

## China plans tunnel from Brahmaputra

Chinese engineers are testing techniques that could be used to build a 1,000-km-long tunnel, the world's longest, to divert water from the Brahmaputra river in Tibet, close to Arunachal Pradesh, to the parched Xinjiang region, a media report said on Monday.

The move, that is expected to "turn Xinjiang into California", has raised concerns among environmentalists about its likely impact on the Himalayan region, Hong Kong-based *South China Morning Post* reported.

Water would be diverted from the Yarlung Tsangpo river in southern Tibet, which turns into the Brahmaputra once it enters India. The proposed tunnel would provide water to China's largest administrative division, comprising vast swathes of deserts and dry grasslands.

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## Climate change and ill-health

A new research published by *The Lancet* medical journal talks of the various ways in which climate change has started affecting the health of people across the planet. 'The Lancet Countdown: Tracking Progress on Health and Climate Change' report says China, Bangladesh, India, and Indonesia are the countries that have registered the highest number of deaths linked to air pollution. Here is a look at the key numbers on how climate change affects health and labour productivity:

**46** — The global increase percentage in weather-related disasters since 2000.

**50** — Number of years of gain in public health undermined due to anthropogenic climate change.

**87** — The percentage of global cities that are in breach of WHO air pollution guidelines.

**129** — Total economic loss in billion dollars due to weather events in 2016.

**5.3** — The average fall in productivity (in %) for rural labour globally since 2000, due to rising temperatures.

**9,20,000** — Number of people globally out of the workforce in 2016 due to rising temperatures.

**4,18,000** — Number of Indian workforce out of jobs in 2016 due to rising temperatures.

**1,000,000,000** — Number of people likely to migrate within 90 years, due to a rise in sea level caused by ice shelf collapse.

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

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## A station in Himalayas to study climate change

Researchers setting up a monitoring system on a glacier in 2015. Photo: Special Arrangement

Glaciologists are studying Himalayan glaciers to understand the impacts of climate change in the polar climate and its connection to the Indian monsoon.

A team of glaciologists from the National Centre for Antarctic and Ocean Research, Goa, led by Paramanand Sharma, has already scaled over 4,500 metre to set up a research station on the icy terrain. The station would have several automated research facilities to detect the changes in glaciers, and glacial melt-water.

The scientists will be looking into various aspects of climate change and the present status and future stability of glaciers from the Himalayas. Scientists will be undertaking an integrated study on the health and fate of benchmark glaciers from the Chandra basin (part of the Indus river basin) in Lahaul-Spiti valley, Himachal Pradesh, Western Himalaya, he explained.

The newly established station would be one of the few high-altitude research facilities in the Himalayas that would help the scientists to study the region throughout the year. The inclement and challenging weather with extreme cold and windy conditions and the low availability of oxygen at the dizzy altitudes make the task of the scientists a challenging one, explained Thamban Meloth, the leader of the Cryosphere and Climate project funded by the Ministry of Earth Sciences.

The “effects of global warming is most perceptible and amplified in the Polar Regions — the Antarctic and Arctic — and the Himalaya. The ice sheets and glaciers also act as natural recorders of climate variability and change,” he said.

India has also been attempting to learn more about the climate change in Antarctica and its linkages to global and tropical climate system and to look into the evolution, current dynamics and possible future instability of selected Antarctic ice shelves using geophysical studies and modelling.

The bio-geochemical cycling within the glacial ecosystems of Antarctic, Arctic and Himalayan region, the dynamics and health of the Arctic glaciers, the dynamics and response of selected Himalayan glaciers to climate and other factors will also be studied.

The multidisciplinary project has researchers from glaciology, geology, biology, physics, and chemistry that helps in understanding the cryospheric systems in a holistic way.

Since the last decade, the NCAOR has drilled several ice cores in Antarctica, up to a depth of 100 metre. These cores represent the Antarctic climate variability and change during the past several hundreds of years. The Centre is also measuring the carbon cycling in Antarctic cryosphere as well as the stability of ice shelves in coastal Antarctica, in the face of a warming climate, he explained.

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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## UN says carbon emissions gap could affect climate target

Investing in cleaner technology can reverse the emissions trend. File | Photo Credit: [AP](#)

The UN Environment Emissions Gap Report 2017 warns that a big carbon emissions gap exists between the levels that can be achieved in 2030 with present climate commitments, and what needs to be done using set pathways to limit increases in global average temperature to less than 2° Celsius or a more ambitious 1.5° C by the year 2100.

The report says full implementation of the unconditional Nationally Determined Contributions (NDCs) and comparable action afterwards “could result in a temperature increase of about 3.2° C by 2100 relative to pre-industrial levels”, while full implementation of conditional NDCs would marginally lower that projection by about 0.2°C.

The breaching of the safe limits that is possible even with current climate commitments — the NDCs that form the core of the Paris Agreement — indicates that governments will need to deliver much stronger pledges to cut greenhouse gas emissions when they are revised in 2020, said the report released ahead of the 23rd Conference of the Parties to the UNFCCC in Bonn, commencing on November 6.

Fossil fuels and cement production account for about 70% of greenhouse gases, the report noted. The alarming number and intensity of extreme weather events in 2017, such as hurricanes, droughts and floods, add to the urgency of early action, it said.

The report reveals a large gap between targeted 2030 emission levels and those consistent with least expensive pathways to the 2°C and 1.5°C goals. The 2°C emissions gap for the full implementation of both the conditional and unconditional NDCs for 2030 is 11 to 13.5 gigatonne CO equivalent (GtCOe). The gap in the case of the more ambitious 1.5°C target is 16 to 19 GtCOe. Should the U.S. follow through with its threat to leave the Paris Agreement in 2020, the picture could become bleak.

The Paris accord pledges only a third of what is needed to avoid climate catastrophe, and adopting new technologies in key sectors, at investments of under \$100 per tonne of emissions, could cut them by up to 36 gigatonnes per year by 2030, which is more than sufficient to bridge the current gap.

A large part of the potential to close the emissions gap lies in solar and wind energy, efficient appliances and passenger cars, afforestation and stopping deforestation. These six factors hold a total potential of up to 22 GtCOe per annum, the report says. Strong action on plugging other greenhouse gases, such as hydrofluorocarbons, through the Kigali Amendment to the Montreal Protocol, and other short-lived climate pollutants such as black carbon, could contribute.

“One year after the Paris Agreement entered into force, we still find ourselves in a situation where we are not doing nearly enough to save hundreds of millions of people from a miserable future,” Erik Solheim, head of UN Environment, said in a media release.

CO emissions have remained stable since 2014, driven in part by renewable energy, notably in China and India.

This has raised hopes that emissions have peaked. But, the report warns that other greenhouse gases, such as methane, are still rising, and a global growth spurt could send CO emissions upward.

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EESL launches \$454 million 'Creating and Sustaining Markets for Energy Efficiency' project in partnership with the GEF

**EESL launches \$454 million 'Creating and Sustaining Markets for Energy Efficiency' project in partnership with the GEF**

**EESL's projects, under one of the largest funding by GEF till date, will mitigate 60 million tonnes of CO<sub>2</sub> eq**

**UN Environment's 'District Energy in Cities' Initiative already identified \$600 million of Energy Efficiency projects across 5 cities in India**

Recognizing India's efforts towards a low emission-economy and focusing on energy efficiency programmes, the Global Environment Facility (GEF) has now partnered with Energy Efficiency Services Limited (EESL), under Ministry of Power, for the project 'Creating and Sustaining Markets for Energy Efficiency', here today. The project will receive a composite funding of \$454 million comprised of the GEF grant of \$20 million and co-financing of \$434 million in the form of loans and equity, including a \$200 million loan from the Asian Development Bank (ADB). EESL further proposes **Energy Efficiency Revolving Fund (EERF)** for sustainable funding mechanism of energy efficiency projects in the country.

The EERF mechanism will support the '**proof of concept**' investments for the new technologies of super-efficient ceiling fans, tri-generation technologies & smart grid-applications and ultimately scaling up energy efficiency financing and programme development to help cover initial investment costs of identified energy efficiency programmes like street lighting, domestic lighting, five-star rated ceiling fans and agricultural pumps, in the country. This unique model will help in addressing the upfront risks of new technologies. Further, the accrued savings from these technologies can then be used to finance additional projects, which would allow capital to revolve as a sustainable funding mechanism.

The GEF project further brings together many technical and financing partners including United Nations Environment (UN Environment), Asian Development Bank (ADB) and *Kreditanstalt für Wiederaufbau* (KfW) which aims to mitigate 60 million tons of CO<sub>2</sub> eq (carbon dioxide equivalent), that will enable a total direct energy savings of 38.3 million GJ by 2022 and 137.5 million GJ by 2032. (1 GJ = 277.778 kWh)

Addressing the gathering, Shri Ajay Kumar Bhalla, Secretary, Ministry of Power, said that currently around two-thirds of total power generation capacity in India is based on fossil fuels. By 2030, India is committed to achieve 40% of the installed capacity based on clean energy sources. To achieve this target, it is imperative to create awareness in the citizens, especially among youth, to

encourage energy efficiency measures like use of electric vehicles, energy efficient building codes etc., he added.

Speaking on the occasion, Shri Anil Kumar Jain, Additional Secretary Ministry of Environment, Forests and Climate Change, said that the overall size of energy efficiency market in India is estimated to be \$23 billion. Initiatives like these seek to tap that market by implementing an innovative business model that is scalable, flexible, embraces different and emerging technologies and has incentives for all stakeholders.

Ms Naoko Ishii, Chairperson and CEO, GEF said that with the strong leadership of EESL and the Government of India, the penetration of these clean energy technologies will help India leapfrog to a more sustainable future while helping reduce local and global emissions.

Kenichi Yokoyama, Country Director of India Resident Mission of ADB, said that ADB will partner EESL to implement energy efficiency projects in India to facilitate sustainable growth by addressing climate change issues, boosting the economy and generating greater employment in the country.

Mr. Geordie Codville of the UN Environment said that the project is aimed at scaling up energy efficiency efforts to achieve India's Intended Nationally Determined Contribution (INDC) goals and ultimately the UN Sustainable Development Goals (SDGs).

EESL also has its sights set on district cooling systems which can reduce energy demand for cooling by up to 50 percent. EESL has partnered with **UN Environment's District Energy in Cities Initiative**, which has already identified \$600 million of projects across five cities in India.

GEF is an international partnership of 183 countries, international institutions, civil society organizations and the private sector that addresses global environmental issues. The funding announcement was made at the launch of the **GEF-6 fund** which supports two projects – 'Creating Markets for Energy Efficiency' and 'District Energy in Cities'.

Other dignitaries present on the occasion were Shri Raj Pal, Economic Advisor, Ministry of Power, Shri Saurabh Kumar, MD, EESL and other senior officers of the Ministry and PSUs under it.

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## Why we cannot breathe easy after the Lancet study on indoor pollution

Come winter, India, especially north India, gets all worked up about air pollution. For researchers, this also becomes the prime time to release reports on this critical issue. The latest one has come from the premier medical journal, Lancet, highlighting the need to have climate policies that curb air pollution. One of the key findings of the report is this: indoor air pollution was linked to more than 1.24 lakh deaths across India in 2015, which was higher than the number of deaths caused by pollution emanating from coal power plants (80,368 fatalities) and other industries (95,800 fatalities).

The Lancet report is a timely reminder that we ought to take indoor pollution much more seriously. For example, household pollution in India (especially in the rural areas) is caused by the use of polluting fuel sources such as wood, charcoal and animal dung. Women pay heavily for it. The elderly, too, suffer from this kind of pollution because they spend so much time indoors.

To tackle this challenge, authorities must spread awareness among people about the issue and the serious threat it poses to their health and wellbeing. This should help people in finding different ways of reducing exposure with better kitchen management and protection of children at home. Second, change in pattern of fuel use. At present, majority of low-income families rely solely on direct combustion of biomass fuels as this is the cheapest and easiest option available to them. This has to be rectified by promoting the use of cleaner energy sources. Third, there must be some modification in redesigning the cooking stove, like adding a chimney; and last, but not the least, improvement in ventilation.

Along with having direct health effects, pollution of any nature also has a long-term impact not just on the person but also on the goals of a nation. Can India meet the targets of Sustainable Development Goals — for example, Goal number 3 talks about “Ensuring healthy lives and promoting the well-being for all at all ages is essential to sustainable development” — without tackling pollution on a war footing?

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**ISA, EBRD ink pact on solar energy**

The International Solar Alliance (ISA) and the European Bank for Reconstruction and Development (EBRD) on Thursday signed a Joint Financial Partnership Declaration for the promotion of solar energy.

“India has been in the forefront of the 42-nation International Solar Alliance,” Finance Minister Arun Jaitley said while speaking on the occasion. “Our energy requirements are huge and [we] want to make optimal use of our new and renewable sources of energy.”

Earlier, interim Director General of the ISA Upendra Tripathy said that the collaboration between the ISA and the EBRD would also help funding of solar projects both in African and other countries.

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## Blackbuck conservation reserve to come up in U.P.

Blackbucks grazing in agricultural fields in the trans-Yamuna belt near Allahabad. Sanjay Kumarde03 buck

A wildlife conservation reserve dedicated exclusively to the blackbuck is coming up over 126 hectares in the trans-Yamuna region of Allahabad in Uttar Pradesh.

The State cabinet has approved a Blackbuck Conservation Reserve in the Meja forest division that is known for its rocky, undulating and arid terrain.

A herd of around 350 blackbucks is estimated to be inhabiting the region, senior government official Sanjay Kumar told *The Hindu*.

There are a few national parks and sanctuaries inhabited by blackbuck in the country, like the Velavadar Wildlife Sanctuary in Gujarat and the Ranibennur Blackbuck Sanctuary in Karnataka. However, there are not many conservation reserves exclusively dedicated to the antelope.

Mr. Kumar, who as a former District Magistrate of Allahabad, played a vital role in conceptualising the reserve, mobilising local cooperation and getting the project approved, says it is the “first ever conservation reserve” of any kind in U.P.

Blackbucks, known for their majestic spiral horns and coat colour contrasts, are found in grasslands and open forests.

They once ruled the open savannahs of north and central India, but are now restricted to just a few patches and habitats, primarily due to human population growth, ecosystem degradation and hunting.

The U.P. government evoked Section 36 A (1) and (2) of the Wildlife Protection Act, 1972, to declare the conservation reserve.

“The conservation of blackbuck can now be done in an effective way. It will also create awareness about biodiversity conservation and provide opportunities for people’s participation. Eco-tourism will be encouraged and locals will get opportunities for employment,” a government spokesperson said.

### Safe haven

The blackbucks can often be seen grazing in agricultural fields during the dry season in the trans-Yamuna belt in Meja and Bundelkhand. However, according to Mr. Kumar, who is also a wildlife photographer, the island of safe haven for the blackbuck within the designated reserve is a rocky terrain dotted with trees of dhak, mahua, neem and acacia. “The area boasts more than 200 species of birds and herbivores like blackbucks and bluebull [nilgai], and carnivores like jackals and striped hyena,” he said.

On the intervention of Mr. Kumar, while he was DM of Allahabad till recently, NTPC authorities at the Meja power plant sanctioned an amount of Rs. 1.20 crore to the forest department under their corporate social responsibility to support the work of the blackbuck habitat through construction of approach roads, waterholes and erection of retro-board signages. Mr. Kumar himself sanctioned funds for setting up solar pumps and establishing an interpretation centre for visiting tourists.

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**FM: India has pledged unequivocal commitment for furthering the cause of New and Renewable Energy;**

**FM: India has pledged unequivocal commitment for furthering the cause of New and Renewable Energy;  
International Solar Alliance (ISA) and the European Bank for Reconstruction and Development (EBRD) sign Joint Financial Partnership Declaration to deepen the cooperation in support of Renewable Energy.**

The International Solar Alliance (ISA) and the European Bank for Reconstruction and Development (EBRD) signed here today the Joint Financial Partnership Declaration in the august presence of the Union Minister of Finance and Corporate Affairs, Shri Arun Jaitley with an objective to deepen the cooperation in support of Renewable Energy.

ISA and EBRD have joined hands for promotion of Solar Energy. From ISA's side, Shri Upendra Tripathy, the Interim Director General ISA and on behalf of EBRD Ms. Nandita Parshad, Managing Director EBRD for Energy and Natural Resources signed the declaration. During the signing ceremony Shri Anand Kumar Secretary, Ministry of New & Renewable Energy, Government of India, H.E. Mr Alexandre Ziegler, Ambassador of France to India and Sir Suma Chakrabarti, EBRD President were also present.

Speaking on the occasion, the Union Finance Minister, Shri Arun Jaitley said that India has been in the forefront of the 42 nation International Solar Alliance. He said that India under the leadership of Prime Minister Shri Narendra Modi has pledged unequivocal commitment for furthering the cause of New and Renewable Energy since the Paris COP21 UN Climate Change Conference. Shri Jaitley said that our energy requirements are huge and want to make optimal use of our New and Renewable Sources of energy. The Finance Minister congratulated both ISA and EBRD for partnering with an objective to deepen cooperation in support of renewable energy. Shri Jaitley said that ISA has taken a giant leap forward to mobilise international support for investment in Solar Sector. He added that ISA need to firm-up such financial partnership deals with more Multilateral and Bilateral Donor Agencies in order to meet its stated objectives of getting better Technology; aiding easier costing to improve affordability of Solar Energy. The Finance Minister Shri Jaitley urged both the signing parties to go in for innovation of New and Dynamic Mechanism for credit enhancement and risk mitigation in solar sector. Citing the first Financial Partnership collaboration of ISA with the World Bank, Shri Jaitley urged that more and more multilateral and development banks should come forward and join hands with ISA in help fulfilling the objectives of massive and affordable deployment of solar among 121 ISA member countries.

