Federation 2.1%, Brazil 6.1%, China 0.3%, and, within the European Union, the United Kingdom 6.4%. The report's data is based on the Emission Database for Global Atmospheric Research (EDGAR) produced by the European Union.

### Non-CO<sub>2</sub> emissions

In 2016, the five largest emitting countries and the European Union accounted for 68% of total global CO<sub>2</sub> emissions and about 63% of total global GHG emissions. Most of the emissions consist of CO<sub>2</sub>, about 72%.

But methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and fluorinated gases (F-gases) also make up substantial shares of 19%, 6% and 3%, respectively. Over the past two years, total global greenhouse gas emissions, excluding those from land use change and forestry, have shown a slowdown in growth, reaching 49.3 gigatonnes CO<sub>2</sub> equivalent in 2016.

Over the past three years, non-CO<sub>2</sub> GHG emissions have continued to grow somewhat faster than CO<sub>2</sub> emissions: by 1.5% (2014), 1.2% (2015) and 1.0% (2016). CO<sub>2</sub> over the same period increased by a respective 0.8%, -0.2% and 0.3%. Globally, the combined share of non-CO<sub>2</sub> greenhouse gas emissions is about 28% in total GHG emissions, but it varies for the largest countries: 11% for Japan and 31% for India.

China's current share is estimated at 20%, that of the United States and the European Union at 23%, and Russia's at 25%.

### A sign of growth

"India's rising emissions are only a sign of development," said Karthik Ganesan, Research Fellow at the Council on Energy, Environment and Water.

"Emissions do hurt the environment, but then the EDGAR database that this report draws upon only looks at emissions from 1990 onward when the whole world woke up to the problem of climate change. CO<sub>2</sub> emissions have a 100-year residence period in the atmosphere. So, if you include the cumulative emissions data from before 1990, every developed nation will outnumber India."

### 'Not doing enough'

Chandra Bhushan, Deputy Director General of Centre for Science and Environment, told *The Hindu* that developed nations weren't doing enough to reduce emissions in keeping with their

historical CO2 emissions.

According to India's own submission at the United Nations, its cumulative emission is 3 % of the global emission.

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## Drowned by the dam

Was the ceremonial dedication of the Sardar Sarovar Dam to the nation on September 7 a success or a failure? The answer to this question could vary. Some may be influenced by the fact that no chief minister other than Gujarat's participated in the function. Others may point to the low-key ceremony at the dam site without the presence of 2,000 monks expected from Varanasi. Many others could go with the mainstream media's frontpage news. Anyway, the crowd at the public meeting addressed by the prime minister at Dabhoi was small.

In fact, there are several clues that can help us decide exactly what was dedicated to the nation - the project or the dam wall. For a project to be dedicated to the nation, shouldn't it be completed in the first place? When the project in question pertains to a dam, is it enough to raise a wall to its envisaged height or should canals be constructed as well? Only 33 per cent of the canals in Gujarat have been constructed. Can the one dedicating the project and the one receiving the project - the nation - be satisfied if the enormous impacts of the 138.68 metre-high wall on communities upstream and the downstream, about 10 lakh people, and the ecosystem are not taken into account? The nation may not be aware of what has been gifted to it, but will soon realise the betrayal.

The Sardar Sarovar Project was not planned 56 years ago as claimed by the [Narendra Modi](#) government but 38 years ago, when the Narmada Tribunal declared its award in 1979. The dam whose foundation stone was laid by [Jawaharlal Nehru](#) in 1961 was a different project. It was only 162 feet (49.37 metres) in height without any conflicts, impacts - social and environmental - or a tribunal. The tribunal process for the serious resolution of conflict began much after 1961, by which time no less than six village communities had lost their land to the first-ever acquisition for the project by contractors, in fact, in 1961 itself. When they protested and joined the struggle against the project, these communities were offered a meagre cash package. The present Sardar Sarovar Project, the 455-foot dam, is to be completed by filling a huge reservoir of 40,000 hectare, ousting 244 villages and one township - partly or fully.

In an order on February 8, the Supreme Court ruled that those entitled to land should be paid a package of Rs 60 lakh. It also said that the others who had earlier received a meagre package be paid Rs 15 lakh. The Court also directed that all amenities, mandatory under law, should be in place at every resettlement site by June 2017, perhaps not realising the scale and unfeasibility of the task. The Grievance Redressal Authority was given the responsibility to receive complaints and pass orders that had to be implemented by the state authority.

The state as well as the Grievance Redressal Authority have not fulfilled their duty but have been insistent that the "oustees" should have left their lands by July 31. But how could they do so since all those eligible for compensation having not received the rehabilitation package and the rehabilitation sites are not ready - they do not have drinking water supply, there are no drainage facilities which has lead to water logging and there is no grazing land for cattle. Their right to rehabilitation, to be completed at least six months before the submergence of their property - land, houses, trees or threshing ground - was upheld as part of their right to life by a three-member bench of the apex court. They stayed strong, in spite of the large battalions of police having moved in and braved threats by the government.

A vast majority of city dwellers, many of them intellectuals who deal with money and markets, must have been startled by the advertisements issued by the Madhya Pradesh government that talked of a Rs 900-crore package for the "oustees". A large portion of the package was planned for "temporary" resettlement: Tin sheds of 150 to 200 square feet each, fodder for cattle and food camps for thousands of families, all for four months. These are families of farmers who will lose

prime agriculture land and at least a few thousand cattle in each village. They also include self-employed fisherpeople, potters, boatmen, traders, agricultural labourers.

In response to the satyagraha by those threatened with displacement, the MP government declared packages that contain promises for cash, rights to fisherpeople, potters and boatmen. But these haven't materialised and the people continue to struggle non-violently against the violent path of development.

In almost every project, be it related to infrastructure or "smart-city", there is little concern for compensation and mitigation. People in the Narmada Valley have realised this over the past three decades. The larger question also remains: Who is this development for and at what cost? Dams may be dedicated, as are nuclear power plants, but it's only a resource transfer from nature-based communities to urban India at an unparalleled cost to not only those who lose but the country as a whole. It's time we once again debate this question. Else, we will be doomed as a civilisation as the force of nature is punishing us through typhoons, melting glaciers, floods and droughts.

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India to conduct the First 'BIMSTEC Disaster Management Exercise- 2017' next week beginning 10<sup>th</sup> October

## **India to conduct the First 'BIMSTEC Disaster Management Exercise- 2017' next week beginning 10<sup>th</sup> October**

The First 'BIMSTEC Disaster Management Exercise- 2017' (BIMSTEC DMEx-2017) will be conducted by the National Disaster Response Force (NDRF) as the lead agency next week from October 10-13, 2017 in Delhi and the National Capital Region (NCR). At the 17th BIMSTEC Senior Officials Meeting held in Kathmandu, Nepal on February 7, 2017, it was decided that India would organize the first annual Disaster Management Exercise for the region.

This Exercise will be a platform for sharing Best Practices on all aspects of Disaster Risk Reduction (DRR), strengthening regional response and coordination for Disaster Management among the BIMSTEC member countries. The main focus of the BIMSTEC DMEx-2017 will be on testing the region's preparedness and resilience towards effective activation of inter-Governmental interaction/dialogue/agreements for immediate deployment of regional resources for disaster response. It will help create synergy and synchronize efforts to institutionalize regional cooperation among the member countries. The exercise will help strengthen the effective utilization of the Search & Rescue Teams for Disaster Relief & Emergency Response, including Emergency Rapid Assessment Teams and Management of mass casualties especially in situations involving breakdown of infrastructure and communication.

Delegates from all seven nations of the 'Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation' (BIMSTEC) grouping, - namely Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka and Thailand, representatives from Embassies/High Commissions of BIMSTEC nations in Delhi, National Disaster Management Authority (NDMA), and Senior Officers from the Nodal Ministries will participate in the event.

At the end of the four-day Exercise, a publication will be brought out on the outcomes and recommendations of the Joint/Common Exercise and include Agreement among BIMSTEC Nations on regional cooperation for Disaster Management and Emergency Response. This would be presented to the BIMSTEC Leaders at the Summit to be hosted by Nepal in October/November, 2017.

The BIMSTEC DMEx-2017 is being conducted in two phases in Delhi and NCR. The main exercise will comprise of Table Top Exercise (TTX), Field Training Exercise (FTX) and After Action Review (AAR) which is scheduled for October 10-13, 2017. Earlier, the first phase comprising a Preparatory Meeting and field visit of site selected for FTX during the main exercise, was held in Delhi NCR on August 8-9, 2017.

India has been at the forefront of DRR efforts by hosting the South Asian Annual Disaster Management Exercise (SAADMEx) and the Asian Ministerial Conference for Disaster

Risk Reduction (AMCDRR). India has also offered its expertise and capabilities in DRR such as the South Asia satellite, GSAT-9, and the Tsunami Early Warning Centre to other countries. Disaster Management was one of the important Agenda items the BIMSTEC leaders deliberated upon during the Goa BRICS Summit in October last year where BIMSTEC leaders were the Special Invitees.

The BIMSTEC region is home to around 1.5 billion people, constituting around 22% of the global population with a combined GDP of US \$2.7 trillion economy. Majority of the BIMSTEC countries are situated in the South Asian Region (SAR), prone to natural disasters such as floods, cyclones, earthquakes, avalanches and drought.

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## SC ban on firecrackers : Ruling in favour of a vast majority of citizens against commercial interests of a few

Diwali, this year may be celebrated truly as festival of lights in the National Capital Region (NCR) of New Delhi and its adjoining areas. The Supreme Court on Monday banned the sale of firecrackers in the city for the next 20 days.

It is an extraordinary step that the top court has taken to deal with an equally urgent condition arising from alarming air pollution levels in the city.

Last year, Delhi woke up to distressing levels of pollution after Diwali, when the average PM (particulate matter) 2.5 level reached an unprecedented levels of over 700  $\mu\text{g}/\text{m}^3$ — one of the highest recorded the world over and 29 times above WHO standards. The court calls this a health emergency.

It is not in dispute that during the festival season of October- November in Delhi, bursting of fireworks not only releases a deadly concoction of fumes into air causing extreme air pollution but also causes severe noise pollution.

Medical evidence suggests that severe air pollution in NCR is leading to multiple diseases and other health related issues among the people. The city has seen an increase in respiratory diseases like asthma, lung cancer, bronchitis primarily attributable to the worsening air quality in the NCR. The damage being caused to people is irreversible.

What makes matter worse for the city is also the fact that the festival season coincides with the setting in of winters in north India which reduces wind speed, the marriage season and the burning of crop residue by farmers of Punjab and Haryana at the same time.

In passing the ban order, the court may have departed the time-honoured way of celebrating the festival, but the choice for it was not a difficult one to make - when it concerned the lives of people.

Justifying the ban on sale of firecrackers, the court says that it needs to test, if banning sale of firecrackers during Diwali will have a positive effect on air quality in Delhi.

The court feels, as far as adverse effects of burning of crackers during Diwali are concerned; those have been witnessed year after year. The air quality deteriorates alarmingly and the city chokes on the foul air.

However, the court needs to be lauded not just recognising and protecting the health needs of future generations but also tilting the balance in favour of a vast majority of citizens against the commercial interests of a few.

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## **Union Home Minister to inaugurate First BIMSTEC Disaster Management Exercise tomorrow**

### **Union Home Minister to inaugurate First BIMSTEC Disaster Management Exercise tomorrow**

The Union Home Minister Shri Rajnath Singh will inaugurate the four-day First 'BIMSTEC Disaster Management Exercise- 2017' (BIMSTEC DMEx-2017) here tomorrow. The Exercise will be conducted by the National Disaster Response Force (NDRF) as the lead agency from October 10-13, 2017 in Delhi and the National Capital Region (NCR). At the 17th BIMSTEC Senior Officials Meeting held in Kathmandu, Nepal on February 7, 2017, it was decided that India would organize the first annual Disaster Management Exercise for the region.

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This Exercise will be a platform for sharing Best Practices on all aspects of Disaster Risk Reduction (DRR), strengthening regional response and coordination for Disaster Management among the BIMSTEC member countries. The main focus of the BIMSTEC DMEx-2017 will be on testing the region's preparedness and resilience towards effective activation of inter-Governmental interaction/dialogue/agreements for immediate deployment of regional resources for disaster response. It will help create synergy and synchronize efforts to institutionalize regional cooperation among the member countries. The exercise will help strengthen the effective utilization of the Search & Rescue Teams for Disaster Relief & Emergency Response, including Emergency Rapid Assessment Teams and Management of mass casualties especially in situations involving breakdown of infrastructure and communication.

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**NMCG Approves Eight Projects worth over Rs 700 Crore Under Namami Gange Programme****NMCG Approves Eight Projects worth over Rs 700 Crore Under Namami Gange Programme**

National Mission for Clean Ganga has approved eight projects worth Rs. 700 crore, out of which four pertain to sewage management in Uttar Pradesh, Bihar and West Bengal, three are related to treatment of drains through bio-remediation and one of inventorization and surveillance of river Ganga.

On sewage management front, a project for pollution abatement in river Ganga at Bally in West Bengal has been approved at an estimated cost of Rs 200.07 crore that would include construction of a 40 MLD STP under Hybrid Annuity based PPP model among other works. Similarly, construction of a 65 MLD STP under Hybrid Annuity model has been approved for Bhagalpur in Bihar at an estimated roject cost of Rs 268.49 crore. In Uttar Pradesh, sewage treatment related works at an estimated cost of Rs 213.62 crore have also been approved that includes construction of two STPs (28 MLD + 05 MLD) in Farrukabad and one 2 MLD STP at Bargadiya drain in Fatehpur. Pollution abatement works for river Ganga like interception, diversion and treatment of sewage in Bithoor have also been approved at an estimated cost of Rs 13.40 crore.

Three projects of treatment of drains using bio-remediation technology have also been given a green signal at an estimated cost of Rs 4.29 crore. These are for Rajapur drain and Digha drain in Patna and Laksar drain in Haridwar.

One project for pollution inventorization, assessment and surveillance on river Ganga has also been approved at an estimated cost of Rs 42.9 crore. Continuation of an ongoing exercise, the project aims to strengthen environmental regulation and water quality monitoring vis-à-vis river Ganga.

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**Foggy thinking — on SC restoring ban on cracker sales in Delhi**

For the second time since November 2016, the Supreme Court has temporarily banned the sale of firecrackers in the National Capital Region. The idea is to test whether it cuts the deadly pollution levels seen in Delhi during and after Deepavali. In other words, to see whether they can be collapsed from the astronomical 1,000-plus micrograms per cubic metre of fine particulate matter seen in 2016 to merely life-threatening levels of a few hundred micrograms/cu.m that Delhi usually sees in winter. But that is a big if. Given that it came just about 10 days before the festival, it will be tough to impose the ban on an industry that has already produced stocks to order. Nor will it be easy to rein in revellers unconvinced by the court order. More importantly, despite delivering a big blow to the industry and incurring the displeasure of many, it offers too piecemeal a solution, akin to the even-odd licence number scheme of the Delhi government in 2015. North India needs a more holistic solution to the toxic air that residents breathe at the onset of winter. The major sources of pollution in the NCR have been clear enough to drive policy changes. While their relative contributions are still indeterminate, these include construction dust, vehicular pollution, waste burning, generators and crop residue burning in the Indo-Gangetic plains.

To tackle each of these will take decisive and persistent policy actions, not panic-driven and ill-considered bans. Take the 2015 ban on crop-residue burning in Punjab and Haryana for example. Two years later, farmers continue to violate it, because the State governments have still not taken the steps required to solve the underlying problem — the high cost of cleaning the paddy stubble instead of burning it to prepare the field to sow wheat. Though the government has offered subsidies on a machine called Happy Seeder, which doesn't require a stubble-free field to plant wheat, farmers haven't taken to it as burning remains cheaper. Another option is biomass-energy plants that buy paddy straw from farmers for use in generating power. Yet, government incentives for biomass-energy plants haven't been enough to galvanise industry. This, in turn, leaves farmers wary. The only answer is for the Punjab and Haryana governments to move purposefully on the solutions they know will work — just as the only option for the Delhi government is to raise awareness on the impact of firecrackers, while also tackling vehicular pollution, construction dust and other pollution sources. In the absence of these less dramatic, but more feasible solutions, it is unlikely a firecracker sale ban will avert the kind of health emergency that struck Delhi last year.

Rajasthan's ordinance shields the corrupt, threatens the media and whistle-blowers

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**Shri Rajnath Singh inaugurates the First BIMSTEC Disaster Management Exercise****Shri Rajnath Singh inaugurates the First BIMSTEC Disaster Management Exercise**

The Union Home Minister Shri Rajnath Singh inaugurated the four-day first Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation Disaster Management Exercise (BIMSTEC DMEx-2017) here today. The Exercise is being conducted by the National Disaster Response Force (NDRF) as the lead agency from October 10-13, 2017 in Delhi and the National Capital Region (NCR). At the 17th BIMSTEC Senior Officials Meeting held in Kathmandu, Nepal on February 7, 2017, it was decided that India would organize the first annual Disaster Management Exercise for the region.

Addressing on the occasion, Shri Rajnath Singh extended warm greetings to all delegates from BIMSTEC nations that have come together to participate in this joint exercise. He said that their presence for this exercise represents their governments' commitment to regional co-operation in the area of disaster risk management.

Expressing concern over the disasters, the Home Minister said, in the recent monsoon season, floods and landslides have affected millions of people across almost all the BIMSTEC countries. This is yet another reminder of the importance of improving our disaster preparedness, he emphasised. Shri Rajnath Singh said that over the period 1996 to 2015, the BIMSTEC countries have lost 317,000 lives to disasters. In these disasters more than 16 million people in BIMSTEC countries have lost their homes and economic losses are also high and escalating, he further added. He said, in terms of number of extreme weather events – floods, droughts, heat waves and cyclones – the future is not going to be any better and the frequency and intensity of such events is likely to rise in view of the climate change. However, if we make our communities, our towns and villages, and our economic activities resilient, we can reduce the losses, the Home Minister said. He said that the improved disaster preparedness is a corner stone of this effort and in this direction, all the BIMSTEC nations have made significant progress over the last two decades. Highlighting the progress of various nations, he said that the cyclone preparedness programme of Bangladesh is recognized as a global best practice and the last mile connectivity of Tsunami early warning system in Thailand has significantly improved preparedness in coastal areas.

Speaking on India's efforts in this direction, Shri Rajnath Singh said that we are making concerted efforts to reduce preventable deaths and other losses and are also analyzing

the patterns of disaster mortality and taking focused steps. He said that India's effective handling of Phailin and Hudhud in the recent past is the direct outcome of over a decade of policy initiatives and enhancement of early warning capabilities, advance preparation, training and capacity development.

He expressed hope that over next few days besides focusing on joint exercise, delegations will have opportunity to share their country's experience. He said that success of this joint exercise will depend on not only the work that will be done over next few days but also follow-up work after the exercise.

The Home Minister said that over a period of time we need to use exercises to develop a pool of BIMSTEC disaster responders spread across all participating nations. These building blocks will ensure that when need arises, we can mobilise an effective response and help each other in a timely manner. He expressed sincere belief that BIMSTEC nations need to join hands to mitigate disasters since they face problem of floods on a regular basis.

Shri Rajnath Singh said if the BIMSTEC member states start sharing the hydrological data of transnational rivers with downstream countries, it will certainly help the nations in risk reduction and better disaster preparedness. We need to build a consensus on regular sharing of hydrological data of transnational rivers, he emphasised.

Shri Rajnath Singh reiterated India's commitment to stand shoulder to shoulder with other BIMSTEC nations in achieving its common goals in reducing disaster losses and explore all possible avenues of collaboration. He said that India has established the Tsunami early Warning System for the Indian Ocean Rim Countries. We have deployed our National Disaster Response Force in other affected countries for response operations, he said. He informed that prior to BIMSTEC, India has hosted joint bilateral exercises with SAARC countries and also hosted a joint meeting on disaster risk management of all the BRICS nations. Last year we hosted the Asian Ministerial Conference for Disaster Risk Reduction, he said. Shri Rajnath Singh said that in May this year India launched South Asia Geostationary Communication Satellite that will improve communication, weather forecasting, etc. He assured that India will work with the same level of commitment under BIMSTEC and is indeed looking forward to moving hand in hand with the BIMSTEC nations. He thanked BIMSTEC country delegations for coming to India for this joint exercise.

BIMSTEC Secretary General, M Shahidul Islam said that it is a great honour and privilege for him to be present at the first disaster management exercise. He expressed happiness at the fact that this exercise is being organised when BIMSTEC is completing 20 years of its formation this year and this is the reflection of true spirit of regional cooperation. He said that disaster management is of high priority because Bay of Bengal region is one of the most disaster prone areas of the world and has witnessed many disasters in the recent past. He expressed concern that during disasters, apart from human loss, economic loss is also huge which affects the GDP of the country. He said that we have little control over natural calamities, so we need to focus on disaster risk reduction. We need to learn from each other and our past experiences, he added. He emphasised that coordination and quick response must go hand in hand. He further said that various structural and non-structural systems have been put in place which has reduced the human loss. The Secretary General also said that people to people contact is very important along with institutional framework. He said that this exercise is just a beginning for a larger cooperation.