Earlier, Shri Upendra Tripathy, the Interim Director General ISA informed that the ISA and EBRD have agreed to strengthen cooperation in pursuit of their shared goals of mobilising green energy financing. The collaboration will provide an opportunity to EBRD to support solar energy investment in the least developed countries especially in Africa. This will also help funding of solar projects both in African and other countries. He also stated that more such financial partnership deals shall be signed by the ISA in near future to achieve its mandate in a proper and effective manner.

Speaking on the occasion, Sir Suma Chakrabarti, EBRD President stated that this is a very important agreement for the EBRD, which has always been eager to share its expertise with new partners and also to learn from them. He said that with the ISA, we share the vision of sustainable development and of green energy, which ultimately benefits the global economy.

ISA is working for deployment of over 1000 GW of solar energy and mobilising more than US\$ 1000 billion into solar energy by the year 2030. Similarly the European Bank for Reconstruction and Development (EBRD) is keenly interested to increase its green financing portfolio to 40% of its annual business. To this effect the EBRD launched Green Economy Transition Approach in 2015. Till date, the EBRD has invested more than €4 billion directly in renewable energy, supporting projects in over 20 countries and funding more than 6.5 GW of capacity.

The International Solar Alliance is an initiative jointly launched by the Prime Minister Shri Narendra Modi and the President of France on 30th November 2015 at Paris, in the presence of the Secretary General of the UN, on the side lines of COP21 UN Climate Change Conference. The main objective of ISA is to undertake joint efforts required to reduce the cost of finance and the cost of technology, mobilize more than US \$ 1000 billion of investments needed by 2030 for massive deployment of solar energy, and pave the way for future technologies adapted to the needs of 121 countries lying fully or partially between the Tropics. So far 43 countries have signed the Framework Agreement of the ISA, and out of which 14 have also submitted the Instrument of ratification to the depository i.e. Ministry of External Affairs, Government of India. ISA will be the first international inter-governmental treaty based organization to be headquartered in India.

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**When we pay attention towards environment, there won't be any tension about future of mankind: Vice President**

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### **Inaugurates International Conference on Environment – 2017**

The Vice President of India, Shri M. Venkaiah Naidu has said that when we pay attention towards environment, there won't be any tension about the future of mankind. He was addressing the gathering after inaugurating the International Conference on Environment - 2017, organized by the National Green Tribunal, here today. The Chief Justice of India, Justice Dipak Misra, the Minister of Science & Technology, Environment, Forest and Climate Change and Earth Sciences, Dr. Harsh Vardhan, the Chairperson of the National Green Tribunal, Shri Swatanter Kumar, Justice of the National High Court of Brazil & Secretary General of the UN Environment International Advisory Council of Environmental Justice, Justice Antonio Herman Benjamin, the Attorney General for India, Shri K.K. Venugopal and other dignitaries were present on the occasion.

The Vice President said that the GDP is important but it is even more important to improve human lives. He further said that quality of life is the ultimate test of all our development efforts. Development has very little meaning if it doesn't lead to health, happiness and harmony, he added.

The Vice President said that he has often confronted this question of what takes priority - environment protection or development. He further said that he can say confidently that there is no intrinsic contradiction between the two; all that is needed is to check over exploitation.

The Vice President said that each wing of our polity has a distinct role to play. He further said that the legislatures frame laws that address the concerns of the people, the executive effectively implements and delivers. The judiciary ensures that the laws are interpreted and implemented both in letter and spirit, he added.

The Vice President said that rapid economic growth and intensified industrialization has also led to increasingly unhealthy, polluting and carbon-intensive lifestyles. He further said that we have to adopt a better way of measuring growth, which is more holistic and reveals a truer picture of progress and quality of life and not merely economic growth. We have to invent and innovate methods to maintain economic growth and bring holistic prosperity without adverse impacts on the environment, he added.

Following is the text of Vice President's address:

"It gives me great pleasure to be a part of this august gathering. I must take this opportunity to appreciate the efforts of the National Green Tribunal (India's foremost Environmental Justice Court), United Nations Environment Programme (UNEP), the

Asian Development Bank, the Ministry of Environment Forests & Climate Change and the Ministry of Water Resources, River Development & Ganga Rejuvenation in successfully organising such events in the past at International and National levels and for the present event- World Conference on Environment, November 2017.

These events serve as forums for discussion on wide ranging environmental issues of universal concern. This is the second International Conference on the subject this year and fourth International Conference on Environment being organised under the aegis of NGT.

Brothers & sisters, we have had decades of deliberations on international environmental consciousness, jurisprudence and laws. We have progressed from denial to acceptance of global warming. We have moved from non-voluntary non mandatory contributions to voluntary commitments to mitigate the threat of climate change. Many countries have started taking proactive measures for protecting the environment.

We all are realizing a little slowly, a little painfully that we have been recklessly damaging our environment. Wisdom is slowly dawning upon all countries that our existence is at stake and we have to act fast to avoid a catastrophe.

At this point, I am reminded of the words of Mahatma Gandhi. He stated:

*“The earth, the air, the land and the water are not an inheritance from our fore fathers but on loan from our children. So we have to handover to them at least as it was handed over to us”.* These times call for collective intervention by the international community for pushing the environmental agenda and working on a meticulously charted sustainable development path of keeping global warming well below 2°C, while pursuing efforts to limit it to 1.5°C.

Economic Growth should not be seen as independent of environment. What nations needs to work together for, is sustainable economic growth.

Many countries around the world call our planet the Mother Earth. Many religions have given us a rich heritage of thoughts and ideas on living harmoniously with nature. In India too, we have a rich repertory of hymns and practices that celebrate, worship and preserve nature. For instance, Bhu-Suktam in Atharva Veda written almost 20 centuries ago, celebrates nature and seeks to see it protected and preserved.

*“O Mother Earth, may your hills and snow clad mountains spread their coolness, may your forests spread delight. On your firm foundation which is **unconquered, unslayed and unbroken**, I stand firm.”* Destruction of trees is frowned upon. As Prophet Mohammed said “He who cuts a lote-tree, Allah will send him to Hellfire”. In the Hindu tradition, all trees are sacred, all living and non-living creatures are valued and treasured.

The seers have said “Ishavasyam Idam Sarvam” (The whole universe is divine and sacred).

These well-springs of our collective heritage need to be revived. We must not only recollect some of the best thoughts from our past but also shape our present in line with those noble ideals. Or else, our future might turn to be dark and bleak.

The signs of a catastrophic future are already actually here for us to experience. We do not have clean air and clean water in many cities. Our quality of life is constantly declining.

GDP is important but it is even more important to improve human lives. Quality of life is the ultimate test of all our development efforts. Development has very little meaning if it doesn't lead to health, happiness and harmony. When we pay attention towards environment, there won't be any tension about the future of mankind

Having served in the Government of India for nearly four decades, I have often confronted this question of what takes priority- environment protection or development. I can say confidently that there is no intrinsic contradiction between the two; all that is needed is to check over exploitation. As Gandhiji had said, Nature provides enough to meet our needs but cannot provide for our greed. The challenge is huge. However, if we have the political will, the legal frame work and an able Judiciary, we can achieve results.

Each wing of our polity has a distinct role to play. The legislatures frame laws that address the concerns of the people, the executive effectively implements and delivers. The judiciary ensures that the laws are interpreted and implemented both in letter and spirit.

I do hope each of us in each of these spheres of responsibility, act in unison with a common objective but within the clearly defined parameters delineated by the Constitution.

The environmental change is occurring at a much faster rate than previously thought. These threats are population growth, rapid urbanization, rising levels of consumption, desertification, land degradation and climate change have combined to leave countries suffering from severe water scarcity. These highly disturbing trends are also making it increasingly hard for the world to feed itself.

To speak of Asia Pacific region, the rapid and much desired economic growth has left very huge impact on the natural resources and ecosystems. Worsening air quality, extreme water scarcity and humungous waste generation are threatening human and environmental health.

The region continues to be the world's most disaster prone region having a 41% share of all natural disasters reported over the last two decades, which also accounted for 91% of

the world's deaths attributable to natural disasters in the last century.

In Southeast Asia, the average area deforested annually is more than 1 million hectares, resulting in the release of hundreds of millions of tonnes of carbon dioxide every year between 2005 and 2015.

The contamination of water sources by human and industrial waste, including pharmaceutical and personal care products, is a major problem in the region.

It is estimated that about 30% of the population uses contaminated drinking water. Water-related diseases and unsafe water contribute to 1.8 million deaths annually in the region. Unsafe sanitation, disposal of untreated wastewater and runoff of agrochemicals are responsible for a rise in water-borne diseases, especially in Asia's population-dense urban areas.

Uncontrolled dumping, which is still the main waste disposal method in the region, is also a major source of disease. In Mumbai, for example, about 12% of total municipal solid waste is burned either openly on the streets or in landfills.

Rapid economic growth and intensified industrialization has also led to increasingly unhealthy, polluting and carbon-intensive lifestyles.

Global Warming is not merely a concern due to increased temperatures. It is displacing people out of their homes, where their ancestors and forefathers have dwelled for centuries, in search of livelihood, food and shelter due to altered geographic and climatic conditions.

According to WHO, approximately 12.6 million deaths are attributable to unhealthy environments, i.e. nearly 1 in every 4 death recorded globally. Out of this 8.2 million deaths have resulted from non communicable diseases like cancers, strokes, heart problems, chronic respiratory diseases, etc. Regionally, the low and middle income countries in South-East Asia and Western Pacific Region are the worst hit.

Distinguished speakers and audience, I would like all of us to reflect on certain key issues and seek solutions to our current predicament.

1. Is it time for the World to formally adopt a better way of measuring growth, which is more holistic and reveals a truer picture of progress and quality of life and not merely economic growth?
2. Can we move beyond the boundaries of countries and adopt a regime of Global Civics and World Governance, in matters which are of great concern to the entire humanity?
3. Is it time to move towards an eco centric approach, where the role of human race is

not merely that of stewardship, but that of Earth Trusteeship?

4. Can we discover, invent and innovate methods to maintain economic growth and bring holistic prosperity without adverse impacts on the environment?

We must find answers to these questions; and initiate swift action.

Let us not wait for the disaster to strike.

We have to combine knowledge and wisdom with concrete action.

We must define our roles and be watchful trustees of our natural wealth.

We must enhance awareness and proactively involve all sections of the population.

The agenda of the Conference is quite timely. I look forward to your fruitful deliberations and eagerly await your implementable recommendations.

I wish you all a successful conference!

Jai Hind!"

KSD/BK

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## IIT Guwahati uses superhydrophobic cotton to remove oil-spill

“The efficiency of absorption is very high - above 2,000 weight percentage for both heavy and light oils,” say Uttam Manna (left) and Adil Majeed Rather

Removing up to 95% of oil-spill of different densities — light and heavy oils — repetitively at least 100 times using superhydrophobic (extremely water repelling) medical cotton has been demonstrated by a team of researchers led by Dr. Uttam Manna from the Department of Chemistry at the Indian Institute of Technology (IIT) Guwahati.

The researchers turned the medical cotton, which is extremely water absorbing, into a superhydrophobic (water contact angle of 157 degrees) material and used it for absorbing oil both in air and under water. The efficiency of absorption is very high — above 2,000 weight percentage for both heavy and light oils. This translates to one gram of the superhydrophobic cotton absorbing 20 grams of either heavy or light oils. The results were published in the *Journal of Materials Chemistry A*.

The absorbed oil can be recovered through physical compression. The superhydrophobicity remained intact even when the cotton was manually compressed up to 1,000 times and subjected to other physical manipulations.

“The other important characteristic is its ability to absorb oil from three complex phases — light oil that floats in the air–water interface, sediment oil that settles at the bottom as it is heavy, and from water-in-oil emulsion,” says Dr. Manna. The superhydrophobic property was intact even when exposed to UV light for ten days, the material was able to absorb oil from river and sea water, and extremely acidic (pH 1) and alkaline (pH 12) water.

### Treating emulsions

While the cotton is able to efficiently absorb oil from water-in-oil emulsion, it is inherently incapable of removing oil from oil-in-water emulsion. In the case of water-in-oil emulsion, very little of water is present in oil and so it is easy to remove all the oil leaving the water behind. But in the case of oil-in-water emulsion there is very little of oil present. “Since there is more water present, the superhydrophobic material does not come in contact with oil and so will be unable to remove oil efficiently from oil-in-water emulsion,” clarifies Adil Majeed Rather from the Department of Chemistry at IIT Guwahati and the first author of the paper.

### Filtering oil

The researchers were able to achieve selective filtration of oil under water against gravity in the case of heavy oil that has settled at the bottom. To do this, the researchers plugged one end of a tube with the superhydrophobic cotton and dipped the tube so it comes in contact with the oil.

“Once in contact with the sediment oil, the cotton absorbs the oil and due to hydraulic pressure the oil gets removed from the cotton and accumulates inside the tube,” says Dr. Manna. “So there is no need to apply pressure to collect the sediment oil from cotton.”

In the case of gravity-driven filtration, heavy oil mixed with water is poured into a funnel, the tip of which is closed with the superhydrophobic cotton. The heavy oil settles to the bottom and comes in contact with the cotton which filters it leaving the water in the funnel. “This method can be used in industry to remove the oil component from water before letting out the waste water,” says Rather.

## Cotton processing

The hydroxyl group seen in cotton is first modified with branched poly(ethylenimine (BPEI) to make it functionalised with amine group. A nanocomplex is prepared separately by mixing BPEI with dipentaerythritol pentaacrylate (5Acl) and added to the functionalised cotton. The nanocomplex provides essential topography and makes the cotton chemically reactive, thus making it possible to further optimise the appropriate chemistry of the material. The nanocomplex reacts with amine-based small molecules of choice to make the cotton hydrophobic to varying degrees.

“We can tune the hydrophobicity — from hydrophilic to superhydrophobic — by using different amine-containing small molecules,” Dr. Manna says. “It is a green synthesis without the use of any catalyst or hazardous material. The process of making superhydrophobic cotton is a simple three-step process and scalable.”

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**Need to focus on planning and design for sustainable and clean urban mobility: Vice President**  
**Need to focus on planning and design for sustainable and clean urban mobility: Vice President**

**Inaugurates 10th Urban Mobility India Conference and Exhibition, 2017 & CODATU XVII Conference**

The Vice President of India, Shri M. Venkaiah Naidu has said that there has to be an increased focus on planning and design for sustainable and clean urban mobility. He was addressing the Inaugural Session of 10th Urban Mobility India Conference & Exhibition, 2017 and CODATU XVII Conference, in Hyderabad today. The Minister of State for Housing and Urban Affairs (I/C), Shri Hardeep Singh Puri, the Deputy Chief Minister of Telangana, Shri Shri Mohammad Mahmood Ali, the President CODATU, France, Mr. Dominique BUSSEREAU, the Ambassador of France to India, Mr. Alexandre Ziegler and other dignitaries were present on the occasion.

The Vice President said that urbanisation is one of the realities of the 21st Century, which is called as urban century. He further said that the 2011 Census has clearly shown that urbanization in India is gaining momentum where every third person is living in urban areas. The current urbanization patterns are causing unprecedented challenges to urban mobility systems, he added.

The Vice President said that urban transport accounts for about 25% of the greenhouse gases worldwide. He further said that it is also the major cause of local air and noise pollution in cities which cause ill health. The traffic congestion created by the transportation systems is responsible for significant economic and productivity costs for commuters and transporters, he added.

The Vice President said that increased motorisation in the Indian cities have caused an ever increasing trend of congestion, pollution, increased travel time, thus producing negative externalities. He quoted Lewis Mumford, the great American urban architect and historian, as saying, "Building more roads to prevent congestion is like a fat man loosening his belt to prevent obesity."

The Vice President said that India has made huge strides in provision of public transport systems in many cities. He further said that Metro rail has seen a rapid growth in many cities with Delhi taking the lead and Bus Rapid Transit System (BRTS) has also seen a phenomenal growth with around 250 kms operational and around 250 kilometers under construction in various cities. He quoted Mr. Enrique Penelosa, the present mayor of Bogota, as saying, "A developed country is not where the poor use cars but where the rich use public transport."

The Vice President said that promoting Non-Motorized Transport infrastructure for walking and bicycle not only acts as last mile connectivity for well-established public transport systems but also has a positive impact on health. He further said that in the pursuit of sustainable mobility, promoting walking and cycling is very important. Need for more pedestrian paths and bicycle

tracks to promote healthy lifestyle, combat diabetes & obesity and reduction pollution, he added.

The Vice President congratulated the Government of Telangana for the implementation of the Hyderabad Metro Rail Project which, on completion, will become the World's largest Metro Rail Project to be implemented in Public Private Partnership mode. He conveyed his best wishes to all in their efforts to create better mobility systems for better quality of life in urban centres.

Following is the text of Vice President's address:

"I am delighted to be with you today at the inaugural session of the 10<sup>th</sup> Urban Mobility India Conference and Exhibition. It is heartening to know that this event is being organized by the Ministry of Housing and Urban Affairs, Government of India in partnership with the Government of Telangana. CODATU, an organization based in Paris, France, and involved in urban mobility, is also holding its 17<sup>th</sup> conference in conjunction with this conference.

This is a flagship annual event of the Ministry of Housing & Urban Affairs, Government of India and has played a significant role in churning of ideas and exchange of knowledge in the field of urban mobility over the years.

Urbanisation is one of the realities of the 21st Century, which is called as urban century. The 2011 Census has clearly shown that urbanization in India is gaining momentum where every third person is living in urban areas. Urban sector's share of country's GDP is expected to increase from its current 66 percent to 75 percent by 2031. The current urbanization patterns are causing unprecedented challenges to urban mobility systems.

Despite the increasing level of urban mobility infrastructure worldwide, access to places/activities and services has become increasingly difficult in the urban areas. For decades, most of the countries have experienced rapid urban growth coupled with increase in use of motor vehicles. Unplanned urbanization has, in many cases, led to urban sprawl and thus generating even higher demand for motorized travel. This has resulted in a range of economic, social and environmental challenges.

Urban transport accounts for about 25% of the greenhouse gases worldwide. It is also the major cause of local air and noise pollution in cities which cause ill health. The traffic congestion created by the transportation systems is responsible for significant economic and productivity costs for commuters and transporters. These challenges are more pronounced in cities of developing countries. These get further compounded by the fact that in the coming decades 90 % of the global population growth will take place in the cities of these countries. These cities are already struggling to meet the increasing demand for investment in transport systems.

In many cities of the world, the mistake of drawing a similarity between mobility and transportation has fostered a tendency towards increasing motorization and a propensity to extend the network of urban roads.

India has also seen a similar situation. Increased motorisation in the cities have caused an ever increasing trend of congestion, pollution, increased travel time, thus producing negative externalities. With regard to increasing the road length, I am reminded of a famous quote by Lewis Mumford, the great American urban architect and historian, who said, “**Building more roads to prevent congestion is like a fat man loosening his belt to prevent obesity.**”

Needless to say, there has to be an increased focus on planning and design for sustainable and clean urban mobility. Mobility is not only a matter of developing transport infrastructure and services. It is also about overcoming the social, economic, political and physical constraints of movements. Recognizing mobility as an entitlement implies a focus on people, and removing the obstacles preventing people from reaching destinations.

**Public Transport:** While private motorisation cannot be wished away completely, providing an affordable, comfortable, reliable and safe public transport can reduce the demand of private motorised vehicles. Global statistics demonstrate that the trips to work made in the world are around 30% on public transport. In India, the average share of public transport in 2011 was 30%. This will probably reduce to 22% by 2021. The lack of affordable and accessible public transport systems has led to the proliferation of informal operators, such as private minibus and microbus services. In some cities, informal carriers are the only forms of public transport available.

High capacity public transport systems are needed to reduce the negative externalities like air and noise pollution, accidents and greenhouse gas emissions. They also provide inclusive access to low income groups.

It is heartening to note that India has made huge strides in provision of public transport systems in many cities. Metro rail has seen a rapid growth in many cities with Delhi taking the lead. Bus Rapid Transit System (BRTS) has also seen a phenomenal growth with around 250 kms operational and around 250 kilometers under construction in various cities. I would like to share with you a quote by Mr. Enrique Penelosa, the present mayor of Bogota, who said that “**A developed country is not where the poor use cars but where the rich use public transport.**”

**Last Mile Connectivity:** For high capacity public transport to become popular, it is important to provide the last mile connectivity. If the commuter does not get comfortable mode for reaching the metro station or the bus stop, he is likely to use his personal vehicle.

**Non-Motorised Transport:** Promoting Non- Motorized Transport infrastructure for walking and bicycle not only acts as last mile connectivity for well-established public transport systems but also has a positive impact on health. In the pursuit of sustainable mobility, promoting walking and cycling is very important. Development of pedestrian pathways and dedicated cycle tracks will go a long way in not only promoting sustainable urban transport but also improving the overall ecosystem of the public transport in the city. Need for more pedestrian paths and bicycle tracks to promote healthy lifestyle, combat diabetes & obesity and reduction pollution.

**Intermodal Integration:** Integration between various modes of transport provides seamless connectivity for the commuters. This may include joint (transfer) stations, coordinated scheduling, joint fares, single ticket or common mobility card and combined public information activities. Basically integration can occur at three levels namely physical, operational and fare integration. Physical integration allows for close proximity of stations facilitating direct connection from one mode to another usually including transfer facility at stations. Cities in Western Europe have taken the lead in facilitating inter modal integration especially between public and non-motorised transport. Kochi metro has introduced a common mobility card which can be used in the metro, bus as well as in the water transport system. Other metro systems like Bangalore metro, Nagpur Metro & Lucknow metro are also adopting similar common mobility card.

**Integration of Land Use and Transport Planning:** Development of a sustainable transportation system starts with the organization of the urban space with the main objective of reducing the need for travel and the length of travel distance. Neglecting the connection between land use and mobility has created the urban sprawl as can be seen in many cities. An integrated planning approach will yield positive results. One strategy for achieving this can be through Transit Oriented Development (TOD).

**Transit Oriented Development (TOD):** Transit Oriented Development is a concept which emphasizes mixed and dense development around the high capacity public transport stations. By concentrating a mix of pedestrian oriented development around the metro or BRT stations, residents are more likely to catch a metro or a bus for out-of-neighbourhood trips and walk or bicycle for within the neighbourhood trips. Integrating public transport systems and the built environment makes both the public transport system and the city successful. I am glad to note that Ministry of Housing and Urban Affairs have formulated a National Transit Oriented Development Policy which can be used to formulate city specific TOD policy. With the increasing metro rail and BRT systems, cities should be encouraged to adopt the TOD policy.

**Innovative Financing and Land Value Capture:** Investment requirements in high capacity Public Transport Systems can be huge due to the large gap in demand and capacity. Therefore it is important to explore the possibility of innovative means of financing. Issuance of bonds and financing of one corridor through land value capture by Bangalore metro is an example how agencies are trying to leverage on the innovative means of financing. The Land Value Capture Policy recently issued by the Government of India can be adopted by various agencies with help and facilitation by the respective city and state governments.

**Public Private Partnership:** In recent times, more and more cities have chosen the Public Private Partnership (PPP) model for development and implementation of urban transport projects, to leverage both public and private resources and expertise. Some of the cities which have tried the PPP model in some form or the other in either provisioning of the metro rail or other high capacity public transport systems are Bangkok, Kuala Lumpur, Manila, Buenos Aires, Rio de Janeiro, Singapore, Hong Kong, and London.

**I would like to congratulate the Government of Telangana for the speedy implementation of the Hyderabad Metro Rail Project which, on completion, will become the World's largest Metro Rail Project to be implemented in Public Private Partnership mode.**

A holistic and integrated approach to urban land use and transport planning and investment is needed if urban areas are to become socially, environmentally and economically sustainable.

Many of the environmental challenges in the urban transport sector are rooted in its reliance on the non-renewable fossil fuel to propel private motor vehicles. There is a need to initiating a shift to clean fuels, retiring old polluting vehicles, strengthening mass transportation, and promoting use of electric vehicles, ensuring parking spaces before registering a car at-least in large metro cities.

Better urban planning and a modal shift to public transport along with long-term transport plans are necessary to facilitate the growth of cities in a manner that does not damage the environment. Technical, fiscal and policy actions are needed to direct transport growth towards the path of sustainability. Urban mobility is finely woven into the spatial, social, economic, political and environmental fabric of cities.

I would reiterate that urban transport is one of the key elements of urban infrastructure that calls for urgent action. The future of transportation in lies in sustainable smart mobility and eco-friendly alternatives. The planners, city authorities and civil society have all to join the mission to make our cities a better place to live in.

Urban Mobility India Conference provides such a forum for stakeholder participation in understanding various contemporary issues of urban transport, benefit from the experiences of international and domestic experts, get knowledge about the best practices globally and interact with the peer groups from different organizations.

I convey my best wishes to all of you in your efforts to create better mobility systems for better quality of life in urban centres.

Thank you! Jai Hind!"

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KSD/BK

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## Hotspots of rattan found in Western Ghats

### A rattan clump

Scientists have discovered that non-protected areas near the Agastyamalai Biosphere Reserve, Silent Valley-Mukurthi National Parks and Coorg-Wayanad in the Western Ghats are hotspots of rattan or cane (light, flexible climbing palms) species. Urgent conservation attention in the face of threats including habitat loss and excessive harvesting would be critical here, warns a study published in *Plant Diversity*.

More than half a million people are directly employed in harvesting and processing rattan in Southeast Asia, including India. Though unsustainable harvests driven by rising demands are decimating rattan stands (clumps) worldwide, how are the rattans of the Western Ghats faring?

### Distribution

Using location records from field studies and literature, scientists at Bengaluru's Asoka Trust for Ecology and Environment (ATREE) and Pune's Indian Institute for Science Education and Research (IISER) first mapped the distribution of all 21 endemic rattan species across the Western Ghats. At 19, the Western Ghats in Kerala and Tamil Nadu have the highest number of species.

The team then designated 'conservation values' (CV) for each species based on aspects such as the area it is found in and the commercial harvesting pressure it faces. Three species (including *Calamus neelagiricus* which is found only in Kerala's Silent Valley National Park) showed very high CV; the authors suggest that these be classified as endangered (based on categories developed by the International Union for the Conservation of Nature) while three others be categorised as near-threatened and 15 as vulnerable for prioritising conservation action.

Utilising niche modelling to predict areas of high rattan diversity, the scientists also identified three rattan hotspots in the Western Ghats. — near the Agastyamalai Biosphere Reserve, Silent Valley-Mukurthi National Parks and Coorg-Wayanad regions. All these areas fall outside existing protected area networks, where excessive unsustainable harvests could be a problem. Loss of tropical forest tracts to coffee and tea plantations — as is common in the Coorg-Wayanad complex — is also an issue, say the scientists.

"Forest department managers need to encourage farmers to establish large-scale plantations in private lands and develop agro-forestry systems as well," says co-author Aravind N.A. (ATREE). "The Forest Department has already established a few rattan plantations in some districts... this needs to be replicated at a wider scale where the demand for rattan is high. These extractive reserves could meet the requirements of communities that depend on these resources," says ATREE's G. Ravikanth, another co-author.

Life is not always a serious affair, there is lightness, humour and nonsense, too, which we enjoy

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## 'Climate change due to humans'

The United States government on Friday released a major scientific report that says climate change is “extremely likely” to be caused by human activity and will get worse without major cuts to carbon emissions.

The findings of the federally mandated report were approved by the White House, even though they are starkly at odds with the position of President Donald Trump, who has labelled global warming a Chinese hoax and named fossil fuel ally Scott Pruitt to head the Environmental Protection Agency.

### Part of larger report

The Climate Science Special Report spans more than 600 pages and is part of a larger report known as the Fourth National Climate Assessment, which is being issued in draft form for public comment.

Based on “a large body of scientific, peer-reviewed research,” global annually averaged surface air temperature has increased by about 1.8 Fahrenheit (1 degree Celsius) over the last 115 years (1901-2016), it says.

“This period is now the warmest in the history of modern civilization,” said the report, available at [science2017.globalchange.gov](http://science2017.globalchange.gov).

Since the last report of its kind was issued in 2014, “stronger evidence has emerged for continuing, rapid, human-caused warming of the global atmosphere and ocean,” the text said.

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## Marooned once more: on Chennai's need for flood management

Chennai's date with a strong northeast monsoon ought to be a cause for all-round relief since the water fortunes of more than eight million residents of the metropolitan region depend on this weather system. Yet, the torrential rains in the meteorological sub-division, [exceeding the normal by 93%](#) in the period of four days from November 1, [left tens of thousands of citizens in a state of despair](#). Flood waters marooned them in the rapidly growing suburban housing clusters, with many having to flee to safer places fearing a repeat of the [deluge of 2015](#). While there have been efforts to alleviate immediate misery through the distribution of relief material in some places, the larger issue of how the city deals with flood and drought cycles remains unaddressed. Chennai is a lower elevation coastal city with global aspirations, and very high population density. Scientific management should have ensured the preservation of the many traditional lakes and canals that existed in the city's core a century ago to absorb the intense downpour of about 1,300 mm of rain, most of it in an annual window of a few weeks. Successive governments have allowed the mindless draining of wetlands and their conversion into expensive real estate, with catastrophic consequences. Regrettably, the great flood two years ago, which left many dead and families impoverished, has not yielded a policy course correction. If the Tamil Nadu government is serious about putting Chennai on the global map of economically viable cities, it must move beyond the creation of weak storm water drains to an integrated flood management system.

Chennai and its sprawl extending to two neighbouring districts should return to the traditional wisdom of creating tanks and lakes for water storage, and rejuvenating old silted ones, in order to harvest the floods and replenish depleted groundwater. The finding from one study in 2013 shows that 27 tanks have totally disappeared and another 400 have lost almost their entire capacity. This underscores the need to revive such natural sponges. Inviting the community to monitor the health of the tanks and lakes can keep out encroachers, who are often protected by patron-politicians. Yet, such measures can work only when the deficit of good housing and civic infrastructure is actively addressed. Tamil Nadu, one of India's most urbanised States, has a poor record in this area, resulting in fragile slums. New housing has mushroomed in Chennai's suburbs, where municipal bodies are mired in incompetence and corruption. It is these localities with little infrastructure that have borne the brunt this year. Looking ahead, the priority for the State should be to integrate flood management using expert opinion and public consultation. Remedial structures should be built for existing localities. Poor waste management is exacerbating the problem by blocking drains, canals and lakes, while ill-planned road projects are cutting off flood flows. These have to be immediately addressed. The tendency to treat floods and drought as events to dole out patronage is preventing Chennai from forging robust solutions.

Revving up infrastructure spending is necessary, but not sufficient

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## Making a case for microgrids

On 30 July 2012, one-fourth of Bharat was plunged into darkness. A blackout that lasted for two days affected all of North and East India and exposed a severe deficiency in the distribution infrastructure and demand management system in the Indian power sector.

While we as a nation mercifully don't face such major blackouts on a daily basis, the truth is electricity access in India is a case of death by a thousand cuts. Our towns and villages bear the brunt of this poor distribution infrastructure, which is characterized by low voltages, and frequent power cuts, often lasting more than four hours a day.

Employing localized microgrids and reducing dependence on central infrastructure might be the solution to poor distribution infrastructure. And if you asked the folks in Meerwada, Madhya Pradesh, one of the few bright spots North of the Vindhyas on those dark days, they'd agree and point to the small solar microgrid that kept their homes lit and fields humming.

Most of Bharat that lives outside cities suffers from power outages for two big reasons—underestimating demand, and poor balancing of demand and supply. The power infrastructure outside urban centres has been built under the simplistic assumption that a rural household consumes one unit of electricity per day, which, compared to the national average of 12-15 units, is a gross underestimation.

It's a problem that's only getting worse with the nation aspiring to better living standards and creating economic opportunities.

It's the infrastructure-scale equivalent of plugging a geyser into a regular (non-heavy duty) power socket and then wondering why the fuse blew. Lower demand assumption results in infrastructure built for lower capacity that ends up operating at heavy loads during peak hours.

This reduces their operational life and efficiency, increasing events of grid failure. Mismatched demand and supply can also muddle regional and central level planning and result in more power outages.

Distributed local power generation using solar or wind energy could improve the quality of power and provide flexibility in local grid planning and operations for areas outside urban centres. These could be communities or even commercial operations like transportation hubs, warehouses, cell towers or even a substation itself. Distributed generation, otherwise called microgrids, have been around for some time now. But the lack of commercial feasibility has kept them from going mainstream.

However, in the past few years, the cost of solar power has dropped significantly, making solar microgrids increasingly more viable, and bringing with it an ecosystem full of opportunities. It is worth examining these ecosystem building trends and the resulting opportunities in further detail.

First, scale and economics are starting to make sense. Microgrids are commercially viable when two key conditions are met, a threshold scale of 50kW peak power, and customers that are willing to pay higher retail power costs of Rs5 per unit vs. Rs3.25 for the lowest tariff slab. The proximity of a ubiquitous commercial consumer like a mobile tower can help address both conditions.

Commercial consumers usually demand more power and pay more for it, anywhere between Rs6 and Rs11 per unit. Furthermore, consumers in existing microgrids are willing to pay up to Rs6 per unit for reliable power supply, as is evident from projects in Uttar Pradesh, Bihar and Madhya

Pradesh.

Second, the intermittency of solar power is getting addressed. Solar power microgrids cannot operate in isolation and need to be connected to the main power grid as solar power is only available during the day. Microgrids will be commercially successful in those areas with basic grid connectivity, but that experience low voltage and power outages.

Power outages in semi urban and rural areas usually occur around two peak consumption periods—one that occurs a little after noon and one that occurs at dusk. Solar powered microgrids can solve for one of the two peak outages. The addition of storage which currently costs Rs10 per unit, can provide for the second peak. Storage costs are on a downward trend and can drop to a third of today's cost in 5-6 years.

Last, positive trends in policy, economics, and community acceptance is making it easier to solve for land availability. A 50kW solar microgrid can power 100 households and needs less than half-an-acre of land. The key is choosing a suitable consumer—either a community that is already connected to the grid and can lease private land or use community held land around panchayat offices, or a commercial entity with access to land. Larger entities with remote land holdings across India like the Indian Railways, can also deploy microgrids.

That said, an ecosystem of services business needs to be built for micro grids to achieve their true potential. Microgrids, unlike utility scale grids, are owned by small end-users. This creates the need for three types of services. First, the initial set up of the microgrid will require small-scale PMCs (project management companies).

Second, these assets will require operation and maintenance that can be provided by the same type of service provider that serve utility scale solar plants. Finally, we'll need a services company to manage integration, dispatch, and load balancing of several distributed power plants into the grid.

A financing ecosystem to both fund capex and working capital is a key need. The 50kW solar microgrid serving 100 households will need a capex of approximately Rs60 lakh. The payback period for this microgrid will be about 10 years, which is in line with utility scale infrastructure. Thus such grids can avail project finance debt just like other infrastructure projects. So if 80% of Rs60 lakh can be serviced through debt, the user community of a 100-households will have to pay about Rs12,000 per family. This cost structure of the microgrid is more than worth it, given it costs the government Rs30,000 per person to provide electrification and only solves for half of the problem.

Every trend concerning solar power points towards a future where every nook and corner of the nation will be able to power itself. In the final part of this three-part series, we will analyse the services and financing opportunities that are crucial to enabling this bright and sunny future.