During his welcome address, Shri Sanjay Kumar, DG, NDRF said that the first phase comprising a Preparatory Meeting was held in Delhi NCR on August 8-9, 2017, during which the modalities for this exercise were discussed. He said that this exercise will provide a platform to member countries to share best practices and coordination for disaster management among BIMSTEC nations. This is an opportunity to review and discuss the disaster management plans, he added. He said that this exercise will facilitate the regional cooperation for effective disaster response. The disasters cannot be prevented, but certainly be managed, Shri Kumar said. He also emphasised on integration of latest technology in this regard.

The Secretary (East), Ministry of External Affairs, Ms Preeti Saran said that BIMSTEC region has over one fifth of world's population and development of BIMSTEC countries is crucial for the development of world as a whole. She said that regional cooperation under BIMSTEC also spurs the development of North East region. She said that sharing information, joint action and capacity building are important and this exercise is a step in this direction.

Delegation and response teams of all seven BIMSTEC nations i.e. – Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka and Thailand were present during the session. Representatives from Embassies/High Commission of BIMSTEC nations in Delhi, MHA, MEA, NDMA, NIDM, NDRF, SDRF, senior officers of CAPFs and state representatives

were also present. Over 150 delegates of BIMSTEC member nations are participating in this event.

During the four-day exercise, the delegates from the member nations will share their experiences in the varied fields of disaster, training and its mitigation. Various events during the exercise include a Table Top Exercise after the inaugural session to provide participants with an opportunity to review and discuss disaster response plans and sharing of best practices of one nation with the other. Other exercises such as Joint Field Training Exercise on earthquake disaster at Ghaziabad, Joint Field Training Exercise on Flood Rescue at Wazirabad will also be conducted.

KSD/NK/PK

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## India Water Week – 2017 Inaugurated 285 New Irrigation Projects to be Taken up by Next Year Says Gadkari

### India Water Week – 2017 Inaugurated 285 New Irrigation Projects to be Taken up by Next Year Says Gadkari

President Shri Ram Nath Kovind inaugurated India Water Week – 2017 in New Delhi today.

Speaking on the occasion Union Minister of Water Resources, River Development and Ganga Rejuvenation, Road Transport & Highways and Shipping Shri Nitin Gadkari said that 27 PMKSY projects will be completed by this year. He said 285 new irrigation projects will be taken up by next year to provide irrigation for 1 crore 88 lakh hectare of land. Shri Gadkari said drip irrigation and irrigation through pipeline will be the priority areas for the Government as this will save large amount of water and also cut down the cost involved in acquiring land. The Union Water Resources Minister said water, power, transport and communication are the four most important pillars of development. He said Government is keen to provide safe drinking water to every household and irrigation water for every farm. In this connection he referred to the recent inauguration of Sardar Sarovar Project by the Prime Minister, which will provide water to over 4 crore people and help irrigate over 8 lakh hectares of land.

Shri Gadkari said that Inter linking of rivers is very important to save people from floods and droughts. He said 30 Projects for river linking have been approved out of which work on three projects namely Ken- Betwa, Par- Tapi Narmada and Daman Ganga Pinjal will start within three months. The Minister said Government is exploring the possibility of creating a large fund for inter linking of rivers. Shri Gadkari said new ways have to be found for use of treated waste water. He said that he has requested the Power Minister to explore the possibility of using recycled water for NTPC power plants. He emphasised the need for inventing innovative methods for using 70% of river water which goes into seas. Referring to Pancheswar Project the Minister said the Secretary of Ministry Water Resources will be visiting Nepal soon to sort out pending issues. He expressed the hope that work on the project will start soon. Shri Gadkari expressed the hope that some good suggestions will come out from the deliberations and discussion during India Water Week.

Union Minister for Drinking and Water Sanitation Sushri Uma Bharti in her address said that Government is sincerely working to make available safe drinking water to every household of the country and irrigation facility for every farm by 2022. She said, “ It is a matter of grave concern that ground water level is going down critically. We have misused and abused ground water. We will have to respect water, rivers and ground water and make our rivers Aviral and Nirmal.”

Addressing the inaugural session of India Water Week – 2017 Union Minister of State for Water Resources, River Development and Ganga Rejuvenation Shri Arjun Ram Meghwal said that water and energy are two crucial resources whose conservation and optimum utilisation is essential for inclusive growth of a nation. He said 112 districts in the country

have less than 20% irrigation coverage and time bound actions are needed to meet the challenges of water scarcity and flood management the Minister said. The Government has proposed National Ground Water Management improvement scheme, a world bank backed Rs. 6,000 crore scheme, for sustainable management of ground water.

Dr. Satyapal Singh, Union Minister of State for Water Resources, River Development and Ganga Rejuvenation thanked all the delegates participating in the IWW-2017 and hoped that specific focussed sessions on the basic issues of water and energy will be highly beneficial for policy maker and Nation.

About 1500 delegates from India and 13 other countries are attending the five day international event. The theme of India Water Week – 2017 is “Water and Energy for Inclusive Growth”.

The 5th edition of India Water Week (IWW) is being held with a multi disciplinary conference and a concurrently running exhibition enriching the theme and showcasing the technologies and solutions available for the areas under deliberation of the meet. The event will have the following major components:

- Water, Food and Energy Security – Essential requirement for sustainable development.
- Water for inclusive Growth
- Sustainable energy development – Key for all round economic growth.
- Water and Society

A large group of international and national persons of eminence have been invited for sharing their experiences in the field of Water and Power Management, Technical and Sociological interventions for achieving water and energy security in their individual areas and manage the assets created on a participatory basis. In addition, there will be special sessions involving dignitaries, delegates, politicians, experts from the fields related to the event. Expert professional bodies and think tanks are invited to put up Side events addressing specific issues under the theme.

The Business to Business Exhibition “India Water Expo 2017” co-located with the conference will also be organized from 11 to 14 October, 2017 to focus on the latest technologies providing solutions to the water management issues.

In order to establish an international event focused on water resources of India, Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India has been organising India Water Week since 2012 as an annual international event. Four editions of India Water Week have been organised so far in 2012, 2013, 2015 and 2016. The recommendations/action points emerged during earlier events of India Water Week have been sent to all concerned Ministries of Central Government as well as to all State

Governments for their appropriate implementation.

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## Pondicherry Shark, Red Sea Torpedo and Tentacled Butterfly Ray may have become extinct, fear scientists

Juvenile sharks landed in commercial fishery. | Photo Credit: [Special Arrangement](#)

Three marine species, the Pondicherry Shark, the Red Sea Torpedo and the Tentacled Butterfly Ray might have become possibly extinct in the oceanic waters of the Arabian Seas Region (ASR) since no evidence of its existence has surfaced in the last three decades.

Scientists are also worried about the possible disappearance of other species from the region even before they were known to science.

The first ever assessment of the conservation status of sharks, rays, and chimaeras (collectively called chondrichthyans) in the region has left the scientists grim-faced as 78 of the 153 species revived were found fighting for survival.

The Guitar fish found in coastal waters of Kerala and Tamil Nadu and the Ganges Shark found in Arabian Sea were classified as Critically Endangered, among others.

The “extinction risk and conservation status of all chondrichthyans naturally reproducing” in the region were reviewed by the IUCN Species Survival Commission Shark Specialist Group. Though 184 species of sharks, rays, and chimaeras occur in the region, only the confirmed 153 species were considered for the analysis.

The ASR covers the waters of the Red Sea, Gulf of Aden, Arabian Sea, Sea of Oman, and the Gulf. The region is also bordered by

20 countries including India, Bahrain, Egypt, Iraq, the Islamic Republic of Iran, Israel and Pakistan.

The assessment also revealed that 27 species were Near Threatened and 19 others were of least conservation concerns. It was also known that less was known about 29 to evaluate their risk of extinction.

The evaluators included two from Kerala including K.V. Akhilesh of the Central Marine Fisheries Research Institute, Mumbai centre and K. K. Bineesh of the Zoological Survey of India, Andaman Nicobar unit.

By-catch was found to be the biggest threat to the majority of chondrichthyan fishes besides the “pressure from artisanal and industrial fisheries.”

The assessors were of the view that the “increasing decline in the extent and quality of habitat as a result of coastal development and other anthropogenic disturbances, particularly for those critical habitats that many species depend on coral reefs, mangroves, sea grasses pose a serious threat to the survival of many species.”

India, which banned the exploitation and trade of 10 species of sharks and rays, had in 2015 banned the export and import of shark fins of all species.

Jaggi Vasudev’s Rally for Rivers claims they will, but this is not based on the most nuanced science

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## Averting disaster

In recent times, Category 5 hurricanes in the Caribbean and in the American mainland; record floods across Bangladesh, India and Nepal; and drought emergencies in 20 countries in Africa have damaged these regions, killed hundreds, and ruined the lives of millions. For those countries that are least developed, the impact of disasters can strip away livelihoods; for developed and middle-income countries, the economic losses from infrastructure alone can be massive; for both, these events reiterate the need to act on a changing climate, the effects of which have been revelatory.

While 4.2 million people dying prematurely each year from ambient pollution gets relatively little media attention, the effect of heat-trapping greenhouse gases on extreme weather events is coming into sharper focus. It could not be otherwise when the impacts of these weather events are so profound. During the last two years, over 40 million people, mainly in countries which contribute least to global warming, have been forced from their homes by disasters. There is clear consensus: rising temperatures are increasing the amount of water vapour in the atmosphere, leading to more intense rainfall and flooding in some places, and drought in others. Some areas experience both. TOPEX/Poseidon, the first satellite to precisely measure rising sea levels, was launched 25 years ago. Those measurements have observed a global increase of 3.4 millimeters per year since then; that's a total of 85 millimeters over 25 years. Rising and warming seas are contributing to the intensity of tropical storms worldwide.

While the Paris Agreement has set the world on a long-term path towards a low-carbon future, it is a windy path that reflects pragmatism and realities in each individual country. Thus, while carbon emissions are expected to drop as countries meet their targets, the impacts of climate change may be felt for some time, leaving the world with little choice but to invest, simultaneously, in efforts to adapt to climate change and reduce disaster risk. This will require international cooperation. Restoring the ecological balance between emissions and the natural absorptive capacity of the planet is the long-term goal. It is critical to remember that the long-term reduction of emissions is the most important risk reduction tactic we have, and we must deliver on that ambition. The November UN Climate Conference in Bonn provides an opportunity to not only accelerate emission reductions but to also boost the work of ensuring that the management of climate risk is integrated into disaster risk management as a whole. Poverty, rapid urbanisation, poor land use, ecosystems decline and other risk factors will amplify the impacts of climate change. Today, on International Day for Disaster Reduction, we call for them to be addressed in a holistic way.

This article has been cut for length. Achim Steiner is Administrator of the UNDP; Patricia Espinosa is Executive Secretary of UN Climate Change; Robert Glasser is the UN Secretary-General's Special Representative for Disaster Risk Reduction

The new U.S. Fed Chairman is unlikely to opt for policies that might upset the President's plan

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## The wrong approach to environmental regulation

The Supreme Court order on Monday banning the sale of firecrackers in Delhi and the National Capital Region (NCR) has expectedly turned into a controversy. The period of the ban—till 31 October—covers the festival of Diwali, which is celebrated with elaborate fireworks. Some of those disappointed have gone to the extent of arguing that the court order is “anti-Hindu” in nature. Others point to judicial overreach that they think this order best exemplifies. In essence, there are two distinct issues that need to be separately analysed: a) the scope of the state’s regulatory power vis-à-vis a religious celebration, and b) the agency of the state that such regulation should vest with.

On the first count, the matter is relatively clear. The bursting of firecrackers releases a heavy dose of carcinogens in the atmosphere, presenting a public health challenge for the entire city. This is similar to smoking at public places—a regulated activity—but different from consumption of liquor, which harms the individual. Insofar as even the latter causes harm to others, the laws and regulations do kick in—think, for example, of drink and drive penalties. As soon as it is clear that bursting of firecrackers by one person presents a health challenge to another, any argument of religion cannot reign supreme in a constitutional, secular republic.

The more difficult question is the choice between regulation, short of a complete ban, and a complete ban. The decision requires weighing trade-offs, which would depend on numerous inputs from scientific organizations, regulatory institutions, public policy experts and civil society. Since a court of law does not have in-house expertise in these domains, it should leave such matters to the executive. While the Supreme Court delivered its arguments in the broader framework of the “right to breathe clean air” and the “right to health”, it went about dismissing the commercial considerations of the firecracker industry. These considerations could have equally been framed in terms of the right to livelihoods of thousands who depend heavily on the sale of firecrackers during Diwali.

Besides, bans are rarely effective. It is difficult to imagine that no firecracker sale will happen in the entire territory of Delhi and NCR as a result of the Supreme Court order. If the police fail to enforce the order, the credibility of the Supreme Court, particularly in cases of environmental regulation, will suffer immensely.

The manner in which the Supreme Court has dealt with this particular case also raises a number of concerns. It first passed an order on 11 November 2016 (after Diwali) banning the sale of firecrackers. Then it partially lifted the ban on 12 September 2017. In this second order, it introduced several arbitrary caps like limiting the number of temporary licences for firecracker sellers to 50% of those given in 2016. The judges also made statements like: “In our opinion, even 50,00,000kg of fireworks is far more than enough for Dussehra and Diwali in 2017.” And then finally, it decided on Monday that while the 11 November 2016 order will stay in force, the 12 September 2017 order will only be effective from 1 November 2017. To make matters worse, the court has ordered suspension of all the temporary licences issued after its 12 September 2017 verdict which allowed the grant of these licences—albeit with a cap. The Supreme Court couldn’t have followed a more muddled and ad hoc approach.

But none of this is new. In an earlier instance, the Supreme Court had increased the entry tax on trucks entering Delhi without factoring in the demand elasticity of goods (carried in those trucks) transported to Delhi, an overwhelmingly consumption-heavy state. Before the turn of the century, the Supreme Court had ordered the conversion of the public transport fleet in Delhi from diesel to CNG. Even as the order was passed without the requisite infrastructure being ready, it was lauded widely and did indeed improve the quality of air over the next few years. But questions still

remained. Pratap Bhanu Mehta, a leading political scientist, for example, has asked ([goo.gl/5VDQA](http://goo.gl/5VDQA)) whether the court achieved the lowering of air pollution in a cost-effective manner.

The CNG order had other deleterious long-term consequences. [In a 2003 paper](#), Michael Jackson and Armin Rosencranz had warned: "...the Court's action seems likely to impede capacity building in the pollution control agencies, and thereby to compromise the development of sustained environmental management in India." The current situation—the unresolved problem of air pollution, the lack of regulatory capacity on environmental issues, the abdication by the executive and increased judicial activism—do suggest that Jackson and Rosencranz were indeed right.

It is high time the executive returned to take charge at the wheel. The elected government is in the best position to elicit scientific and economic inputs and take a call, even if it involves expending political capital. The governments at the Centre and the states should involve different agencies like the Petroleum and Explosives Safety Organisation and the pollution control boards and invest in setting regulatory standards for the medium to long term. What is currently happening, however, is a far cry: The complementary phenomena of executive abdication and judicial activism have created an ugly spectacle of environmental mismanagement in India.

*Do you agree with the Supreme Court order banning firecracker sales in Delhi and the NCR during the Diwali season? Tell us at [views@livemint.com](mailto:views@livemint.com)*

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**BIZ-NATIONAL WATERWAYS-BONDS**

The Inland Waterways Authority of India has raised Rs. 660 crore through bonds and the proceeds will be used exclusively to develop National Waterways, the government said on Friday.

“The IWAI has raised Rs. 660 crore as ‘GOI Fully Serviced Bonds’. The resources raised by way of bonds are in addition to the budgetary support from the Government of India,” the Ministry of Shipping said in a statement.PTI

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## Public health key concern in banning crackers in Delhi: SC

Staring at losses: A woman drying fireworks at a factory in Sivakasi, Tamil Nadu. The business could take a hit due to the ban on sale in the Delhi-National Capital Region.

The Supreme Court on Friday refused to modify its October 9 order suspending the sale of firecrackers in Delhi NCR till November 1, 2017.

The court said it knew that “some people are trying to give a communal tinge to our order... but we will consider that as people expressing their anguish at our order.”

The court said that its concern primarily was the health of the masses.

The Bench, also comprising of Justice Ashok Bhushan, was hearing firecracker manufacturers and traders hit by the October 9 ban.

“Diwali has been celebrated for hundreds of years. Delhi is no exception to the rest of India. There are children who wait for Diwali celebrations,” senior advocate Mukul Rohatgi, appearing for the traders, submitted.

Interestingly, the October 9 order only suspended the sale and did not impose any restriction on the bursting of crackers.

Mr. Rohatgi even suggested to the court to designate the time and days for bursting crackers.

To this, the Bench said “very frankly” it doubted whether the suspension of sales has dampened Deepavali celebrations in the least. “The sales are already taking place. Crackers are already being burst. It is not anyway going to be a cracker-free Diwali,” Justice Sikri remarked.

The court said it would anyway monitor the post-Deepavali situation after November 1. The suspension was ordered in a bid to test whether a Deepavali without firecrackers this year will have a “positive effect” on the health of citizens and a steadily deteriorating air quality.

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## HC curbs use of fireworks in Punjab and Haryana

Sales pitch A poster outside a closed shop says bursting of crackers can help in getting rid of mosquitoes which cause diseases like dengue and chikugunya. Shiv Kumar Pushpakar

Concerned at the depleting air quality Punjab, Haryana and Chandigarh, the Punjab and Haryana High Court on Friday restricted bursting of crackers on the occasion of Diwali this year between 6.30 p.m. and 9.30 p.m.

### Issues guidelines

The division bench of justice A. K. Mittal and justice Amit Rawal also issued guidelines for issuing licences to firecracker sellers.

Senior advocate Anupam Gupta, who has been appointed amicus curiae in the case, said the order would be applicable in the two States and Union Territory for this year's Diwali.

### 'Ensure compliance'

"The court has asked the local administrations to ensure strict compliance of the order.

Police should deploy adequate PCR vans," said Mr. Gupta. Taking a cue from the Supreme Court order banning fire crackers in the national capital region for Diwali, the High Court had on Thursday suo motu asked Punjab, Haryana and Chandigarh to share details of permanent and temporary licences issued for selling crackers in their respective regions.

### Licences

Issuing guidelines for granting licences, the court ordered that no permanent licence should be issued to sellers without the court's permission.

"Also, temporary licences will be issued only by deputy commissioners and nobody else," said Mr. Gupta

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**NGT seeks report from Punjab gov. on steps taken by it to tackle stubble burning**

The National Green Tribunal (NGT) on Friday asked the Centre and the Punjab government as to what it had done to tackle the issue of stubble burning.

Further, the tribunal directed the Punjab government to draw up a list of power plants and other industries that can use the crop residue as a source of power.

The green panel also issued notice to the NTPC which had projected that it will take the residue as a source of power and sought reply on the same.

On October 11, the NGT had asked the Punjab government to present before the Tribunal, the 21 farmers who had benefited from the schemes rolled out by the government.

A Bench headed by NGT chairperson Swatanter Kumar asked the 12 farmers who were present in court on Friday, whether they had genuinely received government help to tackle the crop residue.

Responding to queries from the Bench, the farmers stated that the Punjab government had provided them with adequate machineries and even collected the crop residue and put it in panchayat lands.

During the hearing, I.G. Kapila, who was appearing for the farmers said that the problem lay with the implantation of the policies.

**Other districts**

Pulling up the Punjab government for not providing enough incentives in other districts as well, the Bench asked, "Why don't you create a structure that the big farmers can benefit from and then help the small farmers?"

"We expect no individual body, government, panchayat and other associations to directly or indirectly burn the residue", said the Bench.

While passing the directions, the Bench also said, "Corporate Social Responsibility [CSR] of both public and private sector are equally enforceable where it will serve the general cause of environment and prevent pollution of air."

The NGT directed the State government to furnish a "complete and detailed mechanism ensuring happy seeders and bailers to farmers depending on their financial capacity."

The panel further stated that the machinery should be provided either free of cost or at a minimal cost which would not have grave financial implications on the farmers.

**END**

## Clearing the air

Earlier this week, the National Green Tribunal (NGT) pulled up the Punjab government for not doing enough to end stubble burning, a major cause of pollution in Delhi and its neighbourhood. The issue has come to the fore again since the monsoon has retreated and farmers have begun to ready their fields for sowing. Removing the crop stubble marks the beginning of the new farm cycle, and evidence suggests that very few farmers are willing to abandon the practice of burning the stubble and adopt environment-friendly technologies like paddy straw management (PSM).