*Vaidhehi Ravindran and Vignesh Nandakumar are venture capital investors at Aspada Investment Advisors. The Bharat Rough Book is a weekly column on building businesses for the mass markets represented by the middle of India's income pyramid.*

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**“India considers Climate Change as a major Threat to Collective being, wants to Play a Positive and Constructive Role in Combating it”: Dr. Harsh Vardhan**

**“India considers Climate Change as a major Threat to Collective being, wants to Play a Positive and Constructive Role in Combating it”: Dr. Harsh Vardhan**

### **Environment Minister’s address at the Inauguration of India Pavilion at COP-23**

Union Minister of Environment, Forest and Climate Change, Dr. Harsh Vardhan has said that India considers climate change as a major threat to collective well-being and wants to play a positive, as well as constructive role in combating it. Addressing a gathering at the inauguration of India Pavilion at the ongoing meeting of Conference of Parties (COP-23) at Bonn in Germany today, the Minister said that climate change will put a disproportionate burden on the poor and marginalised sections of the global community. He added that scientific evidence clearly indicates the severity of climate change and the cost of delayed action. “Access to clean air, water, and a livable climate are inalienable human rights. And solving this crisis is just not a question of politics, it is our moral obligation”, Dr. Harsh Vardhan said.

Emphasising that though India’s per capita emissions are only one-third of global average and its contribution to global stock of carbon dioxide is less than 3%, India has still moved ahead with implementation of path-breaking initiatives under the leadership of the Prime Minister, Shri Narendra Modi.

The Minister pointed out that India Pavilion is a window to our heritage and our progress, our traditions and indigenous technology, aspirations and achievements.

Inviting views and best practices among different stakeholders, Dr. Harsh Vardhan stated that one of the key global objectives is to develop an inclusive world order that does not leave anyone behind. The Minister underlined poverty eradication as one of the most fundamental objectives we all must work together upon. Dr. Harsh Vardhan also pointed out that the contribution of citizens, sustainable lifestyles and climate justice provides an alternative means to address climate change, which must be rigorously pursued

The Minister also highlighted several key initiatives at the national and state level.

The following is the text of the Environment Minister’s speech in Bonn today:

“I welcome you all to the India Pavilion at COP 23. India considers climate change a major threat to our collective well-being and wishes to play a positive and

constructive role in combating it. We have large vulnerable populations and therefore, we take the challenge seriously, especially because climate change shall put disproportionate burden on the poor and marginalized sections of the global community. Therefore, this COP is of great significance to all of us.

We have gathered here at COP-23 in Bonn to move forward and work towards developing guidelines for efficient implementation of the Paris Agreement under the Convention.

Scientific evidence clearly indicates the severity of it and the cost of delayed action. Access to clean air, water, and a liveable climate are inalienable human rights. And solving this crisis is just not a question of politics, it is our moral obligation. We have only one planet and humankind must become accountable for the destruction of our collective home. Protecting our future on this planet depends on the conscious evolution of our species. Though India's per capita emissions are only one-third of global average, and its contribution to global stock of carbon dioxide is less than 3%, it has still moved ahead with implementation of path breaking initiatives under the dynamic leadership of the Prime Minister, Shri Narendra Modi.

In this context, the India Pavilion is a window to our heritage and our progress; our traditions and our indigenous technology; our aspirations and our achievements. India's new economic momentum is a subject of international attention and a source of global opportunity.

A series of events will be hosted at India Pavilion showcasing India's achievement, contributions and initiatives to address various dimensions of climate change and we invite exchange of views and best practices among different stakeholders. Therefore, we are here with a constructive and positive approach. One of the key global objectives is to develop an inclusive world order that leaves no one behind. Therefore, poverty eradication is one of the most fundamental objective that we all must work together to bestow upon the future generations a healthy and green planet.

Under the visionary leadership of Prime Minister, we have launched many policies and institutional mechanisms to advance our climate actions. These initiatives are a reflection of our commitment towards addressing climate change concerns including energy security, food and water security, capacity enhancement at national and state level etc. Some of the key initiatives include:

- Achieving about 58.3 GW of Renewable Energy Capacity out of a targeted 175 GW for 2022.
- Pradhan Mantri Ujjwala Yojana for providing free LPG connections and Ujala for embracing energy efficient LED bulbs dedicated towards supporting citizens move towards sustainable lifestyle.
- The broad policy initiatives of the central government are supplemented

by actions of the State Governments. 32 States and Union Territories have put in place the State Action Plan on Climate Change attempting to mainstream climate change concerns in their planning process.

- As part of our mission on strategic knowledge on climate change, we have established 8 Global Technology Watch Groups in the areas of Renewable Energy Technology, Advance Coal Technology, Enhanced Energy Efficiency, Green Forest, Sustainable Habitat, Water, Sustainable Agriculture and Manufacturing.

- India is one of the few countries where, despite ongoing development, forest and tree cover has increased transforming country's forests into a net sink owing to national policies aimed at conservation and sustainable management of forests.

- A number of schemes for transformation and rejuvenation of urban areas have been launched including Smart Cities Mission, Atal Mission for Rejuvenation and Urban Transformation. These schemes have integrated appropriate adaptation and mitigation measures for environment protection.

- Swachh Bharat Mission has been launched with aim to make India clean and litter free. Government has recently revised following waste management rules to make them more effective, efficient and stringent.

- Government has revised six waste management rules which are more effective, efficient and stringent. These include rules for solid waste, Plastic waste, E-waste, bio-Medical and Hazardous and Construction and Demolition Waste.

- Greening of India's extensive Railway routes and Highways is being undertaken.

- Air Quality Index launched in over 30 cities to provide real-time data of air pollution on daily basis.

- Pradhan Mantri Krishi Sinchayee Yojana has been formulated with the vision of extending the coverage of irrigation and improving water use efficiency 'More crop per drop'.

- Pradhan Mantri Fasal Bima Yojana has been launched for farmers' welfare. Another scheme has been launched to provide Soil Health Card to every farmer. Further Government of India has set up the goal is to double the income of the farmers by 2022.

- Second Phase of Science Express Climate Action Special train with the aim to create awareness among various sections of society, especially students, on the science of climate change, the observed and anticipated impacts, and different possible responses as to how climate change can be combated.

- Government has launched "Skill India" with the target to provide skill training in various sectors including sustainable development to about 400 million people by 2022.

- Zero Effect, Zero Defect is a policy initiative to enhance energy efficiency and resources efficiency in Medium & Small Industries.

- Another important initiative relating to rivers is the National Mission for Clean Ganga which seeks to rejuvenate the river along its length of more than 2,500 km.
- Digital India has been launched to transform India into digital empowered society and knowledge economy.
- All these schemes contribute to mitigation and adaptation.

India has been ambitious in its climate change actions and expect other countries also to be ambitious based on their historical responsibility on the basis of equity and Common but Differentiated Responsibilities. We also believe that contribution of citizens, sustainable lifestyles and climate justice provides an alternative means to address climate change which must be rigorously pursued.”

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**HK**

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## India must take the lead in negotiations at COP 23 in Bonn

As the latest Conference of Parties (COP 23) gets underway in Bonn, the focus is once again on emission targets for the developing world and the importance of bringing the US back to the negotiating table. The Paris accord was seen as a landmark agreement since it was negotiated by representatives of 196 parties at COP 21. As of October 2017, 195 United Nations Framework Convention on Climate Change (UNFCCC) members have signed the agreement. COP 23 at Bonn is the second one after Donald Trump's withdrawal of the US (which will come into effect in 2020). It is here that the rules for implementing the Paris agreement (which is not binding) will be negotiated.

Developing countries fear that developed countries might shift more of the emission reduction burden on to them without having facilitated a transfer of technologies in the manner that enables the achievement of even existing targets. The pledges from developed countries in Paris remain unclear and the specifics are expected to become clearer at Bonn. Countries such as India and China continue to resist the imposition of steeper emission targets on developing nations, on the principle that those responsible for emissions historically must pay a price for it. Their position is that nations without the wherewithal to invest heavily in mitigation measures must not be penalised. India must use the opportunity at Bonn to take the lead in convincing developed countries to invest in technology transfer exercises more efficiently.

Currently, India is set to achieve its emission reduction targets with no changes in policies, in spite of being the only one on the list of most polluting countries to have increased its emissions by almost 5% in 2016. India's energy requirements will only grow: large parts of the country remain off the electricity grid, and it continues to witness one of the world's largest rural to urban migrations.

India also has a large coastline, and anthropogenic climate change and the resultant rise in sea levels will directly affect its citizens. Thus another important point to keep in mind at Bonn is adaptation. While most targets and negotiations focus on mitigation of climate change, countries likely to face the brunt of climate change must be concerned with the important issue of long-term finance to strengthen adaptation strategies in order to cope with the impact of climate change.

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## '2017 will be among top 3 hottest years on record'

The sun rises over Frankfurt, Germany, on Monday. The World Climate Conference with 25 000 people participating starts on Monday in Bonn, Germany. | Photo Credit: [AP](#)

Year 2017 will be one of the three hottest years on record, with many high-impact events, including catastrophic hurricanes and floods, debilitating heat waves and drought, says a provisional statement on the State of the Climate released by the World Meteorological Organization (WMO). The average global temperature from January to September 2017 was approximately 1.1°C above the pre-industrial era, it notes.

As a result of a powerful El Niño, 2016 is likely to remain the warmest year on record, with 2017 and 2015 being second or third.

The WMO statement, which uses 1981-2010 as the baseline, was released on Monday at the opening day of the United Nations (UN) climate change conference in Bonn.

"The past three years have all been in the top three years in terms of temperature records. This is a part of a long term warming trend," said WMO Secretary-General Petteri Taalas, in a release, adding, "We have witnessed extraordinary weather, including temperatures topping 50 degrees Celsius in Asia, record-breaking hurricanes in rapid succession in the Caribbean and Atlantic reaching as far as Ireland, devastating monsoon flooding affecting many millions of people and a relentless drought in East Africa."

Patricia Espinosa, Executive Secretary of UN Climate Change, which is hosting the Bonn conference, said, "These findings underline the rising risks to people, economies and the very fabric of life on Earth if we fail to get on track with the aims and ambitions of the Paris Agreement".

"Bonn 2017 needs to be the launch pad towards the next, higher level of ambition by all nations and all sectors of society as we look to de-risk the future and maximize the opportunities from a fresh, forward-looking and sustainable development path," she said.

Extreme events due to climate change have affected the food security of millions of people, with agriculture accounting for 26% of all the damage and loss associated with medium to large scale storms, floods and drought, says the statement, citing an FAO (Food and Agriculture Organization) assessment. Further, between 2000 and 2016, the number of vulnerable people exposed to heatwave events increased by approximately 125 million.

In 2016, 23.5 million people were displaced during weather-related disasters. In Somalia, more than 7, 60, 000 internal displacements have been reported by UN agencies.

All-India rainfall for the 2017 monsoon season (June to September) was 5% below average. However, above average rainfall in the Northeast and adjacent countries led to significant flooding. Many parts of the Indian subcontinent were affected by monsoonal flooding. The most serious flooding occurred in mid-August in eastern Nepal, northern Bangladesh and nearby northern India. Mawsynram (India) received more than 1400 mm from August 9 to 12.

Three major and high-impact hurricanes occurred in the North Atlantic in rapid succession, with Harvey in August, followed by Irma and Maria in September.

The global mean sea level (GMSL) has been relatively stable in 2017 to date, similar to levels first reached in late 2015. This is because the temporary influence of the 2015-16 El Niño continues to

unwind and GMSL is reverting to values closer to the long-term trend. However, preliminary data shows that a rise in GMSL may have started to resume from July-August 2017 onwards.

If you encounter a 700 kg animal on a high street in Kodaikanal, remember we might have invited its unusual presence

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## Two-day conference of States Power Ministers to be held in Rajgir, Bihar

### Two-day conference of States Power Ministers to be held in Rajgir, Bihar

A two-day conference of Ministers for Power and New & Renewable Energy of States & Union Territories will be held in **Rajgir, Bihar, on 10<sup>th</sup> and 11<sup>th</sup> of November, 2017**. The Conference will be inaugurated by Shri Raj Kumar Singh, Union Minister of State (IC) for Power and New & Renewable Energy. The aim of this two-day conference is to review the implementation of various ongoing Schemes/ Programmes and deliberate on a host of issues pertaining to Power and Renewable Energy sectors.

Ministers and Secretaries of the States and Union territories and senior officials of the two sectors and Public Sector Undertakings under them will meet up to discuss issues like,

#### POWER SECTOR

##### Distribution

- **Saubhagya (Pradhan Mantri Sahaj Bijli Har Ghar Yojana):** Achieving 100% household electrification by December, 2018
- **DDUGJY:** Completion of feeder separation, system strengthening projects
- Prepaid/**Smart Meters**
- Expediting **IPDS** works in Urban areas and reduction of **AT&C losses** to less than 10%
- Promotion of **Digital Payments**
- Strategy towards **24x7 Power for All**

##### Reforms

- **Compliance of RPO targets** and REC mechanism by the States/UTs. RPO trajectory for the year 2022 and incentives to DISCOMs for achievements of these RPO targets
- How to mandate Cross Subsidy Charges within the specified limit prescribed in **Tariff Policy**
- **ISTS:** Transmission charges

- **PPAs:** Signing and honouring

### Thermal

- **Ash Management System:** Launch of Mobile Application

### Hydro

- **Operating Hydropower Projects** at designed maximum peaking capacity
- Discussion on **Infrastructure Funding** of Hydro Power Projects

### Transmission

- **Right of Way (RoW) Issues** in Transmission Projects

### Energy Conservation

- Potential opportunities and action plan for making **Buildings Energy Efficient:** Review of progress of adoption of Energy Conservation Building Code (ECBC) by States
- **Demand Side Management** through use of energy efficient appliances
- Promoting **E-Mobility** (Electrical vehicles) in India: Standards, Charging Infrastructure and Market Transformation

## NEW & RENEWABLE ENERGY SECTOR

### Renewable Energy Sources

- Scheduling & Forecasting for **Renewable Energy Integration**
- Review of Implementation of **Solar programme**
- Challenges being faced in implementation of **Solar Rooftop programme**
- Presentation on new Decentralized ground mounted Grid connected solar energy/**KUSUM Programme**
- **RE-INVEST 2017**
- Review of **Wind Power programme**
- Review of **SHP programme**
- Review of **Biomass programme**
- **LWE Districts**

The concluding session of the conference would consist of comments and feedback by States/UTs and adoption of Conference Resolution by the delegates.

**RM/VM**

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## Capital crisis: on Delhi's deteriorating air quality

[Delhi's air quality deteriorates with unflinching regularity](#) at this time of the year, with large swathes of north India in the grip of a suffocating smog, but the State governments that can make it easier for millions to breathe do not act with any sense of urgency. That it has turned into a public health emergency in the capital, with the [air quality index touching extremely hazardous levels](#) in some parts, necessitating the closure of primary schools, has further lowered its standing. It is unconscionable for governments, through indifference and inaction, to subject citizens to such toxic air, and cause extreme suffering especially among people with respiratory ailments and impaired lung function. The smog that envelops the region is exacerbated by the [burning of biomass in Punjab and Haryana](#), and the winter atmosphere is marked by weak ventilation. An analysis of local sources by IIT-Kanpur last year pointed to construction dust, vehicular pollution, and domestic and industrial emissions as other major factors. Clearly, the burden of such chronic problems has outweighed the benefits conferred by measures such as the ban on Deepavali crackers, and in the past, the shift to compressed natural gas for commercial vehicles and restricting car use to odd and even number plates on alternate days. A comprehensive solution demands that the governments of Delhi, Punjab, Haryana and Uttar Pradesh, assisted by the Centre, address farm residue burning and construction dust.

The post-monsoon — as opposed to pre-monsoon — burning of rice and wheat residue releases maximum aerosols that contribute to the volume of PM<sub>2.5</sub>, which gets embedded in the lungs. Automation of farm operations leaves root-bound crop waste after machine harvesting, running to millions of tonnes, requiring a solution of scale. Sustainable residue removal cannot be achieved by the farmers alone, and requires help from the state machinery. Here, Delhi Chief Minister Arvind Kejriwal should be commended for his initiative to discuss the modalities of joint action with the Punjab and Haryana governments. The national capital needs a major greening effort. Unpaved surfaces raise dust levels as in all Indian cities, but civic agencies ignore the problem. There is every reason to think that even the Ministry of Environment's orders issued in 2015 under the Air (Prevention and Control of Pollution) Act, 1981 to comprehensively green Delhi's road margins and open spaces were not pursued seriously. Shifting more of the city's travel to comfortable public transport can cut fine particulates in congested areas and improve the air for residents. Many such initiatives were taken up by China in its cities to reduce exposure to PM<sub>2.5</sub> that produces morbidity from cardiovascular and respiratory diseases and leads to premature death. Only a determined response to the crisis can spare Delhi of its infamous tag as one of the most polluted cities on the planet.

Revvng up infrastructure spending is necessary, but not sufficient

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## Delhi's debilitating smog is shocking but not surprising

If it weren't for the fact that pollution levels are the worst ever every year, Delhi could have been living in a science fictional time loop for the past few years. The smog gets so bad at this time of the year that Delhiites choke. The government scrambles for immediate stopgap solutions. A few are implemented. Once winter is over, it's back to business as usual. Rinse, repeat.

Delhi continues to bear the ignominy of being one of the most polluted cities in the world with alarming indifference. It isn't as though the solutions to the issue of pollution are shrouded in the smog that currently envelops the city, rendering them invisible. Obvious solutions such as reducing the number of polluting vehicles, imposing strict guidelines for polluting industries, and building better public transport infrastructure have been talked about for many years. Yet, authorities only think of strategies such as the odd-even plan (whose benefits are debatable) for cars when the pollution levels reach these dangerous levels.

Residents of the city must also share the blame. Before Diwali this year, the Supreme Court tried to reduce firecrackers from adding to the problem, but many people defied the spirit of its judgement by bursting polluting crackers well into the wee hours of the morning. The number of cars that are added to the road every day, the number of diesel powered generators that the city uses, and the impunity with which pollution control measures are flouted – all add to the smog that the capital's residents are now breathing.

Crop burning from neighbouring states also adds to the pollution in Delhi. No practical solutions that don't involve criminalising the farmers who grow our food have been found for that either. Identifying and helping farmers implement more efficient ways of mulching and composting, and using crop residue for the production of biogas have been suggested as alternative means of dealing with crop residue that farmers currently burn. But the implementation of such methods will require a serious engagement with farmers, who are already under immense financial pressure.

The problem of air quality is also a problem of unplanned and extensive urbanisation.

There isn't a miracle cure for this problem. Air pollution in Delhi has been caused by several decades of continuing irresponsible behaviour. Whatever the solution, and however much it costs, it is sure to be offset by the cost of man hours lost due to delays in flights, trains and vehicular traffic due to smog and the staggering health costs involved. Quite simply, it makes economic sense to invest in cleaner technologies and practices. This will require political will, commitment, and a concerted effort by all stakeholders including residents, non-governmental organisations and governmental agencies.

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## Heat source under Antarctica melting its ice sheet: NASA

The Thwaites Glacier in West Antarctica. | Photo Credit: [AP](#)

A geothermal heat source called mantle plume lies deep below Antarctica's Marie Byrd Land, explaining some of the melting that creates lakes and rivers under the ice sheet, a NASA study has found.

Although the heat source is not a new or increasing threat to the West Antarctic ice sheet, it may help explain why the ice sheet collapsed rapidly in an earlier era of abrupt climate change, and why it is so unstable today.

The stability of an ice sheet is closely related to how much water lubricates it from below, allowing glaciers to slide more easily, NASA said.

Understanding the sources and future of the meltwater under West Antarctica is important for estimating the rate at which ice may be lost to the ocean in the future.

Antarctica's bedrock is laced with rivers and lakes, the largest of which is the size of Lake Erie.

Many lakes fill and drain rapidly, forcing the ice surface thousands of feet above them to rise and fall by as much as six metres. The motion allows scientists to estimate where and how much water must exist at the base.

About 30 years ago, a scientist at the University of Colorado Denver in the US suggested that heat from a mantle plume under Marie Byrd Land might explain regional volcanic activity and a topographic dome feature. Very recent seismic imaging has supported this concept.

"I thought it was crazy. I didn't see how we could have that amount of heat and still have ice on top of it," said Helene Seroussi of NASA's Jet Propulsion Laboratory (JPL) in California.

With few direct measurements existing from under the ice, Seroussi and Erik Ivins of JPL concluded the best way to study the mantle plume idea was by numerical modelling.

They used the Ice Sheet System Model (ISSM), a numerical depiction of the physics of ice sheets.

Seroussi enhanced the ISSM to capture natural sources of heating and heat transport from freezing, melting and liquid water; friction; and other processes.

To assure the model was realistic, the scientists drew on observations of changes in the altitude of the ice sheet surface made by NASA's IceSat satellite and airborne Operation IceBridge campaign.

"These place a powerful constraint on allowable melt rates — the very thing we wanted to predict," Ivins said.

Since the location and size of the possible mantle plume were unknown, they tested a full range of what was physically possible for multiple parameters, producing dozens of different simulations.

They found that the flux of energy from the mantle plume must be no more than 150 milliwatts per square metre.

Seroussi and Ivins' simulations using a heat flow higher than 150 milliwatts per square meter showed too much melting to be compatible with the space-based data, except in one location: an area inland of the Ross Sea known for intense flows of water.

This region required a heat flow of at least 150-180 milliwatts per square meter to agree with the observations.

However, seismic imaging has shown that mantle heat in this region may reach the ice sheet through a rift, that is, a fracture in Earth's crust such as appears in Africa's Great Rift Valley.

Sundarbans proved a challenge for camera traps and GPS collars

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## Choking on air

Three weeks ago, with a ban against firecrackers and a graded response action plan (GRAP) in place, Delhi's authorities seemed better equipped than in the past two years to combat the unhealthy haze that engulfs the city after Diwali. Pollution levels did surge after the festivities but the fact that they were lower compared to the past two years gave hope that the city's authorities were in control in their battle against bad air. These hopes have been belied. The post-Diwali smog never receded and on Tuesday, the city registered "severe" on the Air Quality Index (AQI). "Everyone may experience serious health effects", notes the AQI website.

The Environment Pollution and Prevention Control Authority (EPCA), which enforced GRAP two days before Diwali, has asked the Delhi government to put more emergency measures in place. The SC-mandated body has suggested that parking fees be quadrupled. It also asked Delhi Metro to lower fares during non-peak hours for at least 10 days and introduce more coaches. There are problems with this course of action. The GRAP envisages progressively tougher action as pollution levels rise, without waiting for an emergency to impose strict measures.

The EPCA did not have to wait for pollution levels to plummet to levels described by the Indian Medical Association as "a public health emergency" before making its post-Diwali GRAP recommendation. But the SC-mandated body did not see matters turning grave even after the haze persisted. An even more serious problem pertains to the passive attitude of the Delhi government. In the past two years, it has waited for pollution to assume emergency proportions before reacting, and then done nothing more than respond to courts or court-mandated bodies like the EPCA.

The Delhi government implemented the odd-even policy last year only after the Delhi High Court asked it to submit a time-bound plan. Despite the problems it created for people, there was enough support for the policy which demanded the Delhi government conduct a comprehensive analysis of its successes and failures. But it has, reportedly, developed cold feet over the odd-even policy. The EPCA, though, wants to enforce the odd-even policy if the city's pollution levels aggravate. The SC-mandated body's other proposals will require at least 16 authorities to work together. The EPCA and the Delhi government have not devised a coordination mechanism between these bodies. It remains to be seen if the city's latest pollution crisis spurs them into action.

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## Spirit of Paris: on the climate change meet in Bonn

The 23rd conference of the UN Framework Convention on Climate Change [under way in Bonn](#) faces the challenge of raising the ambition of the world's leaders, and giving practical form to the provisions of the Paris Agreement. Although 169 countries have ratified the accord, and there is tremendous support for greener, low-risk pathways to growth worldwide, the Trump administration in the U.S., one of the top emitters of greenhouse gases (GHGs), has [announced it will withdraw from the pact](#). Even if it will take until 2020 to achieve an actual withdrawal, the U.S. action reverses the overall momentum achieved in Paris in 2015, and negates President Barack Obama's legacy of regulations designed to reduce America's GHG emissions, especially from the use of coal. It is heartening that China, which has achieved rapid economic growth and leads in GHG emissions, [is firmly behind the pact](#) to reduce the risk of climate change. There is steady progress in the growth of renewable energy sources as they become cheaper and the efficiency of solar, wind and energy storage technologies improves. As UNFCCC Executive Secretary Patricia Espinosa has said, the time is now to firm up the tasks set out in the agreement reached in Paris, notably on funds to mitigate and adapt to climate change. The Agreement has a benchmark of raising \$100 billion a year by 2020.

Major risks from climate change, such as extreme weather phenomena, loss of agriculture, water stress and harm to human health, pose a threat to millions around the world. For some countries, such as Fiji, which holds the presidency of the Bonn conference, and other small island-states, the future is deeply worrying because of the fear that sea levels may rise sharply due to climate change. The recent Emissions Gap Report from the UN underscores the terrible mismatch between the voluntary pledges made by countries for the Paris Agreement and what is necessary to keep a rise in global average temperature below 2° C, preferably 1.5° C. All major countries, especially those that have depleted the global carbon budget by releasing massive amounts of GHGs since the Industrial Revolution, have to respond with stronger caps in their updated pledges under the Paris Agreement. India's emissions have been rising overall, but it has committed itself to lowering the emissions intensity of its GDP by 33-35% by 2030 from the 2005 level. By some estimates, India has been awarded among the highest levels of multilateral climate funding at \$745 million since 2013. Securing funds for mitigation and adaptation is a high priority for India, but it must ensure that States acquire the capacity to absorb such assistance efficiently. While the emphasis on a giant renewable energy programme has won global acclaim, the focus is equally on India's readiness to embrace green technologies across the spectrum of activity, including buildings and transport.

Revving up infrastructure spending is necessary, but not sufficient

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**DL-HC-POLLUTION**

As the killer 'pea soup fog' continued to engulf the city, the Delhi High Court on Thursday issued a slew of directions to improve air quality, including watering roads to minimise dust.

Calling it an "emergency situation", a Bench of Justices S. Ravindra Bhat and Sanjeev Sachdeva asked the government to consider the option of "cloud seeding" to induce rainfall artificially, as an immediate step to bring down dust and particulate matter in the atmosphere.

It directed the Delhi government to seriously consider a ban on further construction in the city to the extent possible and implement the odd-even vehicle usage scheme as short term measure.

"What we are facing today has already been faced by London. They call it a pea soup fog. It is a killer. Stubble burning is the visible villain in it, but there are other elephants in the room," the Bench said.

It said the fog here was a "deadly mixture of vehicular pollution, construction, road dust and stubble burning."

Directions were also issued to the Traffic Police to ensure there is no vehicular congestion on roads and to provide masks to the personnel on duty.

The Bench also ordered the Union Environment Secretary to hold in the next three days a meeting of Chief Secretaries of Delhi, Punjab, Haryana and Uttar Pradesh to work out a joint short-term plan to bring down air pollution.

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## For a wider cover: meeting climate goals

In 2015, India made a Bonn Challenge commitment to place into restoration 13 million hectares (Mha) of degraded land by 2020 and an additional 8 Mha by 2030. [India's Nationally Determined Contributions](#) (NDCs) have also pledged to sequester 2.5 to 3 billion tonnes of CO<sub>2</sub> equivalent additionally by 2030 through enhanced tree cover. Initial government estimates suggest that to achieve this, India will need to extend tree cover on at least 28-34 million hectares, outside of the existing forest cover.

As different States work to achieve these commitments, it appears that there is an over-reliance on plantations. In July this year, Madhya Pradesh planted 66 million trees in 12 hours to enter the record books, overtaking Uttar Pradesh's record of planting 49.3 million trees in a day, in 2016. Other States are also expected to follow suit.

Notably, neither the Bonn Challenge nor the NDCs are about large-scale plantations alone. The Bonn Challenge, for instance, lays emphasis on landscape approaches — a model aimed at improving the ecology of a landscape as a whole in order to benefit local livelihoods and conserve biodiversity. The NDC lays emphasis not only on carbon sequestration but also adaptation to climate change through a strengthened flow of benefits to local communities that are dependent on forests and agriculture for sustenance.

This also reflects the spirit of India's policy framework on forests which lays emphasis on a landscape approach to manage forest and tree cover, so that the flow of multiple ecosystem services — including food security, climate mitigation and adaptation, conservation of biological diversity and water supplies — is secured.

In this context, large-scale plantation drives, which often do not lay stress on species selection, the quality of planting materials or survival rates, nor recognise tenure and resource rights to ensure that the benefit flows to communities, do not really achieve the goals. Plantations do have their space, but as one among a larger suite of interventions. However, to operationalise a landscape approach, we must protect healthy forest areas from deforestation, degradation and fragmentation. We must also creatively integrate trees into different land uses.

India has numerous models that are suited for different regions and farm household sizes to draw upon, and must not rely on plantation drives alone to secure environmental and developmental outcomes.

The nation practises at least 35 types of agroforestry models that combine different trees that provide timber, fruits, fodder, fuel and fertilizers with food crops. This diversifies income from farming, and improves land productivity. Farmer-managed natural regeneration (FMNR) systems where farmers protect and manage the growth of trees and shrubs that regenerate naturally in their fields from root stock or from seeds dispersed through animal manure can also deliver several economic and ecosystem benefits.

In Niger, West Africa, farmers operating on 5 Mha of land added roughly 200 million on-farm trees using FMNR in the past 30 years. This has sequestered 25-30 million tonnes of carbon and increased annual agricultural production by about 500,000 tonnes.

In India, the National Bank for Agriculture and Rural Development's (NABARD's) 'Wadi' model and the Foundation for Ecological Security's re-greening of village commons project are good examples of tree-based interventions which are proving to have great value in terms of cost-effectiveness as well as the range of benefits they deliver to communities.

An important success factor in large-scale tree-based programmes is security of tenure and land rights. In several parts of the world, securing tenure over forests has been established as a cost-effective way of achieving climate sequestration. In Brazil, for instance, the average annual costs of providing communities with secure rights to their forest is \$1.57 (103) per hectare (ha) while the resulting carbon-mitigation benefits range from \$38/ha to \$230/ha per year. That's a net value of \$1,454-1,743/ha for a period of 20 years.

It is also important to have in place a performance monitoring system to quantify tree survival rates and the benefits to communities. This can be achieved through a combination of remote sensing, crowd sourced, ground-level monitoring with support from communities and civil society organisations.

As we regenerate trees through different interventions, it is critical to ensure that owners have the right to manage and use these trees. It is also critical to use scientific evidence-based methodology with a participatory approach to determine the right type of tree-based interventions most suitable to a certain land use. A tool called the Restoration Opportunities Assessment Methodology (ROAM) is being used in 40 countries to find the best methods for landscape restoration. The tool includes rigorous analysis of spatial, legal and socio-economic data and draws on consultations with key stakeholders to determine the right type of interventions. In India, this tool is being piloted in Uttarakhand and Madhya Pradesh.

India has the policy framework, the political will and financing to endorse landscape restoration. What we really need now is innovation and imagination to build replicable and scalable models with a participatory approach to achieve the country's climate goals through landscape restoration.

*Dr. Rohini Chaturvedi is Director, Landscape Restoration Program, WRI India*

The definition of harassment needs to be constantly updated, and the process for justice made more robust

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## How Krishna Wildlife Sanctuary sanctuary in Andhra Pradesh is becoming a reserve of the rare Fishing Cat

In 2008, the International Union for Conservation of Nature and Natural Resources (IUCN) classified the rare Fishing Cat as endangered. They mostly in the vicinity of wetlands, along rivers, in swamps, and mangrove forests.

But as many as 15 Fishing Cats were recorded in the pilot project conducted at the Krishna Wildlife Sanctuary in Andhra Pradesh in 2014-16.

The sanctuary is a rare eco-region with vast tracts of pristine mangrove forests. It has the potential to become the world's first reserve of the Fishing Cat.

Sundarbans proved a challenge for camera traps and GPS collars

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**Shri Kiren Rijiju inaugurates the 'India Disaster Response Summit'****Shri Kiren Rijiju inaugurates the 'India Disaster Response Summit'**

The Union Minister of State for Home Affairs, Shri Kiren Rijiju has said that India need to prepare itself for moving towards Disaster Risk Management (DRM) and Disaster Risk Reduction (DRR) from an approach of traditional Disaster Management. He emphasised that Disaster Mitigation Strategy should be areas of priority for addressing Disaster Risk Management. Shri Rijiju was inaugurating the 'India Disaster Response Summit', organised jointly by the National Disaster Management Authority (NDMA) and Facebook, here today on how best to leverage social media platforms to 'prepare, respond and recover' for, during and after a disaster.

Calling it a great example of execution on the Prime Minister Shri Narendra Modi's ten-point agenda on Disaster Management, which has clearly listed harnessing technological innovations to create a culture of disaster resilience in the country, Shri Rijiju said, the world is moving towards partnerships, where people are proactively partnering with the Government in responding to disasters. This partnership is a benchmark and first of its kind – we are the first Government to partner with Facebook on disaster response, he added. Shri Rijiju also invited other technology companies to create tailored solutions for disaster-related challenges.

Shri Rijiju said that reaching out to the people and communities is the primary responsibility of all stakeholders and efforts should be to make people aware, informed and to guide them during emergency situations. He urged community groups and stakeholders to find innovative ways to inform people on time in scenarios of Disaster Management. He said the efficacy of Disaster Management requires a well defined guideline and the role of media is vital when disaster strikes and even in executing rescue and relief operations. He exhorted the communities to come forward with new techniques of sharing information on real time basis for better handling of situation at disaster scenario. Technology can be leveraged in providing a quick response and information to people at time of need, he added.

Shri Rijiju said collaboration with various stakeholders including NGO's and private players could provide the necessary base for response with a vision towards 'Capacity Building' to handle disaster risk situation for addressing emergency rescue situations. He said that Government will act as facilitator towards information and communication among various stakeholders by helping evolve new modes of communication for better contact between the 'Government and the People'.

Shri Rijiju said that social media affects everybody's life and common sources of communication through social media has played a vital role in day-to-day information communication, which needs to be leveraged in proper direction. Mentioning about earthquake resistant technologies adopted by foreign countries, he said that efforts should be in the direction of better planning towards evolving technology in line with better communication tools for disaster response planning.

Speaking on the occasion, Shri R. K. Jain, Member, NDMA, said, the NDMA is proactively using social media for awareness generation. This collaboration is a milestone towards integrating social media with disaster response activities. He hoped this partnership will open new avenues for using mobile technology in disaster situations.

Later participating during a panel discussion on the need for effective data analysis and tools, Shri Kamal Kishore, Member, NDMA, said, social media can help shape a future where, on the one hand, vulnerable communities become increasingly self-reliant and on the other hand, Government agencies have more powerful tools to get real-time feedback and reach out to people whom they seek to serve.