This must not be seen as a mere enforcement problem that can be resolved by penalising errant farmers and state agencies. There are economic and behavioural issues behind farmers' reluctance to leave behind a tested and proven technique for a relatively untested technology. These need to be addressed. The expenses incurred towards adopting costlier farm practices could be borne by the state and there needs to be a concerted outreach by the agriculture establishment to familiarise farmers with the new technologies.

Two years ago, the NGT took a grave view of air pollution in winter, banned the practice of stubble burning, and ordered Punjab and Haryana, the rice-wheat bowls of northern India, to enable farmers to adopt a technology-driven solution while penalising the ones who refuse to abide by the order. The NGT's concern is understandable: Pollution-related ailments are on the rise and the state appeared indifferent to the problem. The Delhi High Court too had given a similar ruling and cautioned the chief secretaries of Punjab, Haryana, Rajasthan and Uttar Pradesh that they will be held accountable if the practice was not stopped.

Yet, the results have been patchy. This newspaper has reported how Punjab's government planned to parade 21 farmers from an "adopted" village before the NGT to cover its tracks. This is to be expected. Farmers shifted to burning the stubble decades ago because it had become expensive and time-consuming to use manual labour to remove it after harvest. In the absence of a viable market for the stubble, it made economic sense to burn the crop residue.

How best to nudge farmers to adopt environment-friendly agri practices, is the question. The government needs to look beyond fiats and explore the option of financial incentives to clear the air.

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**4-day-long BIMSTEC Disaster Management Exercise – 2017 concludes****4-day-long BIMSTEC Disaster Management Exercise – 2017 concludes****India has emerged as a frontline state for Disaster Risk Reduction: Dr Jitendra Singh**

The first Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation, Disaster Management Exercise (BIMSTEC DMEx-2017) concluded here today. Members of the BIMSTEC i.e Bangladesh, India, Myanmar, Sri Lanka, Thailand, Bhutan and Nepal participated in the four-day exercise, conducted by the National Disaster Response Force (NDRF) as the nodal agency in Delhi and the National Capital Region, which comprised of a Table Top Exercise (TTX), Field Training Exercises (FTXs) on Earthquake and Flood and an After Action Review (AAR).

Today, debriefing and 'After Action Review' (AAR) was conducted to share the important lessons learnt which would assist the countries to augment disaster response and coordination.

During the exercise conducted from October 10-13, 2017 various important suggestions/actions viz, Participation of women in Disaster Response Mechanism, Emphasise on psycho-social-trauma care, replication of ICS, Gender consideration during evacuation and rehabilitation, Utility of Civil Military Coordination Centre, Religious aid to motivate the affected people, Importance of maintaining Law & Order in the affected area to avoid human trafficking and other post-disaster crimes were shared by the participants.

Addressing the participants at the Valedictory Session, Minister of State (Independent Charge) of the Ministry of Development of North Eastern Region (DoNER), MoS PMO, Personnel, Public Grievances & Pensions, Atomic Energy and Space, Dr Jitendra Singh said that India has emerged as a frontline state for Disaster Risk Reduction (DRR). He said natural disasters know no manmade boundaries and hence countries will have to come together at global and regional levels. The Prime Minister Shri Narendra Modi's 10-point agenda on DRR could be the focal point to take us forward, he added.

Dr Jitendra Singh said India has pioneered the use of space applications and imaging in DRR and we have been able to reduce the loss of lives considerably. He said the Prime Minister himself personally micro-managed rescue and relief efforts during the 2014 Kashmir floods and also monitored the flood rescue and relief efforts in Assam, Bihar and

Gujarat this year.

Dr Jitendra Singh said such exercise provides a platform for sharing the best practices, methodology and response mechanism amongst the BIMSTEC member nations in the field of Disaster Management. He appreciated the commendable role played by NDRF as a lead Agency in conducting this First BIMSTEC DMEx- 2017 successfully. He emphasized the need of better coordination, cooperation and sharing of best practices for effective disaster management in the region. Forums like this are opportunities to share and learn from each other's experience, he added.

Shri Sanjay Kumar, Director General NDRF quoted that during the informal consultations at the BIMSTEC Leaders' Retreat held in Goa (India) on October 16, 2016, the leaders agreed to undertake BIMSTEC Annual Disaster Management Exercise. Further, during BIMSTEC senior officials' meeting in Kathmandu (Nepal) on Feb 7, 2017, India offered to host the first BIMSTEC Annual Disaster Management Exercise. Accordingly, the concept of first BIMSTEC DMEx was conceived and NDRF was entrusted to plan and conduct this first exercise as a lead agency. DG, NDRF thanked all the delegates and their team members for their active participation in the exercise & hoped that this Exercise would go a long way in formulating an effective disaster response mechanism among the BIMSTEC member nations. Further he added that it is very reassuring to be a witness to the progress made by all the countries in the region towards disaster preparedness in general and disaster response, in particular.

Shri Prashant Agrawal, Joint Secretary, MEA (BIMSTEC & SAARC) and Shri R K Jain, Member, National Disaster Management Authority (NDMA) also addressed during the valedictory session. They appreciated the active participation of rescue teams from all the BIMSTEC member countries and thanked organisers for successfully organizing of this mega event.

The four-day-long exercise was inaugurated by the Union Home Minister Shri Rajnath Singh on October 10, 2017.

All the delegates appreciated the efforts of Govt. of India and BIMSTEC Secretariat. The delegates were impressed by the efforts of NDRF in hosting this mega event.

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**“India invites all Nations to partner in the endeavour to harness Clean Energy and Save the Planet”, says Shri R.K. Singh**

**“India invites all Nations to partner in the endeavour to harness Clean Energy and Save the Planet”, says Shri R.K. Singh**

### **Power Minister chairs Curtain Raiser Ceremony for Global Renewable Energy Investors Meet and Expo (RE-Invest 2017) and Founding Ceremony of ISA**

Union Minister of State (IC) for Power and New and Renewable Energy (NRE), Shri R.K. Singh chaired a Curtain Raiser ceremony, held here today, to inform that the 2nd edition of the Global Renewable Energy (RE) Investors Meet and Expo (RE-INVEST 2017) will be held from 7th to 9th December, 2017 at the India Expo Centre, Greater Noida and National Capital Region of Delhi. A new website for RE-INVEST 2017 ([re-invest.in](http://re-invest.in)) was also launched on this occasion, in presence of French Ambassador to India, H.E. Mr. Alexandre Ziegler. France will be the partner country for the event. During the event, Minister for Infrastructure and Sustainable Development, Republic of Kiribati, H.E. Mr. Ruateki Tekaiarasi signed the Framework Agreement of International Solar Alliance (ISA) during the event. Kiribati becomes the 41st country to sign the agreement.

Addressing the gathering, Shri Singh noted that India's energy needs are going to double in the next 6-7 years at the present rate of growth of the economy. Nevertheless, India would continue to grow at a brisk pace and at the same time, decrease its carbon footprint so as to maintain its commitment towards giving the future generations a cleaner environment to live in. By 2030, 40% of India's energy needs would be met by Renewable Energy, the Minister added.

Addressing the august gathering of delegates from a number of foreign missions in India, Shri Singh said that India invites all Nations to partner in the endeavour to harness Clean Energy and Save the Planet. The Minister added that investing in Indian renewable energy sector not only helps in reduction of global carbon footprint but it is also a great business opportunity for all partner Nations, looking at the size of RE market in India. Shri Singh also assured the gathering that Government of India is committed to bring in policies to aid its partner countries to come and 'Make in India' in the RE sector.

Speaking during the event, Shri Anand Kumar, Secretary, MNRE, informed that RE-INVEST 2017 is likely to be inaugurated by the Prime Minister of India, Shri Narendra Modi. It has been envisioned as a global event where strategies for development and deployment of renewable energy will be deliberated upon. Heads of various Ministries of India and Heads of International Agencies like International Energy Agency, International Renewable Energy Agency and bilateral and multilateral financing institutions will be participating in these sessions. The event will also include Government to Government, Government to Business and Business to Business interactions.

Further, Shri Kumar said that activities in the RE-INVEST 2017 would include a series of seminars on different themes of renewables along with conferences and exhibition of manufacturers, project developers, investors and others in the renewable energy space.

to showcase manufacturing capabilities, latest technologies, financing options and investment opportunities. The new areas of interest for foreign investors would be electric mobility, electricity storage solutions and green corridors, Shri Kumar added.

Giving an overview of the sessions that would be taking place during the 3-day event, Shri Praveen Kumar, Additional Secretary, MNRE said that on the first day of the RE-INVEST, various Indian States will showcase their policy initiatives. There will also be a special session on India's energy basket by 2030. The second day will have technical sessions on innovative financing, electric mobility, electricity storage solutions, and hybrid renewables. These sessions will be addressed by the best of the international industry experts. In addition, special sessions have been planned on financing, regulatory regimes and on India's Solar Roof top programme. The International Renewable Energy Agency has planned two sessions. The Founding Ceremony of the ISA will also be held on the second day in New Delhi. The second day will also see inauguration of Indraprastha Energy Park.

The final day will start with ISA's Ministerial Plenary followed by roadmap to achieve ISA's Vision and Mission and a session on ISA Financing. Thereafter, country sessions with Australia, United Kingdom, France, USA and Germany have been planned. A Corporate Conclave has also been planned on the final day. This conclave will be attended by CEOs of Fortune 500 companies.

RE-INVEST 2017 will also provide a platform for reviewing the commitments made in RE-INVEST 2015 by industry, banks, manufacturers etc. The industry and developers had committed for 293 GW of renewables and against this, 39.3 GW capacity is commissioned/under implementation. As against the financial pledge of Rs 4 lakh crore by Banks, Rs 1.8 lakh crore have been sanctioned.

On the sidelines of the RE-INVEST 2017, the Founding Ceremony of the ISA and Solar Summit has been scheduled on 8th & 9th December, 2017. Prime Minister of India, H.E. President of France, and the Secretary General of United Nations are likely to grace the ISA Founding Ceremony. The Founding Ceremony will firmly establish the ISA and demonstrate our joint commitment to harness solar energy potential. All prospective member countries of the ISA have been invited to participate in these events.

Talking about the lead that India and France have taken to establish ISA and showing the World the path towards a Cleaner tomorrow, H.E. Mr. Alexandre Ziegler said that ISA is an inter-governmental body of 121 solar resource rich countries lying fully or partially between the tropics, was launched on 30th November, 2015 at Paris, France on the sidelines of the Paris Climate Conference. It has been conceived as an action-oriented organization and it brings together countries with rich solar potential to aggregate demand for solar energy globally, thereby reducing prices, facilitating the deployment of existing solar technologies at scale, and promoting collaborative solar R&D and capacity. Mr. Zeigler added that France is committed to support India in this endeavor and French companies are eager to invest in the Indian RE sector.

Shri UpendraTripathy, Interim DG, ISA informed that ISA has already started functioning as de-facto organization and the ISA Agreement has so far been signed by 40 countries and 10 of them have deposited instruments of ratification. Five more countries have confirmed ratification. Following the deposit and acceptance of the fifteenth instrument of ratification, the ISA Agreement will come into force and ISA will become a treaty-based organization. ISA is India's initiative with its headquarters at the campus of the National Institute for Solar Energy, Gurugram, Haryana.

India is strategically placed, with both the demand and supply of renewable energy co-existing in the country. Consequently, it provides ample opportunities for trade and investment. RE-INVEST2017 will provide ample opportunities to the Global renewable energy industry to forge new partnerships and contribute to India's renewable energy journey. Private sector has always played a key role in India's efforts to tap renewable energy. India permits un-interrupted foreign investment for renewable energy development and deployment.

Dignitaries present during the event included senior Diplomats/ Heads of Missions from various countries, industry stalwarts and senior officers from MNRE.

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**Pradhan Mantri Krishi Sinchai Yojana (PMKSY) has been started to provide a permanent solution from drought**

**Pradhan Mantri Krishi Sinchai Yojana (PMKSY) has been started to provide a permanent solution from drought**

**Government is investing Rs 50,000 crore for a period of five years to develop complete irrigation supply chain, water resources, distribution network and farm-level application solutions to achieve the target of providing water for every farm**

Agriculture and Farmers Welfare Minister Shri Radha Mohan Singh said the government started PMKSY to provide a permanent solution from drought. Three ministries are implementing this scheme in mission mode and the Ministry of Water Resources is leading the project. PMKSY aims not only to create irrigation sources but also to create protected irrigation by harnessing rainwater at micro level through 'Jal Sanchay' and 'Jal Sinchan'. He said it today at the concluding session of India Water Week-2017 organized at Vigyan Bhawan, New Delhi. The theme of the program at the concluding session was "Water and Energy for Inclusive Growth".

Shri Nitin Gadkari, Minister of Road Transport & Highways, Shipping and Water Resources, River Development & Ganga Rejuvenation,; Dr. Satyapal Singh, Minister of State in the Ministry of Human Resource Development and Minister of State in the Ministry of Water Resources, River Development and Ganga Rejuvenation; Shri Arujn Ram Meghwal Union Minister of State for Parliamentary Affairs and Water Resource, River Development & Ganga Rejuvenation, and Dr. Amarjit Singh, Secretary, Ministry of Water Resources, River Development & Ganga Rejuvenation, were present on the occasion.

The Minister said that India is home to 17% of the world population and 11.3% of the livestock population and only 4 percent of the world's water resources are in the country. In such a situation, we have an unprecedented challenge of providing water to such a large human and livestock population.

He said we have a total of 200.8 million hectares of agricultural land in the country out of which only 95.8 million hectares is irrigated, which is only 48 percent of the total. Therefore, it is a challenge to provide water to 52% of non-irrigated land and make it suitable for adoption of advanced farming. It's possible only through proper water management.

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He said that the government is investing Rs.50,000 crore for a period of five years (2015-16 to 2019-20) to develop complete irrigation supply chain, water resources, distribution network and farm-level application solutions to achieve the target of water for every farm.

He said that for the year 2015-16, Rs 555.5 crore has been released for drought mitigation and district irrigation scheme. Under this, Rs.175 crore has been allocated for the material for construction of water harvesting structures under MNREGA and Rs.259 crore was allocated to the states for water recharge, drought mitigation and micro-water storage construction in 219 drought-affected districts and 1071 highly drugged blocks identified by the Central Ground Water Board.

In the year 2016-17, Rs.520.90 crore was released for drought mitigation measures. So far, 56,226 water harvesting structures, 1,13,976 hectare irrigation capacity and 675 district irrigation schemes have been prepared.

He informed that the Ministry of Agriculture has been given the responsibility of implementing Per Drop More Crop scheme. During the Financial Year 2011-14, Rs. 3699.45 crore was distributed to the states for micro-irrigation and 16.14 lakh hectare area was brought under micro-irrigation. While Rs.4509 crore was released during 2014-17 and a total of 18.38 lakh hectare area has been brought under micro-irrigation, which is the highest area so far.

He said that during the year 2016-17, Rs1991.17 crores was allocated for Per Drop More Crop under PMKSY which is 28% more than the Rs1,556.73 crore allocated in the year 2015-16. In 2015-16, 5.7 lakh hectare area was brought under micro-irrigation, while 8.39 lakh hectare area was brought under micro irrigation during 2016-17, which is the highest so far. The Minister said Rs.3400 crore has been distributed for Per Drop More Crop scheme for the year 2017-18, and till September Rs1601.40 crore has been released. The target is to bring 12 lakh hectare area under micro-irrigation during 2017-18.

PMKSY Scheme is being implemented in the mission mode with the help of Command Area Development to complete 99 major and medium irrigation projects covering 76.03 lakh hectares in a phased manner till December 2019.

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**RAPID PROGRESS IN MICRO IRRIGATION SAYS RADHA MOHAN INDIA WATER WEEK – 2017 CONCLUDES****RAPID PROGRESS IN MICRO IRRIGATION SAYS RADHA MOHAN INDIA WATER WEEK – 2017 CONCLUDES**

The five day India water week (IWW) - 2017 concluded in New Delhi today with a call for efficient management of available water resources in the country by Union Agriculture and Farmers' Welfare Minister Shri Radha Mohan Singh. Addressing the valedictory session of IWW the Minister said that the present NDA government has achieved unparalleled success in the field of micro irrigation. Shri Singh said eight lakh hect. of land was brought under micro irrigation during 2016-17. The target for 2017-18 is 12 lakh hect. Referring to Pradhan Mantri Krishi Sinchayi Yojana the Minister said out of the 99 projects 23 are on the verge of completion. He informed that another 32 PMKSY project will be completed by March next year and the remaining by 2019. The Union Agriculture Minister also underlined the need for removing encroachments from Water bodies all over the country to preserve the water resources for posterity.

Union Minister of State for Water Resources, River Development and Ganga Rejuvenation Shri Arjun Ram Meghwal said that first of all it is necessary to know the importance of water and its qualities for mankind. Shri Meghwal said it is our responsibility to preserve this precious natural resources for future generations. Referring to the various recommendations of IWW- 2017 the Minister said it is our responsibility to implement these recommendations. He said "Water is not being used but misused. We have to stop this".

Giving an overview of the deliberations, Dr Amarjit Singh, Secretary, Ministry of Water Resources, River Development and Ganga Rejuvenation said that Union Ministries like Agricultural and Water Resources can jointly work for proper water resources management of the country. He said that about 1300 delegates including 50 delegates from 14 countries attended the five day event. About 150 papers were presented and 17 technical seminars and 14 panel discussion were held during IWW – 2017.

A mobile app prepared by Central Water Commission containing various information about water resources of the country was also launched on the occasion.

The IWW- 2017 was inaugurated by President Shri Ram Nath Kovind on October 10, 2017. The theme of IWW – 2017 was "Water and Energy for Inclusive Growth". The

event had detailed discussions on Water, Food and Energy Security – Essential requirement for sustainable development, Water for inclusive Growth, Sustainable energy development – Key for all round economic growth and Water and Society.

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## Casualties increase as humans, jumbos cross paths

Vanishing boundaries: Experts say there is an urgent need for long term mitigation plans to contain human-elephant conflict. Special arrangement

Thirty-two people have been killed by wild elephants in West Bengal in the past six months, between April and September 2017. While these figures indicate a decline in the trend of human-elephant conflict for the year 2017-18 when compared with earlier years, the State is still grappling with this jumbo problem.

In a reply to a question raised by Rajya Sabha member N.L. Panchariya, the Ministry of Environment, Forest and Climate Change on March 20, 2017, presented figures which made it clear that West Bengal recorded the highest human deaths in attacks by elephants in 2014-15 and 2015-16.

During the year 2016-17, 84 people died in elephant attacks, while the number of human deaths in 2015-16 was as high as 112.

West Bengal Forest Minister Binay Krishna Barman said that a drop in human deaths between April to September 2017 is a result of a number of steps taken by the State government. On October 13, 2017, Mr. Barman launched four special vehicles named Airawat for tackling human-wild conflict in north Bengal. Four such vehicles, with facilities for tranquillising animals and tracking their movement, are already working in south Bengal.

Raman Sukumar, Bangaluru-based elephant expert and Professor at the Centre for Ecological Sciences, Indian Institute of Science (IISc), said that, till the 1980s, there was no elephant population in south Bengal, except in a few border areas.

### **Not a natural habitat**

The problem arose with the increase in the elephant population, and conflict mitigation became more challenging, particularly in south Bengal. He added that the fragmented forests of south Bengal are not a natural habitat for elephants.

S. Kulandaivel, Chief Conservator of Forests-West Bengal, said that in south Bengal, elephant herds have changed their food habits and now survive on agricultural crops, juicy vegetables and fruit crops. Among a number of initiatives that the State Forest Department has taken to mitigate the conflict, Mr. Kulandaivel lists planting trees like bamboo and sal in the forests of south Bengal as elephant fodder.

### **Monitoring movement**

The State Forest Department has also set up an Elephant Movement Coordination Committee (EMCC), where updates on the movement of elephant herds are given via bulk SMS alerts.

The data of the State Forest Department reflects some success in districts like Bankura, where 35 human deaths were recorded 2015-16, 13 human deaths in 2016-17, and three human deaths in the first six months of 2017-18.

The latest figures provide some hope to forest officials in south Bengal, where, from 71 human deaths in 2015-16 and 36 human deaths in 2016-17, the number has come down to 10 human deaths in the first six months of 2017-18.

The situation in north Bengal, however, remains unchanged with 41 human deaths in 2015-16, 47 human deaths in 2016-17, and 22 human deaths in the first six months of 2017-18.

“We are hopeful that we can take this success forward. Moreover, the State Forest department has placed a lot of emphasis on sensitising people over the past few years, and now people have become more aware of how to deal with elephants who stray away from herds,” Mr. Kulandaivel said.