Introducing the Disaster Information Volunteers (DIV) programme, wherein a network of trained volunteers would provide supplementary information on disasters in their local communities to assist Government relief efforts through the Facebook Workplace platform, Facebook Head (Policy Programmes) for South Asia, Shri Ritesh Mehta said we are aiming to empower communities by building products that connect people and create positive social impact. The programme will be piloted in two disaster prone states - Assam and Uttarakhand, he added. Facebook will now share its disaster maps, developed using aggregated, de-identified data, with NDMA. These maps can aid swift disaster response by providing real-time, actionable information.

Senior officials of MHA, NDMA, National Disaster Response Force (NDRF), National Institute of Disaster Management (NIDM), Central Government Departments, representatives of Facebook and Non Governmental Organisations (NGOs) attended the event.

KSD/SB/NK/PK

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## Shri Nitin Gadkari directs highways projects around Delhi NCR to take steps to reduce air pollution

### Shri Nitin Gadkari directs highways projects around Delhi NCR to take steps to reduce air pollution

The Minister of Road Transport & highways, Shipping, Water Resources, River Development & Ganga Rejuvenation Shri Nitin Gadkari has said that directions have been issued to Project Directors, Contractors and field level officials working on highways projects around Delhi NCR to take stringent steps to check pollution arising out of the construction work. The steps to be taken in this regard include sprinkling water at all construction sites and camp, covering of dumpers transporting construction material / waste including flyash, in the region, covering of exposed soil at the construction sites and adherence to air quality norms by all plants and machinery. Field officials have been directed to inspect the construction sites regularly to ensure that all the pollution control measures are adhered to in a strict manner.

Shri Gadkari also said that thorough research needs to be done to find the cause of this pollution. He said this year the smog has descended despite the ban on crackers and restraint on burning of crops. The minister further said that the Road Transport & highways Ministry will offer all possible help for such research.

NP/MS

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## Environment Ministry Holds Meeting to Discuss Mitigation of Air Pollution

### Environment Ministry Holds Meeting to Discuss Mitigation of Air Pollution

A meeting to deliberate the issue of mitigation of air pollution was held here today under the Chairmanship of Secretary, Ministry of Environment, Forest and Climate Change (MoEF&CC). Several decisions were discussed at the meeting. After detailed deliberations, it was decided that all concerned organisations of State Governments and the Central government involved in this will work towards effectively implementing the following short-term measures immediately:-

- (i) Strict compliance of Graded Response Action Plan (GRAP) and all other directives issued by Hon'ble Courts;
- (ii) Effective enforcement of ban on diesel gen-sets, brick kilns, stone crushers, hot mix plants etc.
- (iii) Ban on entry of unauthorised trucks into Delhi;
- (iv) Enhancing parking fee and capacity augmentation of public transport;
- (v) Use of methods of dust containment and stop civil construction activities for the moment;
- (vi) Ensure watering over unpaved roads to contain road dust;
- (vii) Impose fines on defaulters through Municipal Corporations/State Pollution Control Boards and other organisations; and
- (viii) Improve waste management and stop garbage burning.

The Committee also noted that these steps have already been initiated and that each of these steps needs to be enforced effectively. It was decided that each State Government will set up one or more Monitoring Groups, which will continuously look at compliance. There were suggestions that State Governments should also set up Flying Squads to assess the situation on the ground, prevent violation and report.

Chief Secretary, Haryana and representatives from Punjab government informed the Committee that stubble burning in both the States was over and in the medium term, further problems because of that may not arise. However, both the States had requested that long-term measures to ensure that this does not happen every year need to be put in place. On these issues, it was decided that the Committee will continue to meet regularly and discuss viable options like incentivising the farmers, providing subsidised equipment and using existing technologies to tide over this problem.

The meeting discussed the critical issue regarding deteriorating air quality in NCR and the short-term measures which were required to be urgently put in place.

Among those who attended the meeting were - Chief Secretary, Haryana - Shri Deepender Singh Dhesi, Chief Secretary, Delhi - Dr. MM Kutty, Principal Secretary, Department of Environment, Uttar Pradesh – Ms. Renuka Kmar, Chairman, Punjab Pollution Control Board, Punjab – Shri KS Pannu and Secretary, Department of Environment, Rajasthan – Shri RK Grover.

The meeting was also attended by Secretary, Ministry of Earth Science; Secretary, Department

of Science and Technology; and Secretary, Department of Biotechnology and Chairman, CPCB.

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## Developing world says rich nations shirking on climate

A globe with the national flags hangs in one of the pavilions at the UN Climate Conference in Bonn. | Photo Credit: [AP](#)

The failure of wealthy nations to deliver on short-term climate commitments could hinder the rollout of a landmark treaty, a bloc of 134 developing countries, including India and China, warned on Thursday at UN negotiations in Bonn.

The diplomatic spat has underscored the difficulty of reaching a consensus at the 196-nation talks.

“If we do not respect decisions that we have made, then how can we build trust among the parties?” said Chen Zihua, China's senior negotiator, referring to long-standing pledges by rich nations to enhance financial support and “revisit” targets for curbing greenhouse gas emissions before 2020.

“And how can we lay a good foundation for the implementation of the Paris Agreement?” he added at a press conference, flanked by diplomats from India, Iran, Nicaragua and Ecuador.

The treaty, inked outside the French capital in 2015, calls on the world to cap global warming at “well below” two degrees Celsius (3.6 degrees Fahrenheit), and even 1.5 C if possible.

With one degree of warming so far, the planet has already seen an increase in drought, deadly heatwaves and superstorms.

The pact rests on voluntary carbon-cutting pledges from virtually every country in the world.

“The science is clear: if we don't get our act together before 2020, you can forget about the 2 C and 1.5 C targets,” said Paul Oquist, Nicaragua's chief negotiator at the talks.

“There has been a failure to comply with existing commitments,” he added.

Under the terms of the UN's core climate convention, the burden for action before 2020 falls mainly on wealthy countries historically responsible for the rapid rise of greenhouse gases.

China is the world's top carbon polluter, followed by the United States, the European Union, India and Russia.

Developing countries sought to have a “pre-2020 agenda” formally added to the negotiating process, but the move was shelved at the start of the 12-day talks. Efforts to resolve the issue have so far been fruitless.

“It would be a bad thing if this hangs over into the second week and becomes a political issue for ministers,” said Alden Meyer, director of strategy and policy for the Union of Concerned Scientists in Washington DC.

“It has been a pretty sterile debate that has degenerated into a finger-pointing exercise,” he told *AFP*.

Some 20 heads of state, including French President Emmanuel Macron and German Chancellor Angela Merkel, are scheduled to appear at the UN climate forum next week.

Sundarbans proved a challenge for camera traps and GPS collars

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## Bonnet macaques losing their ground in south India

Bonnet macaques have disappeared from more than 48% of temples and tourist spots across Kerala, Karnataka and Tamil Nadu. | Photo Credit: [M. Sathyamoorthy](#)

It's tough times for south India's bonnet macaques — a monkey that we think is irritatingly common could be losing ground to the larger and more aggressive rhesus macaque of the north. Other factors contributing to their decline include rapid urbanisation (as roadside trees are felled and vegetation lost) and their disappearance from temples and tourist spots, says a study published in *PLOS ONE*.

Bonnet macaques are endemic commensals: they are found only in peninsular India and live in close proximity with humans, adapting to habitats ranging from riverside temples to roadside fig trees. However, a study in 2011 suggested that rhesus macaques were invading the bonnet's habitats in south India.

To assess the current status of bonnet macaques, a team of scientists from institutes including Tamil Nadu's Salim Ali Centre for Ornithology and Natural History (SACON) surveyed roadsides (1,140 km in total) in peninsular India which were considered the southernmost boundary for rhesus macaques and compiled distributional data from earlier studies in the area. They found that rhesus macaques have spread as far south as Karnataka's Raichur district — adding 24,565 sq km to their former range — in an area where bonnet macaques used to reside.

The team collated information on bonnet macaque presence from surveys between 1989 and 2015 along 651 km of Mysore's roadsides and found that over the last 25 years a staggering 65% of the population has disappeared. The scientists predict that many of these populations will go locally extinct in 10 years. High-resolution satellite and Google Earth imagery between 2000 and 2006 and from 2015 onwards showed a decrease in tree cover on and around these roads; the loss of contiguous canopies now prevents the monkeys from colonising new areas.

Bonnet macaques were present only in low numbers across 16 forest-dominated protected areas that the team surveyed in south India. They also found that bonnet macaques have disappeared from more than 48% of temples and tourist spots across Kerala, Karnataka and Tamil Nadu. These areas are no longer stable habitats for these monkeys, write the scientists. "People are now less tolerant to bonnet macaques," says co-author H. N. Kumara, senior scientist at SACON. "Even in temples, they are captured and translocated elsewhere. If we can give them a little space, they will survive. We need to take more interest in these common and less-charismatic species before they decline like sparrows did."

This isn't the first time a charpai has helped rescue a leopard in a well

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## Elephant corridors in India threatened, says study

Unsafe roads: Two-thirds of the elephant corridors have a National or State Highway passing through them, fragmenting habitats and hindering the animals' movement. Special Arrangement

Elephant herds are known to migrate across 350-500 sq. km. annually but increasingly fragmented landscapes are driving the giant mammals more frequently into human-dominated areas, giving rise to more man-animal conflicts, experts have found. Maintaining elephant corridors is therefore of crucial importance to both elephant and human habitats.

"Elephant corridors are narrow strips of land that connect two large habitats," says Dr. Raman Sukumar, scientist, Indian Institute of Science, Bengaluru. "In many cases, they are already under the control of a government agency such as the Forest or Revenue Department. Corridors could include unutilised spaces in large commercial estates, and fallow or agricultural lands."

'Right of Passage', an 800-page study released in August 2017, authored by experts and published by the Wildlife Trust of India (WTI) in collaboration with Project Elephant and the U.K.-based NGO Elephant Family, identifies and records details pertaining to 101 elephant corridors across India.

Of these 101 corridors, 28 are located in south India, 25 in central India, 23 in northeastern India, 14 in northern West Bengal and 11 in northwestern India.

In terms of their functionality or usage by elephants, almost 70% of the 101 corridors are regularly used, 25% are occasionally used, and 6% rarely. Almost all elephant corridors in south India (93%) and northern West Bengal (86%) are regularly used; 66% of corridors are regularly used in northeastern India.

The study offers specific conservation solutions for the corridors but points to an inverse relationship between the forest cover available and the number of corridors in each region — the more fragmented the forest cover in a region, the more elephant corridors in it.

Thus, the highest number of corridors are located in northern West Bengal, which has one corridor for every 150 sq. km. of available elephant habitat, resulting in heightened human animal conflict and an average of 48-50 human deaths every year. This is followed by northwestern India, which has one corridor for every 500 sq. km. of available elephant habitat. Central India comes next with one corridor for every 840 sq. km.

In southern India, there is one corridor for every 1,410 sq. km. of available elephant habitat. Northeastern India fares best with one corridor for every 1,565 sq. km.

Among the States, West Bengal has the highest number of corridors (14), followed by Tamil Nadu with 13 and Uttarakhand with 11.

In 2005, WTI had mapped and listed 88 elephant corridors. With alterations to natural landscapes and a heightened pace of development, researchers found that seven of these corridors have been impaired and are currently not used by elephants. The team also added 20 new corridors to the list, bringing the total to 101 corridors in the 2017 'Right of Passage' study.

The then-and-now comparative findings are worrying. The 2017 report notes that about 74% corridors are of a width of one kilometre or less today, compared with 45.5% in 2005, and only 22% corridors are of a width of one to three kilometres now, compared with 41% in 2005, pointing

to how constricted corridors have become in past 12 years.

The ground situation studied in 2005 and 2017 also indicates degradation of corridors: 21.8% of corridors are free of human settlements in 2017 compared with 22.8% in 2005, and 45.5% have 1-3 settlements in 2017 compared with 42% in 2005. In terms of land use, only 12.9% of the corridors are totally under forest cover in 2017 compared with 24% in 2005.

“About eight corridors have been secured on the ground by State Forest Departments, MoEFCC (Ministry of Environment, Forest and Climate Change), WTI, and other conservation organisations. This process needs to be hastened and other high priority as well as threatened corridors need to be secured on an urgent basis,” says co-author Dr. Sandeep Kr Tiwari, Programme Manager, IUCN Asian Elephant Specialist Group (AsESG).

To increase awareness on elephant corridors, the team is planning ‘Gaj Yatras’ — parading life-size elephant models crafted by local artisans on road shows through corridors across 12 States where elephants range.

### **Disrupted areas**

Moreover, two in every three elephant corridors in the country are now affected by agricultural activities, the study points out, adding that 58.4% corridors fall under settled cultivation and 10.9% under *jhum* (slash and burn) cultivation.

“All the corridors in northern West Bengal (100%) and almost all in central India (96%) and northeastern India (52.2% under settled cultivation and 43.4% under slash and burn cultivation) have agriculture land. About 72.7% of the corridors in northwestern India and 32% corridors in southern India have agriculture land,” the study states.

Taking note of 266 instances of elephants deaths caused by being run over by trains between 1987 and July 2017, the report points out that 20 corridors have a railway line passing through them.

In all, about 36.4% of the elephant corridors in northwestern India, 32% in central India, 35.7% in northern West Bengal and 13% of the elephant corridors in northeastern India have a railway line passing through them. Moreover, almost two-thirds of the corridors have a National or State Highway passing through them, fragmenting habitats and hindering elephant movement further.

The study notes that almost 20% of the corridors urgently require an overpass for vehicles to facilitate the unhindered movement of elephants. In addition to railway tracks and highways, 11% of corridors have canals passing through them, and 12% are affected by mining and the extraction of boulders.

Three months ago, the Supreme Court, in response to a Public Interest Litigation (PIL) petition submitted by Wildlife Conservation Society-India (WCS) scientist Vidya Athreya suggested that nine States acquire land across 27 high-priority corridors to enable safe movement of elephants.

“Identifying corridors is a dynamic process; many States have started notifying corridors,” says R.K. Srivastava, Director of Project Elephant. The States’ responses are expected this month.

“Large-scale land acquisition is not required,” says Professor Sukumar. “It is the small, strategic pieces of land that are crucial.”

The International Fund for Animal Welfare and the WTI bought 25.5 acres of village land in 2003

and handed over India's first ever privately-bought corridor to the Karnataka government in 2007. The WTI and its partners have also secured six corridors, including the Edayaralli-Doddasampige corridor in southern Karnataka, which connects the Biligiri Rangaswamy Temple and MM Hills wildlife sanctuaries. "The way corridors are acquired is important," says Professor Sukumar. "Approaches have often been antagonistic to local people — this really needs to change. Land acquisition has to be a voluntary and rewarding process."

### **'Eviction not the answer'**

"It is important to involve communities in conservation," concurs Paramesha Mallegowda, Programme Associate at the Bengaluru-based Ashoka Trust for Research in Ecology and the Environment. "Eviction is definitely not the answer. Rather than relocating entire villages, we need to restore the corridors and ask people to avoid using critical [elephant] migratory routes. Conservation is an achievement only if local communities are also involved in the process."

As Dr. Tiwari notes, "At a time when about 400 to 450 humans are losing their lives due to human-elephant conflict annually in India and around 100 elephants are being killed in retaliation, it is high time that the migratory corridors that elephants have traditionally used are saved before it is too late."

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## What is Earth's climate future?

It is climate season again as the UN Climate Change Conference (CoP23) considers a greener future for the planet in Bonn, Germany. There is plenty of literature on the topic, but it is always useful to get it organised between the covers of a book. Australian climate scientist and conservationist Tim Flannery, in *The Weather Makers* (2005), provides a researched and cogent explanation of carbon dioxide's role in keeping the globe warm and preventing it from deep freezing. A lot more has happened over the past decade, of course, in terms of scientific reports published on the impact of man-made greenhouse gas emissions on ecosystems, led by scientists of the Intergovernmental Panel on Climate Change. Prof. Flannery's book provides a foundational understanding of all the connected phenomena.

To understand concerns over Earth's future, it is useful to delve into geological history. We learn, in an accessible explanation given by Prof. Flannery, of the explanation by astrophysicist Milutin Milankovitch in the 20th century, of three principal cycles that are responsible for Earth's climatic variability — its orbit, axis and a wobble on its axis — all taking place at intervals, variously, of about 100,000 years and 22,000 years. To this we must add human interventions in the latest warm phase over the past 8,000 years that culminated in atmospheric carbon dioxide of 280 parts per million (ppm) just before the Industrial Revolution. Since then, the levels have risen steadily due to man-made emissions, touching 403.3 ppm last year.

Just how long can humanity hope to maintain a liveable climate in the present warm phase? *The Weather Makers* provides insights into how civilisations responded to adverse events, such as a rise in rainfall in Mesopotamia after a slight shift of Earth's orbit between 10000 and 4000 BC, and a further reversal in 2800 BC that drove people to other parts where managed irrigation developed as a response. The book cuts across geological time in about 330 pages. It was written when the world was struggling to get the major nations to take the Kyoto Protocol seriously. The international community has advanced since, and has the Paris Agreement as a template on the one hand and the rise of low-cost green technologies on the other. It is encouraging that a young generation now wants to go green and shun fossil fuels. When Prof. Flannery wrote the book, industry and business mostly campaigned against the science, but today, they are ready to embrace it.

The definition of harassment needs to be constantly updated, and the process for justice made more robust

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## Crisis is in the air

The first thing that the Central and Delhi governments should own up to regarding the air pollution crisis is that everyone was forewarned and cannot pretend to be taken unawares. This “winter of our discontent” is the season when, as temperatures dip, pollutants hover around the surface of the city and do not waft upwards. Things will only get more acute towards January. To make matters worse, smoke from burning farm waste descends on the capital from surrounding states at this time, which is a far more intractable problem.

Three years ago, the writing on the wall was the revelation by the World Health Organisation (WHO) that Delhi was the most polluted city in the world, and 13 out of the 20 worst impacted were in north India. The tell-tale parameter is the smallest measurable particulate matter — PM of less than 2.5 microns — which was an annual average of 153 micrograms per cubic metre that year, well above the WHO limit of 35. Beijing, which was previously the black sheep of the world’s urban air contamination, recorded 53 micrograms.

Last year, Delhi lost this dubious distinction to Zabol in Iran and fell to 11th place on the world map. However, north India continued to fare among the worst on the globe, with Gwalior second, Allahabad third, Patna sixth and Raipur seventh. While Delhi continues to get all the attention on this score, one should pay heed to children and senior citizens in these other beleaguered cities. These residents can’t afford air purifiers like many of the capital’s well-to-do and diplomats, not to mention the bizarre measure of installing huge vacuum cleaners on its roads.

Has any decision-maker in the capital understood the full consequences of declaring its air a “national emergency”? Visitors — whether on business or diplomats — will think three times before visiting Delhi this winter. One has only to recall that it was estimated that when President Obama visited for the Republic Day parade in 2015 he may have lost six hours of his life by spending three days in the capital. The US Embassy imported 1,800 air purifiers for his entourage. Children can’t attend school or play outside, and this has made Delhi the air pollution pariah of the world.

This could put paid to the prime minister’s “Make in India” campaign. Indeed, if a good economist could calculate the financial losses on days missed at work, avoiding the outdoors at certain times of the day and the bills for respiratory diseases, it would reveal a huge bill borne mostly by individuals, and prompt the authorities to take all measures possible to curb this public health menace.

Certain causes, like the burning of farm residue require a carrot and stick approach to encourage farmers to recycle crop waste rather than burn it. But other causes like the pollutants from thermal power stations in and around the capital and the dust from construction can be more easily tackled by stiff penalties.

The sources which can be tackled head-on are the pollutants from vehicles. Delhi’s AAP government has done well to experiment with an odd-and-even number plate scheme, which ought to be extended through the winter. Last March, the capital had 8.8 million vehicles, followed by Bengaluru with 6.1 million. Chennai, Kolkata and Mumbai have far fewer — 4.8 million, 3.9 and only 2.7 respectively. The reasons are not far to seek: Mumbai has an excellent public transport system, with its lifeline — the two local railways — carrying 3.7 million passengers a day, despite atrocious travelling conditions, which manifested in the foot overbridge accident this September. The once-renowned BEST bus service, now being bled to death by the city’s municipal corporation, still carries 2.9 million passengers (a sharp fall from 4.4 million seven years previously).

It is a no-brainer that the pollution caused by private vehicles, whether they are four- or two-wheelers, can be curbed by restricting their numbers, as Beijing and other Chinese cities have done successfully even as public transport is greatly increased. Shanghai, for instance, has emulated Singapore's example of setting a limit on the number of cars permitted on its roads; Singapore allows market forces to decide the price of such a licence, which can exceed the cost of a car sometimes. Parking fees ought to be drastically increased, and payable even at night time. And, following London's example, the proceeds should be ploughed back into bettering the bus service.

With India going on a transport infrastructure spree, including in cities, there ought to be a clear discouragement of private motorised transport in favour of public transport. Mumbai's reckless city fathers are doing precisely the reverse by building an Rs 15,000-crore coast road only for cars. If Mumbai has been spared the ignominy of Delhi when it comes to air pollution, one reason is that the sea breezes waft pollutants away. Once this road is built, all that will change since the prevailing winds are in a south-west direction. Indeed, a rule of thumb for any transport infrastructure scheme, whether in cities or outside them, should be that they can be permitted only if half the users constitute the public.

All cities are making the mistake of prescribing metros as the solution for local transport. Although far superior to adding roads, these are expensive. In Delhi, and to a smaller extent in Mumbai, any raising of fares sparks off a controversy. In Delhi, the 200-km-plus Metro network doesn't seem to have reduced the number of cars appreciably, only two-wheelers. Mumbai is going in for a slew of such projects at a high cost, even parallel to the existing express highways, which is inexplicable. The fact that its standalone 11-km Metro sees 3.5 lakh users a day, while Delhi has only 28 lakh or around nine times as many, demonstrates that the Metro won't prove the ideal mode of mass public transport.

That distinction should go to buses, which can run both long distances in cities, as well as provide last-mile connectivity to and from metros and local railway stations. And, dare one even state it, reserved bus lanes are the most cost-efficient and egalitarian means of city transport, which penalise the polluters — cars and two-wheelers — and carry commuters comfortably and cleanly. What's more, it's virtually a no-cost solution.

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## City in search of an idea

A recent seminar on cities in Brasilia was revealing on two counts. First, it pointed out the dismal quality of life in the world's most wretched urban areas — almost all, without exception, in South Asia. Second, since the seminar was Third World-centric, its outcome was all the more damning. The criteria it used were truly basic — health, education, population density, access to water and clean air. The seminar did not even venture into First World standards of parks, recreation, social cohesion, entertainment, culture, or the quality of life.

Polluted air, rain-flooded streets and traffic snarls — these are obvious to most residents of Indian towns, and hardly need any restating. Strained on utilities and infrastructure, the city survives from day to day like a heavily-sedated patient in an ICU. Its future, even its survival the next day, is filled with multiple insecurities. Yet, Indian cities are remarkable in that they display their warts and all without hesitation and with utmost clarity. Look, for instance, at five of India's largest towns, each a critical marker of one major problem.

Delhi's pollution levels were among the highest in the world long before they were statistically reckoned in terms of particulate matter, carbon dioxide emissions, industrial effluents and daily air quality measures. As temperatures drop and crop stubble is burnt in neighbouring Punjab and firecrackers are lit — despite bans — toxic particulate matter rises to alarming levels. Pollution spikes to such unsafe standards in winter that news reports claim — without irony — that "today's level has improved from dangerous to very harmful". Marathons and cyclothons continue to be staged in Delhi, but with participants wearing masks. Is this acceptable for Asia's largest and most populous capital?

In Bengaluru, traffic comes to a virtual halt during peak hours. While, there is no viable public transport system for a population of one crore, the city has almost 70 lakh motorised vehicles — a number that has grown by 6,000 per cent from the 1970s. As a result, the average speed of vehicles in the city has dropped radically. It was recently clocked at 4.7 km per hour, slower than a middle-aged pedestrian walking normally. With the fastest internet connections to the rest of the world, India's IT city is slowest in terms of physical movement.

Mumbai, the country's business centre, comes to a virtual standstill for a completely different reason — floods. Every year, between June and September, people are stranded on embankments, swallowed up by open manholes, electrocuted by low-hanging wires, injured under collapsed buildings, or plain incapacitated in their daily routines between home and office. At Elphinstone Road Railway Station, a stampede after the recent floods left 22 people dead. Numerous old structures are in danger of collapse. For four months, it is not business as usual in Mumbai.

Kolkata's affliction is not new and stems from a lack of civic amenities. Without regular increases in power supply and water provision, the city survives on an entirely outmoded and inadequate supply and distribution system. With the Ganga along its Western flank, the city traditionally had extensive groundwater reserves and wetlands, but large parts of South and Central Kolkata now experience chronic water shortages. With rationing, power cuts and blackouts, India's oldest and once-most sophisticated modern city is now its most un-modern and antiquated.

Chennai is still the most livable of the big five. But that does not mean that it has no problems. Indeed, it has all the same afflictions, but in smaller measure — broken incomplete roads in Perumbakkam, water logging, lack of street drainage and lighting, and continual shortage of drinking water in the new areas. Residents of Chennai have learnt to do with less.

Providing relief to people in the Indian city now lies beyond the scope of conventional solutions and governance ideas — both of which have denied residents a better quality of life. Odd and even-numbered cars, a ban on diesel, planting trees, reviving mangroves, establishing flood break-heads, rationing utilities and reviving public transport are minor and ad-hoc solutions to problems that are now beyond environmental and bureaucratic control.

More than ever now, city officials need to start asking the right questions. Will Bengaluru benefit from the graded transition from fossil-fuel powered cars to electric cars over the next decade? Or will it benefit from the reduction and eventual eradication of cars altogether? Is private pod transport an answer to traffic problems? Should bylaws be revised to allow offices and homes at one place, and cut out commuting altogether? Should Mumbai merely clean up its storm drainage system before the monsoon — or upgrade it as is normally done prior to the rainy season — or seriously examine the possibility of creating large catchment areas throughout the city? Should Delhi encourage carpooling in winter and levy fines on burning coal and — in the obvious next stage of its convoluted policies — provide government subsidies to private air purifiers? Or, as has been done in many South American cities, reduce construction and create biomass parks with a sizeable proportion of trees per person in every neighbourhood?

The real test in the next decade will be one of far-reaching urban ideas that will have to be put in place by a mayor or a CEO (city enforcement officer) — someone in a position to take on responsibilities and initiate action. The promise of a brighter urban future rests with testing new ideas from new sources enacted by new people. The choices are many, but they need to be made now and by a single authority.

“More than any time in history,” wrote Woody Allen, “mankind faces a crossroads. One path leads to utter despair and hopelessness, the other to total extinction”. When applied to the present Indian city, Allen’s prophecy has been realised on both counts.

END

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## India needs a federal green agency

The thick smog that has enveloped north India over the past few days is a public health emergency. The callous response by various government agencies to what has become an annual affair is nothing short of scandalous. There is a deeper problem here. As every state blames the other, the weak policy response is also an indication of an institutional vacuum to deal with public goods issues in a federal political system.

The story so far is well known. Citizens living in the National Capital Region are among the millions who have been left gasping as farmers in neighbouring states burn stubble on their farms, before preparing them for the winter sowing cycle. The immediate responses include calls for a ban on such biomass burning. However, as Mridula Ramesh of the Sundaram Climate Institute has written in Firstpost, a far better alternative to a unilateral ban is to examine solutions based on an understanding of why farmers burn stubble in the first place. Any viable policy response should take into account the needs of the farmers as well as city dwellers.

A key principle of policy design is that the intervention should focus on the root of the problem—stubble burning, in this case. The distortion should be dealt with directly. In this case, is it possible to change the incentives for farmers who burn biomass?

The standard economic solution is to impose a Pigouvian tax on farmers to ensure the polluter pays for his actions. Such a tax would change incentives by increasing the cost of stubble burning. However, the Pigouvian solution is neither politically practical nor just. A far better way to deal with the effects of stubble burning comes from the work of Ronald Coase.

Coase argued, in a landmark paper published in 1960, that the solution to externalities such as pollution is not unilateral action but complex bargaining between different interest groups. The bargaining will be based on how much farmers value stubble burning on the one hand and how much city dwellers value clean air on the other.

One example of the use of the Coasean method is the landmark New York City Watershed Agreement of 1997. New York had been asked by government regulators to build an expensive water filtration plant to improve the quality of water it supplied citizens. To reduce costs, the city negotiated with upstream farmers who were polluting the watershed area to either buy out their land or pay them to change farming methods.

In the case of the smog in north India, it could mean that farmers should be paid to invest in better technologies to deal with the stubble left over from the previous harvest. A subsidy will change their incentives. Such a Coasean bargain is premised on two preconditions. First, property rights need to be assigned. Second, there needs to be a credible agency to manage the negotiation. India has neither right now.

The assignment of property rights in this case is devilishly difficult. The more practical solution is that the state governments of Delhi, Punjab and Haryana be considered the representative agencies for their respective citizens. They should negotiate on how the cost of changing farming practices will be shared. A first step will be to estimate the amount to be paid for every hectare of farmland that is shifted away from stubble burning.

The second problem is the lack of an institutional structure to deal with such federal negotiations, especially when the three state governments are run by three different political parties. This is where the Union government needs to step in as a coordinating agency. It can also offer to bear half the fiscal costs of any green bargain between the three states.

However, a better solution over the long term is to set up a federal agency like the Environmental Protection Agency in the US, with powers to get states to the bargaining table. The exact contours of such an agency will need to be debated by climate change scientists, economists, environmental activists and political parties. The current institutional vacuum needs to be filled.

There is also a broader lesson here. The ongoing fiscal decentralization is welcome, but India still needs an effective Union government to hold a complex country together. One challenge that needs central coordination is the provision of national public goods—be it national defence or monetary stability or environmental quality.

The winter smog that chokes millions of people every year needs to be dealt with through a long-term institutional strategy rather than hasty administrative responses each time citizens choke.

*Does India need a new institutional architecture to deal with multi-state problems such as air pollution? Tell us at [views@livemint.com](mailto:views@livemint.com)*

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## SC terms Delhi smog life-threatening

Choking capital: A view of Vijay Chowk in Delhi covered by smog on Monday. V. Sudershan

The Supreme Court on Monday sought the response of the Centre and the governments of Punjab, Delhi and Haryana on measures taken to counter the smog and pollution choking the national capital and surrounding areas.

Acknowledging the dire consequences that continued exposure to peaking levels of air pollution would visit on the public, including schoolchildren, a Bench led by Chief Justice of India Dipak Misra said long-term preventive measures should be taken to end this life-threatening situation caused by stubble burning and dust from construction activities.

### Long-term solution

Noting that the petition filed by advocate R.K. Kapoor, highlighting the need for action, should be restored to an appropriate Bench, the Supreme Court said it would focus on chalking out a long-term solution to the problem. Other forums like the National Green Tribunal (NGT) should go ahead with hearing the pollution cases, it said.

The apex court's green signal to the NGT came on a day the tribunal pulled up the Uttar Pradesh government for not complying with its order to ban construction in the National Capital Region despite PM10 level being over 900. The tribunal described the State's attitude as making a "mockery of the system."

Mr. Kapoor suggested in his petition that incentives for farmers and alternative methods such as sprinkling water on trees and the streets would reduce the pollution.

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## A hazy policy

The Delhi government, the Supreme Court-mandated Environment Pollution Prevention and Control Authority (EPCA) and the National Green Tribunal (NGT) agree that the capital's ongoing air pollution crisis is an "emergency". Unfortunately, nothing they have done over the past three weeks has assured the city's smog-struck residents that the three agencies are willing to work together in confronting the situation with the urgency it requires.

Two days before Diwali, the EPCA enforced a slew of measures, including a ban on diesel generator sets, that seemed to signal the SC-appointed body's seriousness in dealing with the pollution that ensues after the festivities. The EPCA also indicated that it would recommend the odd-even policy of road-rationing if Delhi's air quality did not improve. But when it made such a recommendation last week, the city had already registered "severe" on the Air Quality Index. The Delhi government, despite its reservations over road rationing, decided to comply with the directive. The odd-even policy should have been in place on Monday. But the NGT felt that the policy was too watered down to be effective. The green tribunal wanted the exemptions to two-wheelers, women and government servants to go first. The AAP government promised to respond to NGT's reservations but on Monday, it appeared before the green court more than an hour late. This means that the odd-even policy will not be in place even today. Meanwhile, the level of particulate matter in Delhi's air is seven times more than what it should be.

Delhi's persistent air pollution problem should have made all authorities alive to the necessity of concerted action. But the EPCA, NGT and the Delhi government have pulled in different directions. Even earlier, in January, the Delhi government told EPCA that the shortage of buses in Delhi makes road-rationing a difficult proposition: The city has less than half the number of buses it requires. This excuse — also a reason for the exemptions — actually betrays the Delhi government's own ineptitude. During the AAP government's two-and-half year stint in office, Delhi's bus fleet has reduced by 8 per cent, according to the Union Ministry of Road Transport and Highways — this when the party had promised to increase the number of buses in the city in the 2015 elections that brought it to office. That said, the NGT could have shown the sagacity demanded during an emergency by allowing the government to go ahead with the "watered down" odd-even policy — nothing, after all, prevented the Green Court from demanding a more stringent policy if things didn't improve.

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## Why number plate-based bans are odd, even existing tech can do better!

Delhi has a huge problem. Every winter, people realize they are breathing the equivalent of 50 cigarettes a day. However, as soon as the smog clears, so does the issue. Every year, policymakers find and announce quick fixes that demonstrate the government's resolve to do something about pollution. Since crop burning and dust storms are not immediately addressable, all the focus turns to vehicular pollution. This year, the National Green Tribunal (NGT) is ordering measures such as banning road-side parking and the retiring of old cars. Odd-Even road rationing was suggested, diluted with exceptions and then scrapped.

Such quick fixes may even be effective, but will only remain under the glare of the media. They are not sustainable. Recently, I wrote about 'policy windows', and how demonetisation led to the permanent unblocking of regulatory hurdles to a less-cash economy. Even though we have a similar crisis at hand, those in charge are unable to find a way to move the needle forward significantly. This is surprising, because the infrastructure to do this already exists!

The FASTag, launched by the Indian Highways Management Co. Ltd (IHMCL) in 2014, is a way to collect tolls electronically. Each car gets a radio-frequency identification (RFID) tag that is based on an open standard. This means the RFID readers are cheap, inter-operable and not locked in to any particular vendor. The transaction switch is managed by the National Payments Corp. of India (NPCI). When fully implemented, we will be the only country with a nation-wide inter-operable electronic toll collection (ETC) system. The ministry of road transport and highways and the National Highways Authority of India have been doing a great job of installing these RFID tags without much fanfare since 2014. Of the four million vehicles plying on highways daily 600,000 have RFID tags. From 1 December, every new car will come pre-installed with a FASTag.

At first glance, FASTag may seem useful only for automating toll collection. In reality, the architecture of the FASTag is very versatile. Each car gets a unique ID, and is linked to a bank account/wallet. Money is deducted based on the event that has happened, like passing a toll booth. There are at least five ways in which the FASTag platform can help Delhi's vehicular problem.

First, FASTags can implement congestion pricing. This is a model perfected by London and Singapore. Delhi, especially, with the subcontinent's most extensive metro network, and yet the third highest density of cars (424 cars per 1,000 people), needs congestion pricing. The pricing itself can be dynamic to affect demand.