However, experts like Mr. Sukumar, who have been working closely with State Forest Department and have suggested steps to manage the elephant population in south Bengal, said that there is an urgent need for long-term mitigation plans to contain human-elephant conflict.

“I am happy with the outcome but we should not be under any illusion as the elephant population is increasing in West Bengal. If the elephant population continues to rise, we have to try other forms of management like contraception, and capture and relocation of elephants to other States,” he said.

West Bengal recorded 682 elephants in the 2017 census.

The number of human-elephant conflicts here is much higher than in States like Karnataka, which has 6,049 elephants in the 2017 census, almost ten times the number of elephants in West Bengal.

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## All hype on energy

Reform, reform and more reform. That was the message of the first ever CERAWEEK, India Energy Forum held in New Delhi last week. Curated by the renowned energy scholar and Pulitzer winning writer, Daniel Yergin, CERAWEEK is the most sought after event in the energy circuit. This year it moved out of the US for the first time, thanks to Union minister of petroleum and natural gas [Dharmendra Pradhan](#)'s efforts to showcase India's changing energy scenario to the world. Pradhan made himself available for all three days of the summit.

There was a lot to learn at the summit where virtually everyone who counts in the energy sector marked her presence. Saudi Aramco, the world's largest energy group, announced the launch of its India operations.

However, the hospitality didn't exactly enthuse the summit's participants. Though no one criticised the Indian government's lackadaisical approach towards energy upfront, every delegate underlined the fact that India has become the third largest importer of hydrocarbons leaving Japan behind. To quote OPEC secretary general, Mohammed Sanusi Barkindo, "India's oil demand will shoot up by 150 per cent in the next decade". Pradhan too admitted that oil is here to stay for the next "40-50 years at least".

This brought to the fore the discord in the government on the issue of oil vs gas. A few days ago, Union minister of road transport and highways, [Nitin Gadkari](#), had asked India's automakers to switch to electric vehicles or "get bulldozed". The global energy forum, however, wasn't impressed. For, India is yet to provide electricity to all its households. It doesn't have enough electricity and is not spending enough on R&D, unlike China which has an annual budget of \$ 80 billion for the development of electric vehicles (EV).

The energy forum was eager to know what India has done to encourage the use of clean fuel - the idea being to encourage the use of natural gas to replace the more polluting traditional fuels such as diesel and petrol. Noted economist Vijay Kelkar - one of the special invitees - had, in the late 1990s, proposed deregulation of gas prices and getting rid of the administered price mechanism. Even 20 years later, delegates were informed that reforms in the gas sector were a work-in-progress. Natural gas is sold in India on the basis of a government-mandated formula which links local prices to rates in gas-surplus nations. However, most long-term contracts for gas imports are linked or indexed to oil. This archaic system - that doesn't allow market determined price - has become a big disincentive. The government does admit that the absence of a modern system like a gas trading hub is negatively impacting the sector. But it is yet to take steps to create one.

No clear roadmap for gasification of India's economy along with the lack of ways to get rid of oil, makes the issue of oil rates all the more important. The steep fall in oil prices, from \$110 a barrel in 2014 to \$ 29/barrel, helped India wipe out almost its entire current account deficit.

A number of experts noted that crude prices will continue to be subdued in the next year. However, they will march northwards in or around 2019 - which incidentally is the year of the general election. The good news is oil will probably never touch the \$100 mark. But the not-so-good news is that prices will be in the range of \$75 to \$80 per barrel - that could throw India's fiscal plans out of gear.

India has been slow in laying the national gas grid. A number of regulatory issues - from land acquisition to tariff - prevent the private sector from investing in India. Will the government live up to the hype it has created with its pro-business agenda? So far it has failed to instil confidence in the business community, both domestic and international.

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## Toxic farming: on insecticide regulation

Reports of [farmers dying from pesticide exposure](#) in Maharashtra's cotton belt in Yavatmal make it evident that the government's efforts to regulate toxic chemicals used in agriculture have miserably failed. It is natural for cotton growers under pressure to protect their investments to rely on greater volumes of insecticides in the face of severe pest attacks. It appears many of them have suffered high levels of exposure to the poisons, leading to their death. The fact that they had to rely mainly on the advice of unscrupulous agents and commercial outlets for pesticides, rather than on agricultural extension officers, shows gross irresponsibility on the part of the government. But the problem runs deeper. The system of regulation of insecticides in India is obsolete, and even the feeble efforts at reform initiated by the UPA government have fallen by the wayside. A new [Pesticides Management Bill](#) introduced in 2008 was studied by the Parliamentary Standing Committee, but it is still pending. At the same time, there is worrying evidence that a large quantum of pesticides sold to farmers today is spurious, and such fakes are enjoying a higher growth rate than the genuine products. Clearly, there is a need for a high-level inquiry into the nature of pesticides used across the country, and the failure of the regulatory system. This should be similar to the 2003 Joint Parliamentary Committee that looked into harmful chemical residues in beverages and recommended the setting of tolerance limits.

It is incongruous that the Centre has failed to grasp the need for reform in the regulation of pesticides, when it is focussed on growth in both agricultural production and exports. Agricultural products from India, including fruits and vegetables, have been subjected to import restrictions internationally for failing to comply with safety norms. It is imperative that a Central Pesticides Board be formed to advise on use and disposal of pesticides on sound lines, as envisaged under the law proposed in 2008. This will strengthen oversight of registration, distribution and sale of toxic chemicals. There can be no delay in updating the outmoded Insecticides Act of 1968. A stronger law will eliminate the weaknesses in the current rules that govern enforcement and introduce penalties where there are none. Aligning the new pesticides regulatory framework with food safety laws and products used in health care will make it broad-based. After the recent deaths, Maharashtra officials have hinted at the loss of efficacy of some hybrids of genetically modified cotton in warding off pests to explain the growth and intensity of pesticide use. The responsible course would be to make a proper assessment of the causes. It is also an irony that the Centre has failed to use its vast communication infrastructure, including DD Kisan, the satellite television channel from Doordarshan dedicated to agriculture, to address distressed farmers. A forward-looking farm policy would minimise the use of toxic chemicals, and encourage organic methods where they are efficacious. This will benefit both farmer and consumer.

Rajasthan's ordinance shields the corrupt, threatens the media and whistle-blowers

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## Melting ice making Greenland sea less saline

Melting ice is causing coastal waters in Greenland to become less saline, which may in turn affect marine life as well as the global ocean currents that keep Europe warm, a study warns.

For the first time, scientists from Aarhus University in Denmark have unveiled the long-term impact of the melting of the Greenland ice sheet.

### Impact on fjords

The observed increase in freshwater content will affect the conditions in all Greenland fjords, researchers pointed out.

Over the years, the dramatic meltdown of ice in the Arctic Ocean has received great attention and is easy to observe through satellite images.

Also, glaciers have been observed to melt and retreat and the researchers know that today's meltdown of the Greenland ice sheet has more than doubled compared with the period 1983-2003.

How the increased influx of fresh water will affect the marine environment is, however, largely unknown.

### Clear tale

Now, unique annual measurements made within the framework of the 'Greenland Ecosystem Monitoring Program' since 2003 in northeast Greenland tell a clear tale — fresh water from the ice sheet accumulates in the surface layers of the surrounding sea and flows into the Greenland fjords.

Measurements show that the surface water layers became up to 1.5 per mill less saline. This equivalent to an increase in freshwater content from about one metre in 2003 to almost four metres in 2015.

Jaggi Vasudev's Rally for Rivers claims they will, but this is not based on the most nuanced science

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## Time for auto industry to go all electric

A steady momentum has been building up in India on the clean and renewable energy front. The government has been working to effect a radical shift in our energy production and consumption patterns to reduce dependence on fossil fuels. According to last year's National Electricity Plan (NEP3) forecast, India will achieve, ahead of schedule, the target of renewable energy being 40% of total power production by 2030, declared at the Paris Climate Change Conference in 2015.

To reinforce its commitments, the government intends that all vehicles sold in India by 2030 should be electric. A recently released NITI Aayog report on mobility transformation outlines a feasible and phased approach to achieve this goal. Developed in partnership with the Rocky Mountain Institute, it presents the government's vision of a shared, electric and connected mobility paradigm where mobility is a service based on an electric vehicle (EV) fleet, enabled by the convergence of low-cost technologies, smart designs, business model innovation and supportive policies.

The government is leading by example, committing to go all electric for government-use vehicles. The Central government is calling global tenders for the first 10,000 electric cars, of which a pilot phase of 500 cars has already been awarded to Tata Motors Ltd and Mahindra & Mahindra. Among the states, the Karnataka government has taken the lead in formulating India's first comprehensive EV policy, supporting a complete ecosystem from manufacturing to deployment of charging stations.

EVs for private use have not been very popular in our country owing to range anxiety, high capital cost and long charging time, despite the obvious benefits of very low running costs and zero emission. Coming to public transport, despite a sharp increase in private vehicle ownership over the last decade, India still relies heavily on public transport. The government plans to make public transport more economical and environment-friendly by promoting electric buses. However, the current generation of electric buses with traditional battery technology are prohibitively expensive at four to five times the cost of a diesel bus. Given these challenges, how do we accelerate the adoption of EVs?

"Battery swapping" is the way forward to make EVs affordable and accessible to all. To help bring down the capital cost of electric buses, experts are recommending two things among the various solutions being looked at—reducing the battery size and adopting "swappable" battery technology, thereby bringing down the upfront capital cost while reducing the operational cost and charging time. The Indian auto industry is actively working in this direction as it helps state public transport agencies to induct electric bus fleets without incurring too much additional expenditure.

Coming to smaller EVs, the popularity of shared mobility services like Ola and Uber shows that people living in congested urban centres are not keen on using their own vehicles to commute. Electric cars with swappable batteries make a compelling business case for shared mobility operators, both for upfront capital cost and operational expenses. In fact, the economies of EVs are such that there is a better return for high-mileage use, making them better suited for shared mobility services.

The government is putting together a standardization programme for charging stations and swappable batteries. The standardization process can allow manufacturers to have standard products and protocols which will allow mobility service providers to buy multiple platforms (cars and buses) of vehicles with standardized energy sources and charging infrastructure.

The government's agenda also focuses on developing an ecosystem to support the EV industry,

which will enable various stakeholders to stay connected, enabling a high-functioning, EV-driven public transport system. For example, an electric bus heading for the last stop can signal EV taxis in the area about how many passengers it will be offloading. This ensures optimum onward journey options for the disembarking passengers. Or EVs can communicate with refuelling stations about battery requirements, so there is never a danger of getting stranded. These connected vehicles are also a necessary step towards the inevitable progression to autonomous vehicles. Furthermore, a well-connected EV ecosystem helps develop effective and real-time Big Data analysis for continuous integration and improvement. As states invest in smart city development, they must incorporate the infrastructure necessary to help make the EV vision a reality. A convenient network of recharging and battery-swapping stations, bus depots that provide charging points and batteries for swapping, will bring about changes to benefit the nation economically and environmentally.

The auto industry has been growing at a steady pace and India is now becoming an export hub for small and medium-sized cars. This leaves the auto industry well-placed to go all out on electric, especially with policies that enable an entrepreneurial environment and promote a level playing field. This is an opportune time for the auto industry to embrace the government's EV push and collaborate with technology and mobility solution providers to capitalize on this opportunity. It will hugely benefit the nation, economically and environmentally, if the auto industry moves quickly to adapt to this inevitable disruption and reap the rewards.

*R.K. Misra is a non-resident scholar at Carnegie India.*

*Comments are welcome at [theirview@livemint.com](mailto:theirview@livemint.com)*

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## All hype on energy

Reform, reform and more reform. That was the message of the first ever CERAWEEK, India Energy Forum held in New Delhi last week. Curated by the renowned energy scholar and Pulitzer winning writer, Daniel Yergin, CERAWEEK is the most sought after event in the energy circuit. This year it moved out of the US for the first time, thanks to Union minister of petroleum and natural gas [Dharmendra Pradhan](#)'s efforts to showcase India's changing energy scenario to the world. Pradhan made himself available for all three days of the summit.

There was a lot to learn at the summit where virtually everyone who counts in the energy sector marked her presence. Saudi Aramco, the world's largest energy group, announced the launch of its India operations.

However, the hospitality didn't exactly enthuse the summit's participants. Though no one criticised the Indian government's lackadaisical approach towards energy upfront, every delegate underlined the fact that India has become the third largest importer of hydrocarbons leaving Japan behind. To quote OPEC secretary general, Mohammed Sanusi Barkindo, "India's oil demand will shoot up by 150 per cent in the next decade". Pradhan too admitted that oil is here to stay for the next "40-50 years at least".

This brought to the fore the discord in the government on the issue of oil vs gas. A few days ago, Union minister of road transport and highways, [Nitin Gadkari](#), had asked India's automakers to switch to electric vehicles or "get bulldozed". The global energy forum, however, wasn't impressed. For, India is yet to provide electricity to all its households. It doesn't have enough electricity and is not spending enough on R&D, unlike China which has an annual budget of \$ 80 billion for the development of electric vehicles (EV).

The energy forum was eager to know what India has done to encourage the use of clean fuel - the idea being to encourage the use of natural gas to replace the more polluting traditional fuels such as diesel and petrol. Noted economist Vijay Kelkar - one of the special invitees - had, in the late 1990s, proposed deregulation of gas prices and getting rid of the administered price mechanism. Even 20 years later, delegates were informed that reforms in the gas sector were a work-in-progress. Natural gas is sold in India on the basis of a government-mandated formula which links local prices to rates in gas-surplus nations. However, most long-term contracts for gas imports are linked or indexed to oil. This archaic system - that doesn't allow market determined price - has become a big disincentive. The government does admit that the absence of a modern system like a gas trading hub is negatively impacting the sector. But it is yet to take steps to create one.

No clear roadmap for gasification of India's economy along with the lack of ways to get rid of oil, makes the issue of oil rates all the more important. The steep fall in oil prices, from \$110 a barrel in 2014 to \$ 29/barrel, helped India wipe out almost its entire current account deficit.

A number of experts noted that crude prices will continue to be subdued in the next year. However, they will march northwards in or around 2019 - which incidentally is the year of the general election. The good news is oil will probably never touch the \$100 mark. But the not-so-good news is that prices will be in the range of \$75 to \$80 per barrel - that could throw India's fiscal plans out of gear.

India has been slow in laying the national gas grid. A number of regulatory issues - from land acquisition to tariff - prevent the private sector from investing in India. Will the government live up to the hype it has created with its pro-business agenda? So far it has failed to instil confidence in the business community, both domestic and international.

END

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## Why illegal wildlife trade flourishes in India

[India's forests and wildlife have been under threat](#) for a while not just from mindless development but also the illegal trade in flora and fauna. [Last week, a notorious wildlife trafficker with international links](#), who was involved in smuggling the body parts of 125 tigers and 1,200 leopards, was convicted by a Madhya Pradesh court along with four other traffickers and awarded four years rigorous imprisonment. For the crime he has committed, four years in jail is disproportionately small.

### HOW STRONG IS INDIA'S LEGAL FRAMEWORK

This is not to say that India doesn't have a strong legal and policy framework to regulate and restrict the wildlife trade. Trade in over 1,800 species of wild animals, plants and their derivatives, is prohibited under the Wildlife (Protection) Act, 1972.

Yet illegal wild animal trade takes place all over the country.

Porous international land borders and a constrained enforcement exacerbate the situation. Native and non-native species are being brought into illegal trafficking and this threatens biodiversity and conservation in the wild.

A WWF-India document lists all that is illegally traded: From bird eggs to marmosets, and a moth to tiger, a large number of wildlife species bear price tags put on them by poachers and illegal traffickers.

India is also a member of the CITES (Convention on International Trade in Endangered Species of Fauna and Flora) since 1976. CITES is an international agreement between governments that aims to ensure that the international trade in specimens of wild animals and plants does not threaten their survival. CITES works by subjecting international trade in specimens of selected species listed on Appendices to certain controls.

### WHAT INDIA NEEDS TO DO TO CURB WILDLIFE TRADE

But arrests such as the one made in [Madhya Pradesh shows India has a long way to go if it has to curb such illegal trade](#).

In India like many other countries, the problem is not of the laws but that these may be poorly communicated and poorly implemented and enforced.

Often, positive efforts to address wildlife trade concerns are undermined by lack of political will and governance failures.

Without political backing, disincentives for over-exploitation and illegal trade, such as penalties for legal infringements, are all too often weak.

According to WWF-India, there is an urgent need for knowledge and action to bring the legal wildlife trade within sustainable levels and stop all illegal trade that has threatened and even pushed many species towards extinction.

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## The right to breathe

Air quality readings in Delhi are extremely poor, once again, at this time of the year. And with the government gearing up for a graded response, all debate over the Supreme Court ban on firecrackers in the Delhi-NCR region can be put to rest. In November 2016, Delhi witnessed a public health emergency with the air pollution hitting perilous levels and smog covering the city. Given that the situation repeats itself year after year, it was expected that the judgment would be welcomed by citizens from all walks of life.

However, despite the international media hailing the judgment, it was puzzling to note the response from certain quarters at home. Some of us are worried about the commercial interests of traders and the firecrackers that will probably lie unsold. In the process, we choose to feign ignorance to the menace of air pollution and care little about the deadly chemicals that harm us. We do not mind a trade-off between public health and profit. And, to add fuel to fire, our opinion leaders and intellectuals provoke strong reactions among the masses with tweets. Yes, the apex court's ban on firecrackers may hurt the interests of the traders in the short run. But then, clean air is a basic human right. It is too naïve to assume that "nothing can happen to me". Air is a great equaliser. It treats everyone the same - the rich and poor alike.

It is absurd on the part of a few to give the SC order a communal twist and claim that Hindus are being targeted. Fireworks are said to have originated in China. The use of firecrackers spread to other cultures down the centuries to add thrill and glamour to celebrations. Stuffed with potassium nitrate (75 per cent), carbon (15 per cent) and sulphur (10 per cent), firecrackers have nothing to do with Hindu faith and are only a thoughtless excess. Diwali firecrackers produce extremely high levels of PM 2.5 (fine particulate matter with a diameter of 2.5 microns or less) over a short period of time, especially in the breathing zone (within a three-foot radius of the lit firework). PM 2.5 enters the blood stream through the lungs and cannot be filtered out. They act as silent killers causing cancer, respiratory and cardiovascular diseases.

Diwali is a festival of lights, not of raging fire and noxious fumes. Spiritually, it signifies the victory of light over darkness, good over evil, knowledge over ignorance, and hope over despair. Waking up to the chilling impact of lethal air pollution and protecting the city from poisonous fumes to make life safer is more in sync with the spirit of Diwali. The concept and projection of Diwali in our country is often misconstrued. Generations have grown up reading textbooks with images of children playing with firecrackers, thus correlating firecrackers with Diwali celebrations. School books need to be edited and the youngsters need to learn to de-link Diwali from firecrackers. Their course materials must teach them about the outcome of bursting firecrackers.

Air pollution is an inescapable horror for the residents of Delhi with children being most vulnerable. The haze that permeates the city after sundown is a lethal blend of toxic fumes that blacken our lungs like that of the smokers and cling to the tissue like slime. By now, a lot of damage has already been done. Delhi is silently suffering from a severe paediatric respiratory crisis with children suffering from irreversible lung damage. Half of Delhi's schoolchildren will never recover full lung capacity, surveys reveal. Its deathly air has led to generations with choked lungs, weak hearts and a failing immune system. Recently, a team of Delhi's topmost doctors appeared on a TV channel to recount the horrors of pollution in Delhi. One specialist stated that he has seen the change in colour of lungs of people over the last 25 years, turning from pink to blackish, even for non-smokers, due to the toxins being deposited constantly in the lungs.

Among the megacities, Delhi is among those with the poorest air quality, according to a World Health Organisation report. The New York Times' South Asia correspondent, Gardiner Harris, bid farewell to Delhi after completing his assignment in 2015 with an article that lashed out at the city's

breath of death - its poisonous air. His decision to leave India because of Delhi's air pollution raised global concern about the hazardous ambience of the National Capital Region. To contend with the poor air quality, embassies and international businesses in Delhi considered reducing staff tenures, advised staff to reconsider bringing their children to Delhi and provided high-end air purifiers.

As an aspiring global super power, India needs to showcase its capital by meeting international standards on pollution control, and adhering to the quality of living index etc. While trying to project itself as the world's manufacturing hub and seeking foreign investment, the country needs to walk the talk and attain global standards. Delhi needs to be safe and inviting for the global community. It cannot afford to be wrapped up in smoke and haze, blurring the cityscape and fogging its future. Hence, the residents of Delhi from all walks of life should have welcomed the SC order. The government and NGOs should have come forward to create awareness among the people about the order. We need more organisations like the Indian Nature Society, educating the masses against the ill effects of air pollution. Cleaning the air does not feature in the election manifestoes of political parties and it is time they got together on this critical issue.

Delhi has managed to clean up its air before. At the turn of the century, polluting industries were made to leave the city. Coal-burning power plants were shut down. A historic Supreme Court judgment in 1998 - compelling all public transport vehicles to run on CNG - had reduced levels of Respirable Suspended Particulate Matter (RSPM) significantly. From a high of 409  $\mu\text{g}/\text{m}^3$  in 1995, it came down to 191  $\mu\text{g}/\text{m}^3$  in 2000 and fell further to 161  $\mu\text{g}/\text{m}^3$  in 2007. But a decade later, the air quality has slipped and we have lost the gains of the first generation action.

It is only the day after Diwali, when we wake up to a smoky dawn with our eyes burning, our breath choked, our kids coughing and the sick gasping for breath, do we realise the devastating impact of fireworks on the environment. But then, the harm is done. For days the smog does not leave the city due to slow wind speed. So the complete ban of the apex court on the sale of firecrackers is a necessary first step to initiate the much-needed attitudinal changes among people.

No campaign for a clean Delhi can be a success without community participation. If we were sensible enough, it would not have been needful for the apex court to step in to give us the last minute resuscitation. The right to breathe clean air is fundamental. Considering the health hazards caused by the cracker fumes, fireworks ought to be boycotted all across the land for all time to come.

**END**

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## India must detoxify its poisoned farmlands

Last week, the [Maharashtra government registered a police complaint](#) against three pesticide companies and Krishi Seva Kendras (agro-input centres) for selling pesticides not recommended for the region after 32 farmers from Vidarbha died of poisoning. The agriculture department, which is responsible for educating farmers about pesticides, found highly toxic and expensive ones were being sold to unsuspecting farmers by the firms to earn profits. While the deaths indicate failure of the department itself, the genesis of the crisis dates back to the time of the Green Revolution in the 1960s when the need was felt to sharply increase crop productivity to ensure food security. This problem --- increase in the use of pesticides --- is not an India-specific problem: Since 1950, population has doubled, yet the area of arable land used to feed these people has increased by only 10%. There are huge pressures to provide food, at low cost, on land that is becoming more and more degraded as nutrients are stripped from the soil. Naturally, farmers started to rely on external inputs – fertilisers and pesticides for short-term solution for large-scale commercially intensive agricultural systems, says a [report by Greenpeace](#).

### PESTICIDES IN OUR ENVIRONMENT

This over-reliance has led to several problems: Many of these chemicals have become extremely pervasive in our environment as a result of their widespread repeated use and, in some cases, their environmental persistence. The report adds that some take an extremely long time to degrade, such that even those banned decades ago, including DDT and its secondary products, are routinely found in the environment today. What's important to understand here is that it is not just farmers and pesticide applicators are at risk from pesticide use: When women are exposed to pesticides during pregnancy, some of these chemicals pass directly to the child in the womb. During development, the foetus is particularly vulnerable to the toxic impacts of pesticides. Young children, in general, are more susceptible than adults due to their increased exposure rates, in that toddlers and crawling babies are more likely to touch surfaces in the home and put their hands in their mouths. Medical management of pesticide poisoning is difficult because there is little evidence with which to determine the best strategies for treatment and there is often an intermittent supply of antidotes, say experts.

### WE MUST DETOX OUR FARMLANDS

The only sure-shot approach to reduce exposure to toxic pesticides is through a move towards a more long-term and sustainable approach to producing food. This will require legally-binding agreements to immediately phase-out all pesticides that are toxic to non-target organisms implemented at both national and international level. It will not be easy to achieve this but it's worth giving a strong push --- a similar one that is happening in the case of air pollution --- for a healthier tomorrow.

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## Indian cities must become 'sponge cities' to tackle urban flooding

Urban flooding has become a recurrent feature in Indian metros. If it was Mumbai yesterday, it is Bangalore today. It is true that this year has been the IT hub's wettest year in at least 115 years, but that's not the only cause for the collapse of Bangalore. The reason for such mayhem is along with crumbling infrastructure and drainage system, there is no long-term vision on how to tackle such climate challenges. This lack of a proper plan is criminal neglect on the part of the State since the intensity and frequency of these events have been increasing. In the last couple of years, Mumbai, Ahmedabad, Chandigarh and Chennai have faced the same challenge.

One of the key reasons why cities are collapsing due to natural calamities is because we have gone against the natural systems. While natural systems retain water, concrete structures tend to waste it. So when we build cities, we tend to build on wetlands and ponds, which actually have the ability to soak in extra water. But experts point out that the solution to such urban flooding is to mimic nature, by making cities act as a sponge or becoming "sponge cities".

Take for example, Berlin. The city's Rummelsburg neighbourhood is investing hugely on green roofs with swales (a low or hollow place), urban wetlands, gardens and parks, and permeable pavements to soak in the extra water and also keep the city cool. According to Mother Nature Network, China too is investing in their growing cities in this way, and test projects show that keeping rainwater local works. They have set an ambitious goal that began in 2015. By 2020, the government has decreed that 80% of 16 urban areas should absorb and be able to use at least 70% of rainwater, and they're even teaching the concept in elementary schools. So far, they've spent about \$12 billion.

This regular collapse of the city must worry India since we are urbanising and moving from an agrarian economy to a GDP dependent mainly on industries and services that operate from urban India.

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## A flood of questions

The National Democratic Alliance government is all set to begin work on an estimated \$87 billion plan to connect around 60 of India's largest rivers; this includes the Ganga. Once complete, it is expected to help end farmers' dependence on fickle monsoon rains, bring millions of hectares of cultivable land under irrigation and help generate thousands of megawatts of electricity.

The river-linking plan was first proposed in 2002 by the Atal Bihari Vajpayee-led NDA government. However, it was stalled as States failed to end differences over water sharing contracts and clearances. This government has been able to push through clearances for the first phase of the project. Work is now set to link the Betwa and Ken rivers which pass through Uttar Pradesh and Madhya Pradesh, States ruled by the Bharatiya Janata Party.

Several issues should be sorted out first before billions of rupees are spent on a project like this. Water is listed as entry 17 in List II of the Seventh Schedule of the Constitution. While the government has initiated discussions to bring the subject under the concurrent list, it may not be an easy task to achieve. Also, if there are changes in the political dispensation in various States, the government in a State that is upstream, for example, may refuse to share water with downstream States. When there has been a deficient monsoon, we have seen conflicts arise among States over water access. Thus, without having a full-fledged architecture to solve disputes, it would not be prudent to embark on a mammoth project like this.

Second, India is technically poor with respect to data related to the water sector. Unlike other countries, the Central Statistics Office has neither attempted nor funded studies to gather data on water tables at an all-India or State level. Many water stressed countries produce these on a regular basis at a regional level and link them to national accounts statistics. Basically, 'water resource accounts provide an accounting framework that enables the integration of specialised physical resource sector data with other information on the economics of water supply and use in a structure that is consistent with the way data on economic activities are organised in the system of national accounts. In addition to facilitating the integration and sharing of a more comprehensive knowledge base, the natural resource accounting framework provides the basis for evaluating the consistency between the objectives and priorities of water resource management and broader goals of economic development planning and policy at a national and local scale. This in turn improves communication between various agencies generating and using information about water for various purposes and contributes to better coordination, packaging and analyses of such information that are more relevant to the needs of water managers and policy-makers'. The advantage of such an account is that it makes it possible to capture direct, indirect and induced water demand in the process of economic production. Since indirect and induced water demands are typically higher/closer to direct demand, it is essential to include them in combination with water supply table data while estimating the water balance situation in a region.

Fourth, the government should pay more attention to its 'more crop per drop' mission, to what extent Indian agriculture follows this practice and whether water-stressed regions are water exporters due to the crops they cultivate. However, there is a dearth of studies in the Indian context — unlike other countries — addressing the gap by first analysing water flows embodied (virtual/hidden) in agriculture products moving between the States to create knowledge on the

flows. The absence of a well-informed water policy reflects a knowledge governance gap. A recent study (Katyaini and Barua, 2016) on virtual water (VW) flow assessment in respect of foodgrains indicates that though the north zone is highly water scarce, it is a net VW exporter to the highly water scarce west and south, which are net VW importers. Among the north zone States, Punjab has the highest water losses, while Maharashtra (west) and Tamil Nadu (south) the highest water savings in 1996–2005 and 2005–2014, respectively. Therefore, at a subnational scale, VW flows are not consistent with relative water scarcity. This finding is also crucial as it emphasises the need to carry out a subnational VW flow assessment. Such analysis for all the major crops at subnational levels is a must for efficient planning of a scarce resource such as water.

There is much to be done before embarking on a gigantic project of river linking.

*Sanjib Pohit is Senior Fellow, NCAER. The views expressed are personal*

The new U.S. Fed Chairman is unlikely to opt for policies that might upset the President's plan

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## Most pollution-linked deaths occur in India

Nearly 25% of all deaths in India in 2015 were caused by pollution

With 2.51 million deaths in 2015, India has been ranked No. 1 in pollution related deaths, according to a report by The Lancet Commission on pollution and health. China recorded the second highest number of such deaths (1.8 million). India accounted for about 28 per cent of an estimated nine million pollution linked deaths worldwide in 2015.

The Lancet Commission on pollution and health is a two-year project in which more than 40 international health and environmental authors led by environmental scientist Philip Landrigan were involved.

Air quality nosedives despite a quieter Deepavali

At 6.5 million premature deaths globally, [air pollution](#) was the leading cause of deaths in 2015. Among the world's 10 most populous countries that year, the largest increase in numbers of pollution related deaths were seen in India and Bangladesh. But the absolute number of air pollution deaths in Bangladesh was only 0.2 million.

With 1.58 million, China had the second-highest number of air pollution deaths after India (1.81 million). But the number of water pollution deaths in China was only about 34,000, compared to 0.64 million in the case of India.

Nearly 25% of all deaths in India in 2015 were caused by pollution; Pakistan, China, Bangladesh, and Kenya too reported that one in four deaths were caused by pollution.

In the case of air pollution, the number of deaths in India from ambient air pollution was 1.09 million, while deaths from household air pollution from solid fuels were 0.97 million. In the case of water pollution, 0.5 million deaths were caused by unsafe water source, while unsafe sanitation caused 0.32 million deaths.

The results were published in *The Lancet*.

Several cities in India and China recorded average annual concentrations of particulate matter PM2.5 pollution of greater than 100 g/m<sup>3</sup>, and more than 50% of global deaths due to ambient air pollution in 2015 occurred in India and China.

Deaths from air pollution were a result of diseases such as heart disease, stroke, lung cancer, and chronic obstructive pulmonary disease (COPD). Pollution has been responsible for the most non-communicable disease deaths. "In 2015, all forms of pollution combined were responsible for 21% of all deaths from cardiovascular disease, 26% of deaths due to ischaemic heart disease, 23% due to stroke, 51% to chronic obstructive pulmonary disease, and 43% due to lung cancer," says the report.

"Pollution is responsible for more deaths than a high-sodium diet (4.1 million), obesity (4.0 million), alcohol (2.3 million), road accidents (1.4 million), or child and maternal malnutrition (1.4 million). Pollution was also responsible for three times as many deaths as AIDS, tuberculosis, and malaria combined," it says.

Air quality index in key cities on Deepavali day at 4 p.m., ranging from 'good' to 'severe'. Numbers range from 0-500

Jaggi Vasudev's Rally for Rivers claims they will, but this is not based on the most nuanced science

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**After cleaner ghats, Ganga at Varanasi to be pollution-free too****After cleaner ghats, Ganga at Varanasi to be pollution-free too**

All who have been enjoying cleaner ghats at Varanasi would also soon bask in the pollution-free waters of the Ganges flowing by the spiritual city. Under Namami Gange programme, an all-encompassing approach has been employed to arrest pollution flowing into the river and ensure clean ghats. From sewage treatment plants to ghat improvement to river surface cleaning, several steps in a time-bound manner are being taken in Varanasi by National Mission for Clean Ganga to rid the city of river pollution.

On the sewage management front, Varanasi town currently generates an estimated 300 MLD of sewage, which is expected to increase to 390 MLD by 2030. From the current capacity of three existing sewage treatment plants – Dinapur, Bhagwanpur and DLW, only 102 MLD of sewage is being treated while the remaining flows directly into river Ganga through Varuna and Assi rivers. To bridge this gap, a 140 MLD STP at Dinapur and a 120 MLD STP at Goitha are being constructed under Japan International co-operation Agency (JICA) assisted project and JNNURM scheme respectively. These projects are at advanced stage of construction and will be commissioned before March 2018. Apart from this, a 50 MLD STP at Ramana has also been awarded under Hybrid Annuity based PPP model to exclusively address the sewage treatment requirements of Assi BHU area. Concession agreement for this project has already been signed. Together, these STPs will create sewage treatment capacity of 412 MLD, adequate to meet the sewage treatment demands of the town till 2035.

In addition, the works on interceptor sewers for rivers Varuna and Assi, development of three pumping stations at Chauka ghat, Phulwaria and Saraiya, rehabilitation of old trunk sewers and rehabilitation of ghat pumping stations and existing STPs are also underway to improve the entire sewage management infrastructure in Varanasi. Evidently, no stone is being left unturned.

To address the concerns of floating waste on the river, a trash skimmer is operational in Varanasi since April 2017 under river surface cleaning component.

A cleaner Ganga would be incomplete without equally cleaner surroundings. Acknowledging this, the Government of India last year initiated cleaning works at 84 iconic and heritage ghats of Varanasi under Namami Gange programme which has

shown positive results.

Besides, works for construction of 153 community toilet complexes at an estimated cost of Rs 20.07 crore have been awarded out of which the works for 109 toilets have already been completed and they are being used by 15,000 to 20,000 people every day. Also, ghat improvement works at 26 locations have been taken up in addition to repairing works at as many identified locations. In a bid to arrest the pollution from cloth washing activities on ghats, four dhobi ghats – Pandeypur, Nadesar, Bhawania Pokhran and Konia - have already been renovated while construction of three other at Bazardiha, Machodari Slaughter House and Bhawania Pokhri (extension) is underway. Whereas several users of the dhobi community have shifted to the new ghats, many more are being pursued for the same.

In a nutshell, a focused and output-driven approach to make river Ganga pure in Varanasi has yielded results. The objective of *Nirmal* Ganga will now not remain just a dream for Varanasi city.

**Samir/SKP/jk**

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## is it difficult to clean up the Ganga?

### How polluted is the river?

Coursing about 2,500 km, the Ganga is the longest river within India's borders. Its basin constitutes 26% of the country's land mass (8,61,404 sq. km.) and supports 43% of India's population. Even as its basin traverses 11 States, five States are located along the river's main stem spanning Uttarakhand, Uttar Pradesh, Jharkhand, Bihar and West Bengal. Much of the river's pollution load — from chemical effluents, sewage, dead bodies, and excreta — comes from these States. In the Ganga basin, approximately 12,000 million litres per day (mld) of sewage is generated, for which there is now a treatment capacity of just 4,000 mld. Particularly, on the stretch spanning Uttar Pradesh and Uttarakhand, approximately 3,000 mld of sewage is discharged, and a treatment capacity of just 1,000 mld has been created to treat it. Though the contribution of industrial pollution, volume-wise, is about 20%, its toxic and non-biodegradable nature has a disproportionate impact. The industrial pollutants largely emanate from tanneries in Kanpur, distilleries, paper mills and sugar mills in the Kosi, Ramganga and Kali river catchments. Then there is the municipal sewage which, at about a billion litres a day, generates 80% of the pollution load. This spans a wide range, from run-off in rural settlements to carcasses floated down the river.

### What is the government doing?

The BJP included the cleaning of the Ganga in its 2014 election manifesto. The Narendra Modi government earmarked Rs. 20,000 crore for the clean-up and promised that the river would be clean by 2020. Former Union Minister for Water Resources Uma Bharti said the river would be clean by 2018 but the new Minister, Nitin Gadkari, indicated that this deadline was unlikely to be met. He, however, said the river would be "noticeably clean" by March 2019.

### What has been done so far?

The government has set up an empowered authority called the National Mission for Clean Ganga. This is a dedicated team of officers who are responsible for disbursing the Rs. 20,000 crore fund towards a variety of projects that involve setting up of sewage treatment plants (STPs), replacing woodfired crematoriums with electric ones or those that use fuel more efficiently, setting up biodiversity parks that will enable native species — from the Gangetic river dolphin to rare turtles — to replenish their numbers and planting trees to improve the water table in the surrounding regions and prevent soil erosion. The authorities focussed on having trash skimmers ply along the river and collecting garbage, and improving crematoria. However the big task — of installing sewage treatment plants — is grossly delayed. Barely Rs. 2,000 crore of the Rs. 20,000 crore has been spent so far. The government says this has taken time because it wanted to put in place an extremely transparent tendering process. It has also established a system called the hybrid-annuity model, used in commissioning highways, for selecting firms that will manage STPs. Under this, firms would be given nearly half the money upfront to set up a plant and the rest (with a profit margin included) at regular intervals, provided they meet certain criteria over 15 years. Sixty-three sewerage management projects are being implemented in Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal. Last week, STPs to treat 1187.33 mld were cleared for Hardwar and Varanasi in Uttar Pradesh.

### What are 'clean river' criteria?

The ultimate objective, for the river to be clean, would be to ensure that the coliform bacteria level, biochemical oxygen demand, pH and dissolved salts remain within the standards prescribed by

the Central Pollution Control Board.

### **Can the government meet its targets?**

A lot will depend on how soon the STPs are commissioned. On average, they will take about a year-and-a-half to work at their optimal capacity. The tanneries, a major polluter, will have to install new systems to ensure that no discharge leaches into the river. Given that several employ techniques that have not been tried on a large scale in Indian rivers, it is unclear how soon they will deliver results. Moreover, a clean river also implies that it maintains minimum levels — called ecological flows — across all stretches of the river. This requires management on a larger scale, including controlling the several dams along the river that bring with them their own challenges.

Jacob Koshy

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## In Assam's tea estates, how do we find a way to save both people and pachyderms?

Assam is synonymous with some of India's finest teas. But it comes at a bitter cost: serious human-elephant conflict. The situation is particularly grim in Sonitpur district, where, between 1996 and 2009, 206 people and 131 elephants died (more than half of them in tea estates).

"Death and grievous injury to residents, damage to tea plantations and company infrastructure, and loss of productivity were just some of the consequences," says Renu Kakkar, Director of Corporate Social Responsibility at Apeejay Surrendra Group, which owns four tea estates in Sonitpur.

So how can we find a way to save both people and pachyderms? The question brought Apeejay and the World Wildlife Fund for Nature (WWF-India) together. They initiated the Human Elephant Conflict Management Project in 2015 in Sonitpur's Sessa tea estate, where the clashes were particularly high.

Noticing that wild elephants used this corridor when moving between the Sonai-Rupai Wildlife Sanctuary and Nameri National Park, the company decided to devote it to the pachyderms. People were trained to leave the passages for the elephants to use and bio-fences of thorny bamboo are now being created to prevent elephants from venturing into human-dominated areas.

Dark areas have been lit up with solar lights to avoid sudden confrontations; *kumkis* (trained captive elephants) are employed to drive away wild elephants; and elephant raid routes are constantly mapped to monitor their movement.

Through street plays, village meetings, orientation programmes for the Anti Depredation Squad and film screenings, the team has demonstrated non-confrontational conflict management to the villagers, such as using chilli smoke and firecrackers to frighten off the animals.

Now, apart from nine kilometres of biofence that continues to grow in Apeejay's estates in Sonitpur, WWF-India's successfully tested single strand solar fences (14.4 km-long) are in use here; around 80 km of solar fences are used in nearby estates as well. "Apeejay Tea and WWF-India plan to develop Sessa as a model tea garden with all vulnerable areas secured by solar-energised fences and bio-fences," says Anupam Sarmah who heads the North Bank Landscape and Kaziranga-Karbi Anglong Landscape Programmes (WWF-India).

What began as a landscape-level CSR initiative is now being extended to other tea estates (including small-scale tea growers and large companies such as McLeod Russell). Apeejay will also extend it to estates in the Dibrugarh and Sibsagar districts.

According to Kakkar, four of Apeejay's estates have seen a drop in conflict. "Training and consistent counselling have made workers less hostile towards elephants and made them understand that their presence in tea gardens cannot be completely avoided," she says. "And that they must be given the right of way."

Jaggi Vasudev's Rally for Rivers claims they will, but this is not based on the most nuanced science

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## More species of snakehead fish found

Many of the currently wide ranging species *Channa* are listed as of 'least concern' in the Red List of IUCN.

Confusions over snakehead fish species identity need not bother ichthyologists any more, as a global digital database of the species has been developed.

A global collaborative initiative involving as many as 10 scientific institutions has barcoded these freshwater fish varieties, which got their name from their unique snakelike snout. The members of the species are found distributed from the Middle East to eastern Asia, Central and West Africa and the Nile.

Earlier, it was widely believed that there were 38 species in this group. However, DNA-level analysis showed that there were several more species than first thought. The species strength of snakeheads could be 53 or even more, said Rajeev Raghavan, Assistant professor of the Kerala University for Fisheries and Ocean Studies, Kochi, which is one of the partnering institutions in the project. The research findings were recently published in *PLOS ONE*.

### New species

Snakeheads are of great demand in the domestic market for food as well as for ornamental purposes. Since these species are mostly found in the inland waterbodies, no data on their catch is available. It's mostly the brightly coloured ones from northeastern India that find their way into aquaria.

The barcoding also succeeded in identifying new species *Channa* from Assam, foothills of Bhutan, Myanmar and another one from Congo.

The analysis of the data revealed that the eastern Himalaya and the adjoining region of Myanmar were hotspots for snakehead diversity, as up to 10 snakehead species described during the last quarter century originated from this region, explained Dr. Raghavan.

### Current status

India is currently home to 15 species of *Channa* and the species diversity could go up as more studies would be undertaken.

Four currently known species — *Channa bankanensis* found in Indonesia and Malaysia, *Channa marulius*, *Channa striata* and *Channa gachua* — found in the Indian subcontinent and parts of southeast Asia, are considered species complexes, where different species are currently known under a single name because their taxonomy is poorly known or studied, he explained.

More taxonomic studies on the species complexes are required for conservation purposes as many of the currently wide ranging species are listed as of "least concern" in the Red List of IUCN.

One of the criteria for assessing a species as of least concern is its wide distribution. The breaking down of the species complex into individual species may have a different story to tell about its distribution which may prompt the scientific community to think for more species-specific conservation programs, felt researchers.

A study of nearly 300 people living in different parts of India found that nine single-base variants

(single-nucleotide polymorphisms or SNPs) account

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## It's time to make deep emission cuts

Human activities, the collective choices we have made to deploy fossil fuels and change land uses, are responsible for the release of greenhouse gases (GHGs) and associated global warming. In 2016, the earth's temperature was 1.3°C warmer than in pre-industrial times — as warm as in the Eemian interglacial period some 125,000 years ago — when sea levels were 6-9 metres higher than they are today. More dishearteningly, even if countries take the action they promised at the Paris climate change conference in 2015, the world would be about 3°C warmer by 2100, well above the 2°C temperature guardrail to avoid dangerous climate change.

Clearly, the current pattern of increasing emissions (which reportedly grew at the rate of 2.6% per year during 2000-2015) needs a rapid phase down. But the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) indicates that the earth can stay below 2°C. Closer examination reveals that many of the integrated assessment models used to study future scenarios and emissions assume that the world would somehow make use of significant amounts of 'negative emissions'. These are ways to [remove carbon dioxide](#) from the atmosphere, or even change the earth's radiation balance through geoengineering. These negative emissions in the models are used in addition to increasing use of renewables and improving the efficiency of energy services.

CO2 emissions must be nil by 2070 to prevent disaster: U.N.

Some of the approaches that could remove or absorb carbon dioxide in the atmosphere are better agricultural practices that leave carbon in the ground, use of biochar, undertaking afforestation and reforestation. One method that is widely discussed is bioenergy for fuel in combination with carbon capture and storage (BECCS). This involves the use of plants as fuel. The released carbon dioxide is then captured and safely stored indefinitely. However, due to competition for land for food and other purposes, and due to technological limitations, this approach is believed to be inappropriate for extensive use.

Other methods to suck carbon dioxide from the atmosphere and increase carbon dioxide absorption by the oceans are also being explored, but their long-term implications are not clear. Some scientists have been discussing the possibility of injecting cooling aerosols at a large scale in the atmosphere, but these geoengineering technologies pose huge risks and are also not long-term solutions.

Many scientists have voiced concern about over-reliance on BECCS and other large-scale engineering strategies, noting that these reflect political expedience rather than knowledge.

If BECCS and other approaches for negative emissions fail, we are likely to see a 4°C increase in global temperatures. In their recent *Climate Policy* article, Alice Larkin and her colleagues estimate that the cost optimisation models being used for these analyses are overly optimistic about negative emissions in the future.

These models also fail to consider equity dimensions and social and technological barriers. As a result, they pose a severe risk to society, especially to the poorest countries, which will experience the worst impacts of climate change. The irony is that these poor countries have emitted the least amount of GHGs.

India's greenhouse gas emissions up by 4.7% in 2016

There is also fear that policymakers do not fully recognise that widespread deployment of negative emissions is a central assumption in many climate models and the scenarios that are now being advocated to keep to a 2°C rise. A society that places most of its eggs in the negative emissions basket will likely face catastrophic choices. Negative emissions also create a moral hazard problem, where we expect (future) others to bail us out while we continue to lead profligate lives.

This situation complicates an already immense problem and implies that near-term reductions in GHG emissions should receive more and immediate attention. If negative emissions become feasible in future, they could help the world stay on course in reducing warming, but this cannot be assumed while we are running short of the carbon space available to dodge dangerous climate change.

Another critical scientific finding is that even if global emissions were to go down to zero by 2050 through some Herculean feat, there would be considerable amount of warming that the world is already locked into. The adverse effects of these would be severe and difficult to adapt to. This is already in evidence all over the world with several seasons of intense storms, droughts, floods, fires and their aftermath, meaning that any further delay in reducing emissions would put at risk many more lives, livelihoods and investments for decades to come.

According to Kevin Anderson and Alice Bows, the elephant in the room is that economic growth as usual cannot be reconciled with climate impacts, especially as Earth continues to warm. Scientists, they urge, need to speak openly and freely about the dangers of climate change without leaning on euphemisms. Climatologist James Hansen has also brought up the dangers of scientific reticence in the past, particularly in the context of sea level rise.

Policies therefore need to support practices that successfully keep carbon in the ground, prevent deforestation, support agricultural practice that sequesters carbon and promote sustainable land use practices that reduce emissions. We also need a carbon tax — various models for these have been discussed. ‘Lifestyle’ and other consumption activities that may have hitherto been outside the radar of climate policy because they disturb the status quo or are difficult would have to be considered. Policies should nudge especially the more prosperous communities towards less carbon intensive lifestyles, either through taxes or incentives or both. Otherwise, today’s largely policies would merely shift current problems on to the shoulders of future generations.

*Sujatha Byravan is a scientist who studies science, technology and policy*

The new U.S. Fed Chairman is unlikely to opt for policies that might upset the President’s plan

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## How To Clean Air

As we transition from the monsoon to winter, the temporary respite in air pollution is over. A combination of festivals, post-harvest crop burning, firing of brick kilns and reduced wind speed will soon increase the level of particulate air pollution in India. The Global Burden of Disease study estimates that, in India, ambient air pollution is responsible for 3,283 premature deaths every day.

Half of the top 20 polluted cities in the world are in India. India has seen the steepest increase in air pollution since 2010. Although China achieved global notoriety some years ago, it is India that has experienced a nearly 150 per cent increase in ozone-attributable deaths over the past 25 years. In comparison, the number of people who died due to diseases caused by pollution in China did not increase much in the same period.

Till now, almost all air pollution-related deaths were thought to be due to lung diseases. Evidence, however, is accumulating that links short and long-term exposure to air pollution with other diseases - these include heart attacks, stroke, diabetes, chronic kidney disease and cancer. In fact, the highest proportion of pollution-related deaths, especially those related to particulate matter, may not be because of diseases of lungs, but due to these other conditions.

Studies have shown that ultrafine particulate matter, which accounts for over 90 per cent of the particles emitted by road traffic, rapidly enters the bloodstream after being inhaled. These particles then interfere with the normal reactivity of blood vessels, and are distributed to many organs including the kidneys. Even when it does not kill, air pollution reduces the number of years lived in full health by aggravating asthma attacks, eye and skin disorders, and increasing the risk of development of high blood pressure, obesity, Parkinson's and Alzheimer's diseases, psychiatric disorders and frailty. Air pollution affects all stages of life, starting from pre-conception to old age. Exposure of a mother while pregnant causes abnormalities that increase the lifetime risk of chronic diseases in the baby. These associations have been shown in large population-based studies, done either in a cross-sectional manner - that is, examining the differences based on residence in areas with different levels of pollution - or in a longitudinal manner, where changing levels of pollution in the same area is associated with increasing disease risk after all other factors are accounted for.

On the positive side, remedial measures have shown reduction in the number of individuals with adverse outcomes, including improved life expectancy in several parts of the world. Policy interventions before the Beijing Olympics in China led to significant reduction in pollution, and this, in turn, reflected in significant improvement in people's physiology.

This will be a long battle. We need better urban planning starting with proper land-use assessment, reducing major transport activity close to communities, relocating traffic sources (roads, airports) from crowded areas, avoiding the mixing of industrial and residential areas, making better roads, reducing uncovered areas in cities by planting more grass and plants, improving transport technologies, and increasing awareness of the societal burden imposed by air pollution. Interdisciplinary academic groups including experts in toxicology, environmental health, analytical chemistry, applied physics, healthcare researchers, economists, and social scientists should evaluate the full range of impacts of air pollution on human health, develop tools to identify pollutants, find origin of particles, and develop culturally-appropriate solutions.

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## SC bans use of pet coke in NCR

A car park built near the Taj should be demolished, the Supreme Court said.

The Supreme Court on Tuesday directed the prohibition of industrial use of pet coke and furnace oil in NCR regions from November 1, 2017. The order follows the recommendation of the Supreme Court-appointed Environment Pollution Control Authority (EPCA) to ban the sale, distribution and use of furnace oil and pet coke in the NCR. Their use is already prohibited in Delhi.

A Bench led by Justice Madan B. Lokur also imposed a fine of Rs. 2 lakh on the Ministry of Environment for not fixing any emission standards for industries using pet coke and furnace oil in the NCR region.

Casting its net wider against sources of air pollution and government apathy after recently cracking down on the sale of firecrackers during Deepavali, the Supreme Court said fixing emission norms for industries using these toxic materials was vital for public health.

### 'Lethargy, laziness'

The delay on the government's side, the court said, was symptomatic of "lethargy and laziness."

Snubbing the Ministry for submitting draft norms only on October 23, the court said failure from the Ministry's side to pay the Rs. 2 lakh fine would invite serious penalties.

In a separate hearing, the same Bench, led by Justice Lokur, ordered the demolition of a high-tech, multi-parking lot built a kilometre from the Taj Mahal. Uttar Pradesh Chief Minister Yogi Adityanath is expected to visit the monument on October 26 to review tourism schemes. The court gave the authorities four weeks to demolish the parking lot.

Later in the day, counsel for the U.P. government sought a recall of the order, but the court asked her to move an appropriate restoration application. The order came on a PIL petition filed by advocate M.C. Mehta for protection of the monument from pollution and deforestation.

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## Cities at crossroads: Don't waste the possibilities

Young Abhishek Gautam and his friends Deepak and Amit were out riding their bikes on the road beside East Delhi's garbage dump at Ghazipur last September, when a garbage slide from the steep mountain of mixed solid waste (50 metres high, about the height of a 16 storey building and more than twice the permissible height for landfills) pushed them into the Kondli canal nearby. Deepak and Amit were fortunately rescued by the locals, but Abhishek could not be saved. Rajkumari, a 32-year-old woman, also lost her life in the chaos that followed, as heaps of garbage full of slippery wet plastic slid into the canal, creating giant waves which hit the road, disrupted traffic and caused damage to life and property.

We have heard of landslides in the hills of Himachal or Uttarakhand. But garbage slides? Is this the new normal? It need not be, if only we get to the root of the problem. We do not need rocket science to correct the situation, nor too much additional finance, but only civic engagement, better governance and a diligent search for least-cost technical solutions, which do exist.

We should not be looking for more land to create a new "landfill" which in India is a euphemism for a dumping site. This is not just a bad idea; it is an idea that will not work. After the recent garbage slide, for example, in response to the orders of the Lieutenant Governor to stop dumping garbage at Ghazipur, East Delhi Municipal Corporation tried to start dumping at Rani Khera. But residents of five nearby villages gathered in protest, blocking traffic and deflating tyres of vehicles carrying waste. It was a no-go.

The powers-that-be should have seized the Ghazipur crisis as an opportunity to urgently implement a sustainable strategy of solid waste management. It involves building awareness at the household level for not mixing biodegradable waste with dry waste, and to enable the recycling of dry waste like paper, plastic, glass, and metal. We have in these columns spelt out the rationale for composting and decentralised processing of biodegradable waste, so that after taking care of recyclables, far less of the solid waste generated in our cities finds its way to processing sites and to properly designed landfills.

Barely a month after the garbage slide, just before Diwali, a massive fire broke out at the same place in Ghazipur from where the garbage had collapsed, adding to the air pollution woes of the city. Indeed minor and major fires in these dumpsites are only to be expected every now and then given the methane trapped in the accumulated heaps and combustibles in the mixed waste. It is still not too late to communicate to all citizens the reasons why a sustainable strategy of waste management is crucial for their own health and safety.

We saw some emergency action to stop dumping at the Ghazipur dumpsite following an order from the LG of Delhi. The LG also talked of the need to increase the capacity of waste to energy plants. Since the Solid Waste Rules clearly mandate the use of high calorie non-recyclables for waste to energy plants, these plants cannot use mixed waste without pre-sorting.

The National Green Tribunal (NGT) issued an order to reduce the mound height by at least 10 feet and use the material for highway construction. The NGT directed the NHAI (National Highway Authority of India) to lay a trial 2-km stretch of NH-24 using the Ghazipur waste for its widening.

Bringing down the height of tall garbage hills is not difficult, but it requires careful bio-remediation and bio-mining before the recovered material can be put to productive use. The first step is to reduce the volume of waste and to dry it out through bio-remediation using composting bio-cultures. This makes possible the second step of screening the waste, which is called bio-mining. The different fractions (usually through screens of 80 mm, 35 mm, 16 mm and 4 mm) obtained

from the stabilised waste after it is screened, and the light thin plastics which are collected as a dry fan or a separator blows them out, include useful material for compost, road building, and refuse derived fuel (RDF). The fractions between 16 mm and 80 mm which contain mostly inerts (stony and sandy material) are good for road building. The finer fractions below 16 mm containing organics can be used as planting covers for grassy side slopes of the highway.

The fractions coarser than 80 mm consist mostly of combustibles like cloth and coconut shells and are useful for making RDF. A less-known and highly innovative application in building roads is that of soiled and torn thin plastics which are blown out from the bio-mining process. Though not useful for recycling like clean plastics which are collected from dry waste separately at the doorstep, these thin plastics can more than double or triple the life and quality of bitumen (tar) roads thanks to an innovation by R. Vasudevan at Thiagarajar College of Engineering, Madurai.

Thin-film plastics including metallised multafilms are finely shredded to 2-4 mm size (like tea leaves) and used in hot-mix plants that supply ready asphalt/bitumen mixes which are spread and compacted for road-making. In such plants, stone aggregates of various sizes are blended and sent by conveyor into a heating chamber, where tar is poured onto the hot stones and mixed for three to four minutes before loading onto a vehicle for transport to the road laying site.

The key to making long-lasting "plastic roads" is that the shredded thin-films are not added into the bitumen, but added onto the hot stones. The flakes soften and in 30 seconds of mixing form a baked-on polymer coating over each stone. The bitumen adheres so much more strongly to these coated stones that potholes do not form during rains and road edges remain straight and firm. Such "plastic roads" withstand breakup in snowy regions and far outlast normal roads. With their capacity to handle tanks and heavy vehicle traffic, such roads are ideal for border roads. One km of single-lane tar road can consume one tonne of waste plastic, when added at 10 per cent of required bitumen quantity.

The good news is that Tamil Nadu, Himachal Pradesh and some other states are regularly laying plastic roads. In Tamil Nadu, 1,400 km of rural tar roads used plastic in 2003-2004 alone. The Central Pollution Control Board has put out guidelines for making such roads (PROBES/101/2005-06) and the results of comparative testing (PROBES/122/2008-09) after three years of laying. The results have been so good that on November 9, 2015 the Central Road Research Institute mandated plastic roads for all National Highways up to 50 km from cities that have a population over five lakh. Bengaluru has resolved to spend Rs 2,220 crore for fixing rain-battered roads in the next four months. There is a lesson here: Plastic roads will not only withstand future monsoon damage but will also solve the city's problem of disposing of non-recyclable plastic.

If salvaged waste from dumpsite hills can be thus consumed nationwide at the bottoms and tops of our highways, that will be a wonderful way to usefully manage waste and save scarce land.

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## Delhi firecracker ban had no impact, say studies

Pollution levels recorded in the National Capital Region on Deepavali and the two following days were in close agreement with forecasts that assumed that the entire stock of unsold firecrackers in the city was used.

This data indicates that a October 9 Supreme Court ban on the sale of firecrackers in the city had no effect, and partly explains why air pollution remained severe despite it.

The idea behind the Supreme Court judgment was to test whether reduced firecracker use could alleviate the noxious pollution in Delhi during winter.

### Three scenarios

To forecast pollution levels on October 19, 20 and 21 as a result of this ban, Goa-based research group, Urban Emissions, simulated three scenarios using weather and emissions data.

In the first, the ban led to no reduction in firecracker use; in the second, there was a 25% reduction while in the third, the drop was 50%.

“The pollution peaks only matched at 0%. This means that there was no effect of the ban on what people managed to burst,” said Sarath Guttikunda, the director of Urban Emissions.

For example, the peak forecast for PM 2.5, or fine particulate matter, in the 0% scenario was 580 micrograms/cubic metres for October 20, the day after Deepavali, while the actual number averaged from 20 monitoring stations on the same day was 617.3 micrograms/cubic metre. Similarly, PM 10, carbon monoxide, nitrous oxide and sulphur dioxide trends under the 0% scenario also matched actual numbers. To arrive at the forecast, Mr. Guttikunda’s team modelled emissions across Delhi and its satellite cities from bursting 50,00,000 kg of firecrackers, a number cited by firecracker distributors in documents submitted to the Supreme Court after the ban. The colouring of firecracker explosions comes from the salts of chemicals such as magnesium and aluminium, while the fuel is gunpowder made from charcoal and sulphur. “When burst, all salts that produce colours end up straight into PM2.5 and PM10, and sulphur in the gunpowder ends up in SO<sub>2</sub>,” said Mr. Guttikunda.

Interestingly, despite the high usage of firecrackers in 2017, pollution levels remained relatively low on Deepavali day compared to last year. This is because winter pollution levels are affected by several other factors which vary from one year to the next, including paddy stubble burning in the Indo-Gangetic plains, use of diesel for heating, and cold weather that prevents the dispersion of pollutants.

### Pollution last year

In 2016, Deepavali fell on October 30, by when crop-burning (which typically occurs in the last two weeks of October) had already peaked in Punjab and Haryana.

Further, slow westerly winds carried this pollution towards Delhi. Within Delhi itself, wind speeds were low, affecting dispersion. In contrast, Deepavali in 2017 fell on October 19, when crop burning had just begun, said Mr. Guttikunda. Helping Delhi further, strong winds within the Delhi region dispersed the pollution faster.

Meanwhile, another forecasting model, the System of Air Quality and Weather Forecasting and

Research (SAFAR), also ran three simulations for pollution levels on six days around Deepavali, assuming that the stock of firecrackers burnt was 25%, 50% and 100%, respectively, of 2016 stock. According to Gufran Beig, project director of SAFAR, actual pollution levels seen during these days matched the 100% scenario. Rather than use actual stock numbers as Urban Emissions did, SAFAR attributed a portion of the emissions last Deepavali to firecrackers, and used this to develop this year's forecasts.

The failure of the ban didn't come as a surprise to Mr. Guttikunda or other experts, given how late it was imposed. The high pollution despite the ban also showed that other pollution sources, such as vehicular emissions, have been neglected by the government, said Amit Bhatt, who studies sustainable cities at the World Resources Institute, Delhi.

"While episodic events like Deepavali contribute to 4-5 days of bad air, what happens during the rest of the year? Many of us are disappointed because we haven't seen any tangible action for these remaining 360 days," said Mr. Bhatt.

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## Industry as a stakeholder in revitalizing India's rivers

Water is a resource that has to be managed. Unfortunately, in the last few decades, we have not paid attention to this. We are destroying the nation's soil and water resources at such a rate that in 15-20 years' time, we will not be able to feed or quench the thirst of our—now 1.3 billion—people. It is to make the people of this nation conscious of this that over the last month, from 3 September to 2 October, we conducted a Rally for Rivers.

This was a nation-wide campaign to create awareness in the country that our rivers are depleting. I personally drove over 9,300km with 142 events across 16 states, to make a strong pitch for saving our rivers.

On 3 October, we presented a River Revitalization Policy Recommendation draft to the prime minister. This draft is now being distributed to the state governments, various experts, the media, and is also available for public download.

Essentially, most of our rivers are forest-fed. When the land was covered by rainforest, precipitation gathered in the soil and fed the streams and rivers that were then in full flow. But a large part of India now is farmed land, so if we want our rivers to flow, we need to ensure there is tree-cover for a minimum of 1 km on either side of the river.

In farmer-owned land, we must support farmers to shift to tree-based agriculture. Wherever there is government land, we create forests with endemic vegetation in the entire area—and not restricted to the 1km minimum.

This can happen effectively only if there is an enforceable policy that determines how we live around our water bodies, what we should do and what we should not do. The draft policy recommendation that we have presented details these aspects.

There was a phenomenal response to the rally. People from the media and others are telling me it was a landmark people's movement in post-independence India. People have given over 120 million missed calls so far. A missed call is your vote for river revitalization.

Revitalizing our rivers is going to take at least 20-25 years, which means four to five governments will come and go. If we want to keep all these governments focused on this work, the nation must give a resounding "Yes!" to river revitalization. A missed call is a means of doing that.

These last few weeks have been the awareness phase of the campaign. The next step is to sort out the legislative, legal and administrative challenges, and the complexities of implementation. We will pursue this on various levels and support the government where they need support.

We are also looking to set up modules to demonstrate how farmers' income can increase three to eight times by shifting to tree-based agriculture. We have already done this on a small scale but now we are working on large-scale modules across 50- or 100-km stretches of the rivers.

Industry plays a very important role in this and is an important stakeholder in river revitalization. Tree-based products such as fruits have a shorter shelf life, so industry must invest in value addition and in creating supply chains to make it viable for the farmer. Right now, the poor farmer invests in some crop and many a time loses his investment, goes into debt, and commits suicide.

Only if everything goes well does the industry come in. That is not the way it should be done. The industry must invest first so that a base price is guaranteed for a crop. Then the farmer can grow

the crop. We are also looking at how industry can invest in micro-irrigation so that it can be done profitably, reduce water usage and increase crop yield.

Private players can also play a role in tackling pollution. This is a major issue that our rivers are facing, but it is also one that we have the necessary technology to address. It just takes an appropriate system and the commitment to execute.

For example, the private sector can set up water treatment facilities, which are paid for by industry and citizens according to their sewage output, which can be metered. Just as electricity, water and gas are metered, sewage should be too. A public-private partnership system needs to be established and run sustainably and efficiently. The way the roads in our country have been developed in such a short span of time is a case in point to show that such initiatives are possible.

If we truly want to revitalize our rivers, it is very important that everyone participates. If we arrive at a common policy and start the implementation soon, it will be a huge and successful step for the future of our nation and for the well-being of generations to come.

*Sadhguru Jaggi Vasudev is founder of the Isha Foundation.*

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**Power Minister addresses the 3rd Global Investors' India Forum****Power Minister addresses the 3rd Global Investors' India Forum**

**“Electricity is the future of economic growth in India. This growth cannot take place without Industry participation in Energy Sector”, says Shri R.K. Singh**

Union Minister of State (IC) for Power and New & Renewable Energy, Shri R. K. Singh addressed the 3<sup>rd</sup> Global Investors' India Forum, here today. The theme of the event was '**Ideate, Innovate, Implement and Invest in India**' and it was attended by global industry stalwarts.

Addressing the august gathering, Shri Singh said that looking at the future of growing power consumption in India, it is expected that the per capita energy consumption would expand at a breakneck speed, tripling in the next 5-7 years. The Minister assured the members of Industry that the Government would extend all possible support and remove all impediments in the path of investments in the power sector. “Electricity is the future of economic growth in India. This growth cannot take place without Industry participation. I invite you to come and invest in India's Energy sector”, Shri Singh said.

Speaking further on his vision for revamping of Power sector in India, the Minister said that his Ministry is in the final stages of **codifying laws on a number of fronts including** State Governments/DISCOMs honouring of Power Purchase Agreements (PPAs) and penalties for delinquencies; all DISCOMs to have tied up PPAs to cover 100% power requirements including peak loads before licenses are renewed; the Renewable Purchase Obligations to be made statutory; making Smart Meters mandatory and penalties to be imposed for non-payment of electricity bills, inter alia.

Shri Singh also informed the gathering that in the near future, to keep pace with this rapid change in the Renewable Energy Sector, Industry needs to partner with the Government in investing in Green Energy Corridors, Battery Storage Technology, Grid Improvement, Electric Vehicles Programme etc. The Minister invited the Industry stalwarts to devise the future strategy to achieve the above goal, in coordination with the Government. “Our time has come to lead the World in Clean Energy, the Industry must not be left behind in this endeavour”, Shri Singh added.

The event was organized by the ASSOCHAM and witnessed the participation of Global Industry stalwarts, who engaged in an intense discussion with the Minister; and senior officials of the Ministry.

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## Arctic sea ice waning faster than predicted, says study

Dwindling Arctic sea ice will impact global weather patterns and terrestrial and marine life, according to a study.

Arctic sea ice, a key indicator of climate change, could be dwindling faster than predicted, according to a study by the University of Calgary, Canada.

Research undertaken by the Cryosphere Climate Research Group under the Department of Geography at the university has found that satellite measurements over the years have overestimated the thickness of Arctic sea ice by as much as 25% because of the presence of salty snow.

“The implication is that the prediction of an ice-free Arctic ocean in summertime by 2050 could happen much earlier,” says Vishnu Nandan, lead author of the work published in *Geophysical Research Letters*, a peer-reviewed journal by the American Geophysical Union. Dwindling ice cover hastens the warming of oceans, and has an impact on weather phenomena like the El Niño that influences the Asian monsoon.

“The thinning ice would make it difficult for animals like polar bears and seals and organisms like phytoplankton to survive,” says Mr. Nandan who hails from Thiruvananthapuram.

The study, based on satellite data and extensive field measurements, found that salty snow — formed when brine is expelled upward from the ice surface — does not allow radar waves from satellites to penetrate, leading to skewed measurements.

### Correction factor

The researchers have proposed a snow salinity correction factor that could bring down the error in estimation of sea ice thickness.

Mr. Nandan and his team members braved hostile weather, polar bears and treacherous ground in the Canadian Arctic to generate field data for the study.

“We spent months in sub zero temperatures upto minus 40 degrees. The barren land, deafening silence and absence of communication often got on our nerves. Our only contacts were with the Inuit people who guided us through the ice routes”, recalls Mr. Nandan who has worked on Antarctic ice shelves during a previous stint at the Alfred Wegener Institute, Germany.

Jaggi Vasudev’s Rally for Rivers claims they will, but this is not based on the most nuanced science

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## In bizarre twist, coal may become a scarce commodity

**Barcelona:** The idea of coal as a scarce commodity seems somewhat preposterous given it remains one of the most abundant mineral resources on the planet, but the coming years may see a deficit in seaborne markets for the polluting fuel.

The current debate surrounding coal is generally one of how long it will continue to play a role in the world's energy mix before it is replaced by cleaner alternatives, mainly renewables such as wind and solar.

While various analysts will disagree on how quickly this process will occur, the reality is that coal, particularly in Asia, will remain a bedrock of energy supply for at least the next decade.

With the exception of India, most major coal importers in Asia have increased purchases this year, with top buyer China boosting imports by 13.7% in the first nine months of the year, compared to the same period in 2016.

This demand has boosted the Asian benchmark thermal coal price, the Newcastle index back to levels close to \$100 a tonne, with the marker ending at \$98.25 in the week ended 20 October, up 36% from the low so far this year of \$72.42 in May.

In a normal market, the higher prices would result in supply rising to meet the extra demand, but the dynamics in thermal coal have altered.

There will be a supply shortfall of 22.7 million tonnes in 2017 in the global seaborne market, Rodrigo Echeverri, head of energy coal analysis at Noble Resources, told the World Coal Leaders conference this week in Barcelona.

While rising exports from the United States can meet some of the shortfall, Echeverri expects the supply deficit to persist in 2018, meaning that Newcastle prices have to remain above \$80 a tonne in order to incentivise US shipments.

The issue for global coal markets is that despite the rhetoric of countries trying to lower coal consumption, in reality this has been increasing.

China's thermal power generation rose 6.3% in the first nine months of the year, one the reasons that the world's leading coal importer was boosting its purchases from the seaborne market.

The further problem is that meeting extra demand has become harder for the traditional export powerhouses, Australia, Indonesia and South Africa.

"Coal is becoming scarce," Guillaume Perret, who runs a consultancy bearing his name, told the Barcelona event.

Perret expects Indonesia can boost exports by 20 million tonnes to 360 million in 2017, but Australia will only increase its shipments by 1.8 million tonnes to 201.5 million, while South Africa will be flat at 75.5 million.

Russia will make up some of the shortfall by lifting its exports by 8.9 million tonnes to 115 million, Perret said, adding that overall there is still likely to be deficit in seaborne coal of between 5 million and 30 million tonnes a year for the next five years.

What is different about this coal price cycle is that the additional demand hasn't resulted in more investment in supply, and may not even if prices remain elevated.

Coal's reputation as a major contributor of man-made climate change has made it difficult for would-be coal miners to obtain financing.

Even if a coal mine can secure money and regulatory approval, public opposition and protests can make life difficult, especially in more developed countries like Australia.

The world's largest planned coal mine, the 25 million tonne-per-year Carmichael project in Australia's Queensland state, has become a headache for its Indian owners, Adani Enterprises Ltd.

Green activists have been successful in mounting popular protests against the mine, and while politicians from both the ruling centre-right Liberal Party and the opposition Labor Party continue to voice support for the mine, if the opinion polls continue to show a majority of Australia oppose the development, the politicians may change their minds.

Adani's struggles in Australia are likely to be mirrored for other coal developments in the world, making it all the more likely that supply will be constrained in coming years.

While the ensuing higher prices will no doubt be welcomed by coal miners, they are a double-edged sword.

Thermal coal prices above \$80 a tonne will make competing fuels such as liquefied natural gas (LNG) more appealing to buyers, as well as boosting the attraction of renewables.

While LNG is likely to remain more expensive than coal for generating power, new LNG plants are boosting the availability of the super-chilled fuel and security of supplies may become a factor for Asian countries looking at whether to build coal or natural gas power plants.

Coal's advantage in Asia has been its was cheap and abundant, and both of those long-standing assumptions are now being challenged by market dynamics. **Reuters**

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## The lowdown on India's air pollution crisis

Many major Indian cities, including Mumbai, Pune and Kolkata, grapple with air pollution. However, India's air pollution crisis is largely due to the noxious, winter air quality in Delhi and some cities in north and central India. In 2016, the World Health Organisation put 10 Indian cities on the list of the world's most-polluted. Reports from monitoring stations across Delhi, for at least a day after Deepavali this year, reported very high concentrations of particulate matter. The six-rung colour-coded Air Quality Index showed that pollution levels had shot up to 'severe' on October 20 — a sign that the air was toxic enough to warrant even the healthy to stay inside — but in a few hours the needle eased down to 'Very Poor,' or a level that's typical of Delhi winters and risky to those with underlying respiratory problems. Several other north Indian cities on the Gangetic plains, including Agra and Allahabad, are affected too as particulate matter persists throughout autumn and winter. Mumbai, Chennai, Bengaluru and Kolkata see pollution spikes but, primarily aided by geography, see them being flushed out too.

A confluence of interdependent factors is responsible. Winter in north India means a drop in wind speeds and high moisture levels from a retreating monsoon that prevent dust and particulate matter from being quickly flushed out. Further, the burning of agriculture stubble in Punjab brings toxic and unburned carbon particles into Delhi's atmosphere. The city's high emissions from cars, road dust and industrial waste contribute to the high pollution loads that rank it among the world's most-polluted. In other cities, the weather may be friendlier but rising pollution from industry, burning of coal and vehicles means that no fast-growing urban city in India is even close to the WHO-dictated air quality standards.

For one, India bears the burden of the maximum number of air pollution-linked deaths in the world. A report last week by The Lancet Commission on Pollution and Health, involving over 40 international health and environmental authors, reported that air pollution killed 1.09 million in India in 2015. Though the Indian government has disputed this number, it's incontrovertible that a wide variety of sources of air pollution abound. These include ambient air pollution, which is outdoor air pollution comprising gases and particulate matter; and household air pollution from the burning of wood, charcoal, coal, dung or crop waste indoors; and ambient ozone. Such pollution is strongly linked to heart disease, stroke, lung cancer and Chronic Obstructive Pulmonary Disorder (COPD). This also imposes a financial cost. The same report says the financial cost of such pollution is between 1% and 1.5% of the GDP of middle-income countries.

The Supreme Court banned the sale of crackers in Delhi as an "experiment" to check its impact on air quality. A report from the Central Pollution Control Board said concentrations of most categories of pollutants — sulphur dioxide, particulate matter 10 and 2.5 — saw a fall this year across most stations, except nitrous oxide.

The agency also measures noise levels during Deepavali and this year, the numbers show, there was a definite dip in noise compared with the average. However, it's still unclear if crackers were low enough to contribute to reductions in air quality. Unless there's a dramatic re-arrangement of the economy, little can be done about improving air quality.

A 2016 modelling study said that unless there was a concerted effort involving all the States surrounding Delhi, and Pakistan, with regard to the burning of agricultural stubble and clamping down on brick kilns, there would be limited gains.

Groups such as the Centre for Science and Environment have said that the number of cars in the city have to decline, along with a steep rise in the use of public transport, to register any visible difference in air quality. These issues need to be addressed consistently by politicians, business

groups and activist groups. Because of the annual debate around pollution in Delhi, there's intensive scientific monitoring of emission categories and sources by various agencies. However, many other cities lack monitoring.

Jacob Koshy

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## Nickel ore, a liquid threat to dry cargo vessels

The ill-fated *Emerald Star*. Stellar Ocean Transport Llc

Across the merchant marine community, fingers have been pointed at the cargo that the ill-fated *Emerald Star* was carrying — 55,000 tonnes of nickel ore.

While there is no official communication yet on what led to the disaster — an inquiry is under way by Hong Kong authorities — many experts have cited previous instances of sinking of ships carrying nickel ore due to a process called cargo liquefaction. “We suspect the reason for capsizing was cargo liquefaction triggered by rough weather,” said a spokesperson of Vridhi Maritime, the manager of the vessel.

“Under certain conditions [fine particle cargo, containing high levels of moisture], nickel ore may become like a semi-solid or liquid, in a process termed as liquefaction. Then it starts moving like liquid inside the hold [cargo area] of a ship. If the hold is partly filled in such a condition, the effect [free surface effect] on ship stability will be bad. In this context, it may be noted that liquid cargo in bulk is carried by tanker ships, which are specially designed, considering safety requirements,” says P. Krishnankutty, Professor, Department of Ocean Engineering, IIT-Madras.

Survivors recalled that the *Emerald Star*, carrying the nickel ore bound for Lianyungang, a key port for Chinese nickel ore imports from Buli in Indonesia, sank in about 10 minutes. The accounts also speak of the vessel developing a high list or tilt on the port side before sinking: the vessel tilted to its left because of a rearrangement of cargo. The suddenness of the event is also typical of other nickel ore-related capsizes, experts say.

### Certificates in order

DNV GL, an international accredited registrar and classification society that certifies that a ship is built and maintained as per set standards and is seaworthy, has acknowledged that the *Emerald Star* was DNV GL class. A DNV spokesperson, responding on email to *The Hindu*, said the ship “had a clean class record at the time of the incident.”

In shipping parlance, “clean class” would mean the ship had no deficiency and all its certificates and surveys were in order. This lends credence to the opinion that structural deficiency was likely not an issue, especially since the *Emerald Star*, built some seven years ago, was a relatively young ship.

In a 2015 paper, DNV lists six accidents due to nickel ore and notes that they coincide with the period when South East Asia sees storms. Three of them happened in 2010 and two in 2013, and all the ships were carrying nickel ore from either Indonesia or Philippines.

Earlier this year, *Stellar Daisy*, with a cargo capacity of 2,66,000 tonnes, sank off the coast of Uruguay, reportedly after the iron ore it was carrying liquefied.

### Cargo caution

The DNV paper notes that nickel ore is 99% clay-like soil and the ore is likely to liquefy under the impact of a ship’s motion if the moisture exceeds a certain level. It also notes recent changes to international codes governing such cargo. A Transportable Moisture Limit (TML) is specified to limit the maximum moisture content ores can have before loading on a ship, but the paper notes that the moisture level of the ores can change after measurement in laboratories.

The paper also talks about on-board moisture tests, that can be done by ship staff. It recommends having an independent surveyor.

### **Centre of gravity**

When the cargo liquefies, the dry cargo ship is not designed to handle it, says Prof. Krishnankutty. “When the ship rolls to one side (say, starboard side), the liquefied cargo will shift to that side and when it rolls to the other side the cargo may not shift fully. This may happen in most of the cargo holds resulting in the ship’s centre of gravity (CG) shifting to one side. Thus, the ship inclines to the side where CG has shifted,” he says.

A merchant ship’s structure is supported by a steel base, the keel. If the cargo loaded or unloaded at a port causes a list to one side then on-board staff take in or pump out sea water from various ballast tanks to even the keel. Out at sea, the impact of waves can create rolling, pitching and other motions. A ship is designed to have a large self-righting capacity so it doesn’t capsize even during heavy rolling or pitching. “But a high list reduces the reserve stability considerably, which may lead to a sudden capsize of the ship,” points out Prof. Krishnankutty. On Oct. 13, the *Emerald Star* was battling a typhoon that typically causes much rolling and pitching. The vessel had developed a high list too.

Carrying a cargo like nickel ore, a prudent action would have been to change course — termed as weather routing. Questions on weather routing, and issues such as whether the cargo moisture level was monitored, tests were conducted by ship staff, and if the captain was under pressure to carry the cargo may be answered at the Hong Kong inquiry. The captain can refuse to carry any cargo he deems unsafe. “The crew did their due diligence and all norms were followed. The cargo was loaded based on the standard operating procedure of the supplier submitting three certificates to guarantee against liquefying: Shipper declaration, TML and Flow Moisture Point. The ship staff did perform relevant tests and the cargo in a few loading barges was rejected based on these. Weather routing was indeed done but the rough weather the ship faced was unexpected,” said Vridhi Maritime’s spokesperson.

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## Four Asian vulture species now on highest protection list

Several species of vultures, including four that have India on their migratory routes, were awarded the highest protection by the Convention on the Conservation of Migratory Species of Wild Animals on Saturday.

The whale shark, which inhabits the Indian Ocean, got global protection too. However, the proposal to extend additional protection to the chinkara or Indian gazelle was withdrawn, the summit's organisers said.

The week-long convention in Manila concluded with approvals for protection of 34 species in submissions made by 24 countries from Asia, Africa, the Americas, Europe and Oceania.

Delegates from 91 countries had attended the summit, the next edition of which will be held in India in 2020.

The Asian vultures that are set to get collaborative international protection are the red-headed vulture, white-rumped vulture, Indian vulture and slender-billed vulture. They are faced with threats such as poisoning, hunting, collision with electricity cables and habitat degradation.

A subspecies of the black noddy, the yellow bunting and the lesser and great grey shrike are the other avians on the protected list.

Widespread over-fishing is driving many shark species, including the whale shark, to extinction. India is among 121 nations whose waters are home to sharks threatened with near extinction. The major threats are bycatch in nets and vessel strikes.

Proposals for conservation of the blue shark and common guitarfish have also been accepted. A resolution to develop and manage protected area networks within the ASEAN region has been adopted, a spokesperson said. Proposals submitted by Mongolia to protect two of Central Asia's rarest species, Przewalski's horse and the Gobi bear, also got the nod.

The Caspian seal has also been identified for conservation. It is the only marine mammal found in the world's largest inland sea, where its migration is prompted by ice formation and foraging.

"The conference in Manila has been a real game changer for the Convention. An intensive week of negotiations have resulted in a stronger commitment by countries to step up their efforts to conserve the planet's migratory wildlife," said a statement from the Convention's Executive Secretary Bradnee Chambers.

Protecting migratory species poses particular difficulties since they cross borders, including possibly moving to countries with less stringent wildlife protection systems, said Mr. Chambers.

### Multi-nation approach

Governments also agreed to cooperate on reducing the negative impact of marine debris, noise pollution, renewable energy and climate change on the lives of migratory species.

Lions, chimpanzees, giraffes and leopards were marked out as species that needed additional protection.

More than 120 states are party to the Convention, but this does not include China and many other

Asian countries.

“We’re trying to work to bring China onboard as a member of the Convention. We have been engaging them and they are actually doing quite a bit,” Mr. Chambers told reporters.

“What it required is positive engagement with the country to see how to find solutions instead of just bashing the country and looking at the negative side.”

The summit held in Manila has been the largest in the 38-year history of the Convention, which is also known as the Bonn Convention after the German city in which it was signed.

*(With inputs from AFP)*

Jaggi Vasudev’s Rally for Rivers claims they will, but this is not based on the most nuanced science

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## Coal, a scarce commodity?

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The debate surrounding coal is generally one of how long it will continue to play a role in the world's energy mix before it is replaced by cleaner alternatives. The reality is that coal, particularly in Asia, will remain a bedrock of energy supply for at least the next decade.

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In a normal market, higher prices would result in supply rising to meet extra demand, but the dynamics in thermal coal have altered. There will be a supply shortfall of 22.7 million tonnes in 2017 in the global seaborne market, Rodrigo Echeverri, head of energy coal analysis at Noble Resources, told the World Coal Leaders conference last week in Barcelona.

While rising exports from the U.S. can meet some of the shortfall, Mr. Echeverri expects the supply deficit to persist in 2018, meaning that Newcastle prices have to remain above \$80 a tonne in order to incentivise U.S. shipments.

The issue for global coal markets is that despite the rhetoric of countries trying to lower coal consumption, in reality this has been increasing. China's thermal power generation rose 6.3% in the first nine months of the year, one the reasons that the world's leading coal importer was boosting its purchases from the seaborne market. The further problem is that meeting extra demand has become harder for traditional export powerhouses: Australia, Indonesia and South Africa. "Coal is becoming scarce," Guillaume Perret, who runs a consultancy bearing his name, told the event.

### Investment constrained

He said there is likely to be deficit in seaborne coal of between 5-30 million tonnes a year for the next five years.

What is different about this price cycle is that additional demand hasn't resulted in more investment in supply. Coal's reputation as a major contributor of climate change has made it difficult for would-be coal miners to obtain financing.

Public opposition can make life difficult, especially in more developed countries like Australia. The world's largest planned coal mine, the 25 million tonne-per-year Carmichael project in Australia, has become a headache for its Indian owners, Adani Enterprises.

Green activists have been successful in mounting protests against the mine, and while politicians from both the ruling centre-right Liberal Party and the opposition Labor Party continue to voice support for the mine, if opinion polls continue to show a majority of Australia oppose the development, politicians may change their minds. Adani's struggles in Australia are likely to be

mirrored for other coal developments in the world, making it all the more likely that supply will be constrained in coming years.

*(Opinions expressed here are those of the author, a columnist for Reuters.)*

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## Dark journeys

Since it assumed office in 2014, the NDA government has stressed the use of renewable energy to generate electricity. However, thermal power remains the mainstay of the country's energy sector. According to the NITI Aayog, coal will constitute nearly 60 per cent of India's fuel mix in 2022. Given the well-known pollution hazards and environmental impacts of this fossil fuel, therefore, it is imperative that coal is extracted in a responsible manner. Over the past three years, the government has taken measures to mitigate the ecological footprint of coal mining, including ranking mines according to environmental yardsticks. However, such measures have remained at the level of the coal mine and have not addressed the pollution caused by the transport of coal to industrial units. An investigation by this newspaper, published last week, has revealed how a corridor that transports coal imported into the country - mainly from Australia, Indonesia and South Africa - to the steel mines in Karnataka causes deep ecological wounds in Goa.

Coal imports that are unloaded at Mormugao port in Goa are transported by rail and road to Bellary in Northern Karnataka. Official figures show that, on average, 34,200 tonnes of coal is transported each day through the rail route from the Central government-owned Mormugao port via Vasco, Margao and Kulem, to Karnataka. The nearly 400-km journey of this fossil fuel is putting at risk entire habitations along the way. According to the Goa State Pollution Control Board's (GSPCB) 2015-16 report, the PM10 reading of Mormugao port "exceeded the permissible limits on 14 out of 24 readings". Coal dust has pushed up incidents of respiratory disorder and is threatening fragile forests, paddy fields, streams and rivers, the investigation by this paper has revealed.

The investigation has highlighted instances of regulatory deficit, which the concerned authorities must urgently address. Official records show that coal in excess of permissible limits is being handled at the Mormugao port. A report by the port authority admits: "The consent to operate was exceeded from the year 2011-12 onward and the operator has not obtained permission from the GSPCB for enhancing the limits". The need to beef up the regulatory mechanism has acquired greater urgency given that Mormugao port plans to more than double its coal imports by 2030. Goa is not the only state, of course, which is facing problems due to transport of coal. An environmental audit, cited by a 2014 Comptroller and Auditor General of India report, blamed the transport of coal for the high pollution levels in coal-rich Jharkhand. Last year, the Maharashtra Pollution Control Board acknowledged serious lapses in the way coal was being handled at Mumbai's Bori Bunder. Given the continuing centrality of coal in the country's energy mix, it is imperative that policymakers ensure that it is transported in environmentally benign ways.

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## Disaster management systems can safeguard our heritage

The first-of-its-kind analysis by the National Disaster Management Authority (NDMA) of the threats India's museums face lists terrorism; climate-related events such as floods, earthquakes and tsunamis; and vandalism. This is a timely reminder that theft and vandalism are not the sole security concerns for a museum. Of special interest are the climate-related events. Across the world, museums routinely evaluate non-security threats. And governments are increasingly thinking of cultural heritage and the risks and threats to the same when they draw up their disaster management strategies for museums. India has experienced this in the past. Most recently, in 2014, floods destroyed the 115-year-old Pratap Singh Museum in Srinagar.

The authority's report lists the National Museum in New Delhi, the national Gallery of Modern Art in New Delhi, Bengaluru, and Mumbai, the Victoria Memorial Museum and the Indian Museum in Kolkata, and the Allahabad Museum as being under threat. Terrorism and vandalism apart, many of these museums are located in high seismic activity zones and are at risk from earthquakes, the report said. India is a signatory to the 2015 Sendai Framework for Disaster Risk Reduction, which recognises that the State has the primary role in reducing disaster risk and identifies heritage as a priority area. Based on this, the authority's report also has detailed guidelines for museums on the systems that need to be put in place to tackle different kinds of threats.

Fundamentally, museum security matters for the same reasons that museums matter: Museums educate the public, promote cultural heritage and communities, and remind us of India's pluralistic culture. Without them, we would erase the story of our past. As public spaces, these museums attract significant revenue and create safe and open public spaces. In 2015, the Union government promised to implement the Sendai framework. Now that the NDMA's report on museums is out, the Centre must do so without delay. .

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## Hits and misses

The meeting of the UN high-level political forum on sustainable development (HLPF) took place in New York from July 10-19 to discuss the progress made on the sustainable development goals (SDGs) of the 2030 Agenda. Forty-three member nations presented their report cards in the form of voluntary national reviews (VNRs). Around 5,000 people participated — half of them from civil society and private entities. Eighty ministers from various countries, holding diverse portfolios such as external affairs, planning and budget, also attended. Before the meeting, the governments undertook long consultations to prepare their reports. Was the exercise worth it?

The reviews show that countries have taken steps to incorporate SDGs in their national plans and policies and identified policies which already include some of the goals. Governments have created new institutions, or have used existing institutions, to facilitate execution of the SDGs. On this count, the HLPF/VNR exercise has yielded results.

However, there was significant apathy or antipathy among governments to consult and include suggestions from civil society actors in the VNRs. Except in Europe, and some other countries like Brazil and Japan where governments incorporated the inputs of civil society, the process remained largely non-inclusive or superficial. In India, too, the process was patchy. There was also a visible lack of awareness among civil society actors across the world about the mechanism and processes of VNR. The secretariat for HLPF of the UN Department of Economic and Social Affairs has no place for carrying the shadow reports on SDGs of civil society organisations.

In the VNRs, countries generally outlined how well they have performed. Barring some countries in Latin America and Europe and possibly a few in other regions, stress on critical areas and ways to address them was missing. A survey done in 20 VNR nations by Action for Sustainable Development, a global civil society organisations' platform on SDGs, suggests: "In many cases, although there is a sense that the SDGs are included in existing national plans, the 'transformational' aspect of the agenda has been significantly diluted or lost."

The shadow reports prepared by civil society on SDGs find that the scale of inequality is constantly rising while governments' 'austerity' measures of cutting public investment in the social sectors is continuing. There is simultaneously reduction in the corporate taxation. This is worrying as the UN Secretary General's report finds that in 2016, only 45% of the world's population was protected by some social protection system.

A multidimensional poverty index ought to be adopted to analyse domestic poverty conditions as suggested by some nations. A clear road map needed to address pressing challenges of refugee crisis, terrorism, fundamentalism, increasing hunger, inequality and climate change. The HLPF process needs to be strengthened by formalising multi-stakeholder consultations, discussing critical challenges, and making the ministerial declaration mandatory for nations to fulfil.

*Pradeep Baisakh works with GCAP, a global campaign on poverty and inequality*

The new U.S. Fed Chairman is unlikely to opt for policies that might upset the President's plan

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## Climate change taking a toll on global health: Lancet

Uphill task: A cyclist wears a mask as protection against air pollution in New Delhi. | Photo Credit: [Sushil Kumar Verma](#)

New research published by *The Lancet* medical journal states that on an average there has been a 5.3% fall in productivity for rural labour estimated globally since 2000, as a result of rising temperatures around the world. In 2016, this took more than 9,20,000 people globally out of the workforce, with 4,18,000 of them in India alone.

The *Lancet* report talks of the various ways climate change has started affecting the health of people across the planet. Doctors, academics and policy makers have contributed to the analysis and jointly authored the first report of "The Lancet Countdown: Tracking Progress on Health and Climate Change". Partners behind the research include the World Bank, World Health Organization (WHO), University College London and Tsinghua University.

A statement issued the group said, "The findings show that climate change is affecting the health of all populations, today. These impacts are disproportionately felt by communities least responsible for climate change and those who are the most vulnerable in society."

China, Bangladesh, India and Indonesia are the countries that have registered the highest number of deaths linked to air pollution.

Anthony Costello, co-chair of the Lancet Countdown and a director at WHO, said, "The outlook is challenging, but we still have an opportunity to turn a looming medical emergency into the most significant advance for public health this century. We need urgent action to cut greenhouse gas emissions. The health and economic benefits on offer are huge. The cost of inaction will be counted in preventable loss of life, on a large scale."

### Anthropogenic effect

The research builds on the work of the 2015 Lancet Commission on Health and Climate Change, which concluded that anthropogenic climate change threatens to undermine the last 50 years of gains in public health.

The report said that over one billion people globally will be faced with a need to migrate within 90 years, due to a rise in sea level caused by ice shelf collapse, unless action is taken.

The research found that 87% of a random sample of global cities are in breach of WHO air pollution guidelines.

The world has seen a 46% global increase in weather related disasters since 2000, the reported pointed out. The total value of economic losses resulting from climate-related extreme weather events was estimated at \$129 billion in 2016.

Christiana Figueres, chair of the Lancet Countdown's high-level advisory board and former executive secretary of the UN Framework Convention on Climate Change, said, "The report lays bare the impact that climate change is having on our health today. It also shows that tackling climate change directly, unequivocally and immediately improves global health. It's as simple as that."

Jaggi Vasudev's Rally for Rivers claims they will, but this is not based on the most nuanced

science

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## Solar businesses for Bharat

An average Indian consumes a quarter of the electricity used by an average Chinese. This isn't because we're particularly frugal. It's simply because in most of Bharat, particularly states like Uttar Pradesh, Jharkhand and Bihar at least two out of three rural households are in the dark. In light of this, our government's futuristic aspirations of a digital India feels like a dark comedy. India will face a huge energy supply-demand mismatch for the foreseeable future. Importing almost half of its energy requirements, and bringing with it a hovering cloud of import dependence, and currency fluctuations.

We are the third-largest energy consumer in the world. This is despite the fact that one in four Indian households do not have access to power. With increasing income levels, the growing digital economy, and access to modern amenities, energy consumption of the average Indian will increase at least two-fold over the next decade. Factors like increase in mean temperatures, scarcity of ground water, will only exacerbate demand. Needless to say our coal-powered plants will fail to keep up with the growth. If we keep burning coal and oil for energy, 4 out of 5 cars, and an equal ratio of plug points will run on imported oil and coal. The question then arises—how can Bharat power itself?

A look at Shell's global energy resource database brings out the stark mismatch in demand and supply between different countries. Approximately 50% of the world's oil and gas capacity is concentrated in five countries—the US, Russia, Saudi Arabia, Iran and Iraq—in that order. About 80% of the world's coal is concentrated in the US, China and Russia. In this scheme of things, India has less than 1% of the world's share of fossil fuels. On the bright side, India has 15% of the world's solar capacity. These numbers make it self-evident that the path to India's energy sufficiency lies in renewables, especially solar and wind. However, to walk this path, India must develop the ability to convert this capacity efficiently and cost effectively into energy supply.

Indian policymakers are neither unaware of this mismatch nor dormant on this front. In fact, over the last few months we have seen a lot of hubbub over solar being the answer to India's energy future. India's targets at the Paris agreement and policy movements encouraging more auctions for solar power plants are all moves in the right direction. The cost of solar power has dropped by an order of magnitude in the last decade.

It is now possible for solar power to be as mainstream as coal. The report on *India's renewable electricity roadmap 2030* released by NITI Aayog attempts to do this by laying a policy road map aimed at bringing renewable power to the mainstream. This takes into account the need to make the distribution infrastructure robust by ensuring seamless integration of renewable power to the main power grid.

With both policy and economics falling in place, the time is ripe for Bharat to build thriving businesses in this sector. So far, this space has been dominated by investments in utility scale power plants, characterized by historically low price bids for power purchase agreements (PPAs) by solar power companies. The stampede to outbid and win contracts for massive infrastructure build-outs is encouraging. These large-scale utility projects have accelerated the learning curve in technology resulting in a steep drop in infrastructure costs. As infrastructure build-outs get increasingly commoditized, it is now time to take a look at other solar businesses that Bharat can build in this ecosystem.

First among these, are third party operations and maintenance service providers for large utility projects. Because building and maintaining long-term cost viability of these projects require two very different skill sets. These service providers will need to develop technologies and standard

operating procedures to keep costs low while maintaining high standards of power production—on both quantity and quality. In the next five years we estimate an annual market of Rs1,000 crore for these services that will address the 100 gigawatt (GW) of total planned installed capacity. The need for well performing service providers will also gain significant importance with an expected shift in the nature of investors in utility projects from specialist solar or wind companies to purely financial investors who would prefer asset management by third party service providers.

The other space primed for new and innovative businesses is that of distributed generation. Distributed solar power generation will enable localized micro-grids obviating the need for a centralized generation infrastructure. Until now, poor connectivity, high cost of operations and maintenance, and the lack of a financing ecosystem have stood in the way of solar micro-grids. With improved connectivity, lower cost of technology solutions, and the emergence of third party operations and maintenance service providers, micro-grids might finally be viable.

As technology, policy and economics evolve, there will be more businesses that can be built to strengthen the ecosystem. At this time, however, the two areas mentioned are rife with opportunity. In parts two and three of this three-part series, I'll attempt to outline an operating and financing model for these businesses. And then we might just be able to make some hay when the sun shines.

*Vaidhehi Ravindran is a vice-president at Aspada Investment Advisors. The Bharat Rough Book is a weekly column on building businesses for the middle of India's income pyramid. This is the first of a three-part series on solar businesses for India.*

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## Disrupting climate change

After a season of record-breaking hurricanes in the US and floods across Asia, it would be easy to despair about the accelerating pace of climate change. Yet, despite the apocalyptic omens, an energy transformation big enough and fast enough to curb the spike in global temperature remains within reach. Better still, we do not need to wait for new inventions to implement the changes we need; the transformation can happen right now, with profitable solutions delivered by businesses and driven by markets.

Limiting the increase in global temperature to within two degrees Celsius of pre-industrial levels—the target set by the 2015 Paris climate agreement—will require decreasing reliance on fossil fuels, and changing how the world grows crops, harvests timber, and uses land.

New research by the Rocky Mountain Institute shows that both outcomes are possible, and that, together, the impact can “positively” disrupt the trajectory of climate change.

According to our analysis, there are pathways for the future supply and demand of energy, and for how forests and land store carbon, that, if followed, will dramatically slow the pace of warming.

By accelerating the clean-energy transition that is underway, it is possible to reduce greenhouse-gas emissions below what would be expected under current consumption patterns.

This scenario is not as far-fetched as some might believe. The world is already switching to cleaner energy, to electric mobility, and to smarter power and land-use systems faster than anyone, including experts, anticipated.

And it's not the first time the pace of change has exceeded expectations. In 1980, for example, AT&T hired McKinsey & Co. to forecast the number of mobile phones that would be in use in the US within two decades. The consultants predicted that by 2000, the US mobile phone market would support about 900,000 devices. In fact, over 100 million phones were sold that year. Today, the planet has more phones than people.

Solar and wind energy have suffered similarly flawed projections. For decades, experts at the International Energy Agency and the US Energy Information Administration underestimated how quickly supplies from these sources would grow. They consistently guessed low, increasing their forecasts only slightly every year, without ever catching up to reality. But as clean energy businesses innovated, the cost of production from wind and solar declined. Energy became cheaper, and usage increased as a result. Government models typically do not account for such expanding returns.

Another reason for underestimating the speed of today's energy transition is that the scale is different from previous conversions to new technologies.

When people switched from burning wood to burning coal, and then to burning oil, the “new” energy sources came from very large capital projects, like coal mines, offshore oil and gas fields, and refineries. The high costs of deploying these projects were then passed on to consumers.

By contrast, in today's energy market, consumers have more control.

Consider how easy it is to install rooftop solar panels; it can be done in a single day. Millions of small machines—photovoltaic cells, wind turbines, batteries, and smart appliances—are driving today's energy transformation.

Each new device in this distributed system is cheap and pays off quickly, so experimentation is affordable, and the technology can improve rapidly. The result is a huge field of global competitors, with faster innovation and new business models that are helping to achieve economies of scale.

The hardware of the clean-energy revolution has more in common with mobile phones and laptops than with mines and refineries. Because it can be sold in very large markets, with scalable production chains and still-maturing technologies, the transition to cleaner power is happening faster than many experts predicted it would.

Still, not even a rapid shift toward “greener” energy will be enough to keep global average temperature within two degrees Celsius of pre-industrial levels. To achieve that, the world will also need to take more greenhouse gases out of the atmosphere.

Fortunately, that, too, is possible. By incorporating carbon-reducing strategies into agriculture and land conservation, more heat-trapping gases can be locked up in forests and soils.

But while the techniques already exist, success will require increasing the use of no-till farming, adopting permaculture principles, better managing wetlands, and using rotational grazing techniques, among other measures.

The power of markets to drive radical changes in energy and land use is great, but as the storm season of 2017 should remind us, the climate emergency we face requires vigorous and urgent action.

Transforming the way people acquire and consume energy, and use land, will require strong incentives and policy frameworks to set the course for success.

But don't despair: there is still time to save our climate. The transformation has already begun—and it will play out faster than most people expect. ©2017/Project Syndicate

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## Concentration of CO2 in atmosphere hits record high: UN

Smoke bellows from the chimneys of Belchatow Power Station, Europe's largest biggest coal-fired power plant, in this May 7, 2009 file photo | Photo Credit: [Reuters](#)

The concentration of carbon dioxide (CO2) in the atmosphere has hit a new high, the UN said on Monday, warning that drastic action is needed to achieve targets set by the Paris climate agreement.

“Concentrations of carbon dioxide in the atmosphere surged at a record-breaking speed in 2016,” the World Meteorological Organization said.

“Globally averaged concentrations of CO2 reached 403.3 parts per million in 2016, up from 400.00 ppm in 2015 because of a combination of human activities and a strong El Nino event,” it said. The Greenhouse Gas Bulletin, the UN weather agency's annual flagship report, tracks the continent of dangerous gasses in atmosphere in the post-industrial era (since 1750).

The report also said that the last time Earth experienced similar CO2 concentration rates was three to five million years ago, when the sea level was up to 20 metres (66 feet) higher than now.

“Without rapid cuts in CO2 and other greenhouse gas emissions, we will be heading for dangerous temperature increases by the end of this century, well above the target set by the Paris climate change agreement,” WMO chief Petteri Taalas said in a statement.

The historic agreement approved by 196 countries two years ago is facing renewed pressure following U.S. President Donald Trump's decision to quit the accord. But nations are set to press on with the task of implementing it at climate talks in Bonn next week.

“The numbers don't lie. We are still emitting far too much and this needs to be reversed,” the head of UN Environment Erik Solheim said in a statement, reacting to the new report.

“What we need now is global political will and a new sense of urgency.”

The Greenhouse Gas Bulletin tracks concentrations of gasses in the atmosphere, rather than emissions with data compiled from a monitoring station in Mauna Loa, Hawaii.

A study of nearly 300 people living in different parts of India found that nine single-base variants (single-nucleotide polymorphisms or SNPs) account

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