Second, the same FASTags can enable the government to have lower congestion pricing for those who are pooling to work. The government does not even have to create its own ride-sharing app, it has to simply provide application programmatic interfaces (APIs) to legitimate ride-sharing app providers.

Third, these tags can regulate parking, while simultaneously creating a revenue opportunity for cities. FASTags can ensure that a no-parking sign is not just a warning, but a serious penalty for those looking to park illegally. Individuals and businesses can 'switch on' temporary parking spaces during peak hours.

Fourth, the FASTag readers can also be used to implement many of the policy recommendations of the NGT that are otherwise difficult to implement. Pollution Under Control Certificates (PUC) can be linked to the FASTag accounts, and a tag without a valid PUC can be fined automatically when it crosses a reader. The government can run experiments like it did with Odd-Even last year and then quickly scale them up if needed in an automated way.

Fifth, and the most important, all of these problems are really difficult to solve because the government lacks granular traffic data needed to make better decisions. Every decision from the width of the flyover, to the timing between red lights needs better quality data.

Companies like Uber and Google are able to figure it out by tracking which cell tower your phone connects to and tracking your phone's global positioning system (GPS). Right now, an engineer in San Francisco has a much better idea of traffic movement in Delhi than the officials whose job it is to design roads.

With a trusted implementation of FASTag readers, the government can get such anonymized data directly from the ground. Basically, an invisible toll booth that doesn't collect a toll but captures every time any car crosses it. This data can be immensely powerful when used correctly.

Tomorrow, our smart cities can have smart traffic lights that don't stay red a second longer than is optimal. The possibilities of this system are endless, but we need to push collectively to make it happen. Policymakers need to act now, before the policy window closes. Because when the smog finally dissipates, so will the political will to solve the issue, but the problem will still hang in the air. Till next winter!

*Nandan Nilekani is chairman of Infosys Ltd and former chairman of Unique Identification Authority of India.*

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## Warm, warmer: on climate change

As the 23rd conference of the UN Framework Convention on Climate Change in Bonn shifts into high gear, developing countries including India are focussing on the imperatives of ensuring adequate financing for mitigation and adaptation. They are moving ahead with specific instruments for loss and damage they suffer due to destructive climate-linked events. India's progress in reducing the intensity of its greenhouse gas emissions per unit of GDP by 20-25% from 2005 levels by 2020, based on the commitment made in Copenhagen in 2009, has been positive. Early studies also suggest that it is on track to achieve the national pledge under the 2015 Paris Agreement for a 33-35% cut in emissions intensity per unit of growth from the same base year by 2030, and thus heed the 2°C warming goal. Since this performance is predicated on a growth rate of just over 7%, and the parallel target for 40% share of renewable energy by that year, the national road map is clear. What is not, however, is the impact of extreme weather events such as droughts and floods that would have a bearing on economic growth. It is in this context that the rich countries must give up their rigid approach towards the demands of low and middle income countries, and come to an early resolution on the question of financing of mitigation, adaptation and compensation. Of course, India could further raise its ambition in the use of green technologies and emissions cuts, which would give it the mantle of global climate leadership.

At Bonn, stay the course

The climate question presents a leapfrog era for India's development paradigm. Already, the country has chalked out an ambitious policy on renewable energy, hoping to generate 175 gigawatts of power from green sources by 2022. This has to be resolutely pursued, breaking down the barriers to wider adoption of rooftop solar energy at every level and implementing net metering systems for all categories of consumers. At the Bonn conference, a new Transport Decarbonisation Alliance has been declared. It is aimed at achieving a shift to sustainable fuels, getting cities to commit to eco-friendly mobility and delivering more walkable communities, all of which will improve the quality of urban life. This presents a good template for India, building on its existing plans to introduce electric mobility through buses first, and cars by 2030. Such measures will have a beneficial effect not just on transport choices, but on public health through pollution abatement. A national law to raise the efficiency of transport could well be the answer, which the States will readily adopt if supportive financial arrangements are built in. There is some worry that an increase in coal, oil and gas production could negate some of the gains made. The record in this sphere will naturally be evaluated against India's [Paris Agreement pledge](#) to use a combination of incentives for clean production and levies on fuel to maintain a balance.

Revving up infrastructure spending is necessary, but not sufficient

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## A lack of fit

The Delhi government has been at the receiving end of a spate of diktats from the National Green Tribunal since last week when it decided to implement the odd-even scheme of road rationing. The tribunal has weighed in, not on the matter of law, which it is mandated to do, but on policy, which is best left to the executive. It has found the Delhi government's scheme too watered down to effectively tackle the city's ongoing pollution emergency.

On Tuesday, the tribunal termed the exemptions given by the Delhi government to women, government servants, vehicles carrying children, and two-wheelers as "arbitrary". The green court's interventions have put paid to the chances of the odd-even policy being implemented to check the current pollution emergency — the Delhi government contends that the city's public transport shortfall does not allow it to implement road rationing without giving exemptions.

Like any arm of the judiciary, the NGT's expertise lies in interpreting law and weighing executive action against them, as in the case of the Air (Prevention and Control of Pollution) Act. The tribunal was set up for "the effective and expeditious disposal of cases related to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment". But in its directions to policymakers, the green court has often exceeded this mandate, enshrined in the National Green Tribunal Act, 2010. Last year, when Delhi was reeling under another pollution crisis, the NGT decreed that steps be taken "on long-term and short-term basis keeping in view the precautionary principle to ensure that the ill-effects and adverse impact of polluted ambient air quality is not repeated in the year 2017".

Many such summary directives have gone unheeded. According to the court's own admission, the order that passed strictures on construction activity and use of diesel generator sets in the capital "remains unexecuted". "The judgment has been complied with only in default," it noted. The green tribunal usually lays the blame for such failures at the door of state governments. In the last month, for instance, it has admonished the Punjab and Haryana governments on at least three occasions for their failure to implement a 2015 directive that banned stubble burning in these states. The NGT needs to acknowledge that what such failures also signal is that the green body has been treading into areas where it has little expertise, undermining its own credibility.

It is nobody's case that the Delhi government's odd-even policy is flawless. In fact, Delhi's pollution crisis should occasion a rethinking by all authorities that deal with environment. The NGT should re-visit the cases where it has crossed the line that divides judicial intervention from policy-making.

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**Pre-ponement of introduction of BS -VI grade auto fuels in NCT Delhi****Pre-ponement of introduction of BS -VI grade auto fuels in NCT Delhi**

The Government of India has been making concerted efforts in line with Prime Minister Shri Narendra Modi's Commitment at COP 21, to reduce vehicular emissions and improve fuel efficiency with an aim to reduce the carbon footprints and keep a healthy environment. India has followed the regulatory pathway for fuel quality and vehicle emissions standards termed as Bharat Stage (BS).

The Ministry of Petroleum and natural Gas has successfully introduced the BS-IV grade transportation fuels across the country w.e.f April 1<sup>st</sup> 2017. With the launch of BS-IV grade fuel, a new era of clean transportation fuels has begun which will benefit all citizens of our country by substantially reducing pollution levels. Migration to BS-IV grade fuels shows India's resolve to cut down emissions.

As a next step in this direction, Government in consultation with stakeholders has decided to meet international best practices by leapfrogging directly from BS-IV to BS-VI grade by 1<sup>st</sup> April, 2020, skipping BS-V altogether. Oil refining companies are making huge investments in fuel up gradation projects to produce the BS-VI grade fuels.

Taking into account the serious pollution levels in Delhi and adjoining areas, Petroleum Ministry in consultation with Public Oil Marketing Companies has **decided for preponement of BS-VI grade auto fuels in NCT of Delhi w.e.f 01.04.2018 instead of 01.04.2020**. OMCs have also been asked to examine the possibility of introduction of BS-VI auto fuels in the whole of NCR area w.e.f 01.04.2019.

This measure is expected to help mitigate the problem of air pollution in NCT of Delhi and surrounding areas.

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## Crop residue-coal mix to nix stubble burning

The government has directed the state-run power producer NTPC to mix crop residue pellets with coal for power generation in its thermal power plants in a bid to curb crop burning in Punjab and Haryana, one of the reasons behind the pollution crisis in Delhi and its neighbourhood.

Power Minister R.K. Singh said this step would earn farmers Rs. 5,500 per tonne of crop residue. The statement comes a day after the Ministry of Petroleum brought forward the deadline for the rollout of the cleaner BS-VI grade fuel in Delhi to reduce emissions.

### Curbing pollution

“The Ministry has directed the NTPC to mix straw/crop residue pellets with coal, up to 10%, for power generation in all of its thermal power plants,” Mr. Singh told reporters on the sidelines of a function organised by the Power Ministry. “This step would reduce crop residue burning in agriculture dominated States like Punjab, Haryana, etc. and hence reduce air pollution that is currently being experienced.”

“This step would give the farmers a monetary return of Rs. 5,500 per tonne of crop residue and hence create a market for it,” the Minister added. “The infrastructure for sourcing the crop residue from farmers is being set up and the NTPC would soon be issuing tenders in this regard.”

Mr. Singh said his Ministry was in talks with State governments to make it mandatory to source 10% of their fuel from straw or crop residue for all power plants in their respective jurisdictions.

### Portal launched

The Minister on Thursday launched the portal for the Saubhagya Scheme, which seeks to implement last-mile connectivity to electrify rural households.

“Achieving electrification of four crore households is a big challenge, but nevertheless the government is committed to achieving this target by December 2018, with the cooperation of all States,” Mr. Singh said during the event. “This would, in turn, bring about a huge improvement in the quality of life of the citizens.”

The online Saubhagya portal (<http://saubhagya.gov.in>) is meant to enable every State to enter the current status of progress of electrification.

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## Punjab to set up 400 plants to process paddy residue

The Punjab government has decided to set up 400 processing plants before next year's paddy season to convert straw into bio-energy.

"The plants will become operational before the next paddy season, thus preventing recurrence of the environmental hazard triggered by stubble burning," an official spokesperson said in a statement.

The MoU was signed on behalf of the Punjab government by R.K. Verma, CEO, Punjab Bureau of Investment Promotion, and K. Iyyapan, MD of NEWAY, a Chennai-based company.

"Plants will be set up by NEWAY Engineers MSW Private Limited with a total investment of Rs. 10,000 crore over the next 10 months," added the spokesperson.

### Patented technology

The spokesperson said the company would use its breakthrough and patented pollution-free zero residue technology to ensure that there was no residue at the end of the process, thus preventing any land filling. "The technology will provide a sustainable solution to the environmental problems caused by burning of paddy residue in the State."

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## U.K., Canada launch alliance to phase out coal

Police vehicles drive into the premises of the Weisweiler coal-fired power plant near Aachen, Germany on November 15, 2017. According to the dpa news agency environmental activists occupied coal supply routes of the plant. | Photo Credit: [AP](#)

Britain and Canada are launching a new alliance aimed at encouraging countries to phase out the use of coal as part of efforts to curb climate change. The Global Alliance to Power Past Coal is being unveiled on November 16 at an international climate meeting in Bonn.

While coal-fuelled power stations are considered one of the biggest sources of carbon dioxide that's heating up the Earth's atmosphere, countries such as Indonesia, Vietnam and the United States are planning to expand its use in the coming years. Even Germany and Poland, hosts of climate talks in 2017 and 2018, are holding onto coal for the foreseeable future.

The new anti-coal alliance is expected to include Finland, France, Italy, Mexico, New Zealand and several U.S. states committed to the Paris climate accord.

Warm, warmer: on climate change

Meanwhile, a Norwegian investment fund that manages assets worth over \$80 billion is pulling investments from 10 companies over their involvement in the coal sector.

Storebrand, Norway's biggest private pension provider, says it divested from companies including German energy company RWE, Poland's PGE and Eskom Holdings of South Africa.

Its chief executive, Jan Erik Saugestad, said on November 16 the decision is meant as a warning to utility companies to "clean up" their energy sources "or lose customers and investors".

Storebrand said it hopes the much larger Norwegian Sovereign Wealth fund, which holds \$1 trillion generated from the country's sale of oil, will follow its divestment decision.

A book on geological history that explains climate change

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## Why haven't electric cars caught on in India, asks SC

The Supreme Court on Friday wondered why big automobile companies are not investing in solar-powered and battery-operated cars in India as much as they do abroad.

A Bench led by Justice Madan B. Lokur orally pointed out that solar and battery cars have become popular across the world for their clean energy. The court said efforts should be made to drive the market up for such cars in public interest and for a clean environment.

### Emission norms

The car manufacturers, meanwhile, said they would meet the April 2020 deadline for achieving BS-VI emission norms.

The court directed the Union to respond to an application filed by its amicus curiae and senior advocate Harish Salve to ensure sufficient supply of gas in the National Capital Region so that it can be used as the principal fuel. The court asked the Centre to respond to Mr. Salve's application to "direct the Union to oversee measures to strengthen the distribution of electricity in the NCR to ensure that there is no shortfall in the availability of electricity".

The Centre, represented by Additional Solicitor General A.N.S. Nadkarni, has sought some time to respond to the court.

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## SC for nationwide ban on furnace oil, pet coke

The Supreme Court on Friday requested all States and Union Territories to move forward towards a nationwide ban on the use of pet coke and furnace oil to power up industries, in a bid to fight pollution.

The Environment Bench of the Supreme Court had already ordered a ban on the industrial use of pet coke and furnace oil in the States of Uttar Pradesh, Haryana and Rajasthan on October 24.

This ban specifically came after an Environment Pollution Control Authority Report recommended the ban on sale, distribution and use of furnace oil and pet coke in the National Capital Region (NCR). Their use is already prohibited in Delhi.

### **'Not confined to NCR'**

"We may note that the pollution caused by pet coke and furnace oil is not a problem confined only to NCR but appears to be a problem faced by almost all the States and Union Territories in the country," the Bench of Justices Madan B. Lokur and Deepak Gupta observed in their written order.

Pursuant to the Supreme Court ban, both the Environment Ministry and the Central Pollution Control Board, on November 15, brought into "immediate effect a prohibition on the use of pet coke and furnace oil by any industry, operation or processes within the States of U.P., Haryana and Rajasthan until further orders".

However, senior advocate and amicus curiae Harish Salve submitted that such a prohibition would only partly solve the pollution problem in these States. He said the actual source of these pollutants should be stopped. For this, the very sale of pet coke and furnace oil for use as fuel should come to an end in U.P., Haryana and Rajasthan.

Additional Solicitor General A.N.S. Nadkarni, for the Centre, was asked by the court to get instructions from the Centre and respond within a week on the suggestions by Mr. Salve.

On October 24, the apex court 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.

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## The superbugs of Hyderabad

Industrial effluents from in and around the city have turned the Musi river, seen here at Peerzadiguda, on the city's outskirts, frothy and toxic.

Deep inside the Kazipally industrial area of Hyderabad, the capital of Telangana, is an open well, about 20 feet across. Into it empties a thin stream of murky fluid, changing colour from black to brown to a dull green as it flows. Its vapours are mildly pungent at first, but get nauseating within 15 minutes. Yet a man stands beside it, suctioning out the fluid through a pipe attached to a bright red tanker marked 'Industrial Effluent'. This tanker will transport the fluid to Patancheru Enviro Tech Limited (PETL), an effluent treatment plant around 20 km away, where it will be treated and released into Hyderabad's Musi river.

Things don't always go according to plan, though. For one, the Kazipally well, a temporary containment facility for toxic effluents from a dozen pharmaceutical companies, is not leak-proof. A natural rivulet takes the fluid in the well to the nearby Gandigudem lake, where Kazipally's residents — mostly farmers and some pharma industry workers — raise fish to sell. On most days, the rivulet is a mere trickle. But on October 3 this year, when heavy rains lashed Hyderabad, it flooded, poisoning around 2.3 lakh fish in the lake.

Fish kills aren't new in Kazipally. Since the pharmaceutical industry took root in the city in the 1970s, environmental pollution has threatened agriculture, aquaculture and the health of Hyderabadis. But new research in the last few years shows this pollution to be a threat of a larger, more terrifying scale.

The Kazipally well, along with ditches, lakes and rivers around the pharmaceutical cluster, receives large doses of antibiotics, along with the traditionally monitored pollutants. When these antibiotics come in contact with pathogenic bacteria (which cause disease in humans), the latter learn to resist the former, making human infections by these pathogens extremely hard to treat.

Antibiotic resistance is arguably the biggest threat to global health in the 21st century. In 2014, around 700,000 people across the world died due to infections that evaded antibiotics, a number that is estimated to touch 10 million by 2050.

It isn't clear how many Indians die from antibiotic-resistant infections each year, but hospital-based studies are alarming. One study from Delhi's Ganga Ram hospital found that between 2002 and 2009, among patients infected by *Klebsiella pneumoniae* (a pneumonia-causing bacterium), the percentage of these pathogens that were resistant to carbapenems grew from 2% to 52%. Carbapenems are a class of last-resort antibiotics which doctors use only when others have failed.

A big driver of resistance is the overuse of these drugs. When people take antibiotics they don't need, for a viral flu, for instance, the bacteria in their body learn to tolerate these drugs by acquiring resistance genes. But resistance genes don't come out of nowhere — some of them have existed for decades in soil and water, helping environmental bacteria fight natural antibiotics.

### Organic chemicals making life miserable for citizens

Studies in Hyderabad's pharmaceutical cluster now show that the large doses of man-made antibiotics in pollution hotspots like Kazipally force these environmental bacteria to evolve by boosting the numbers of resistance genes. When human pathogens like *Staphylococcus aureus* (which causes skin and respiratory infections), mix with these environmental bacteria, they borrow these genes freely, making them potential killers.

Hyderabad's pharmaceutical industry has responded to the science linking antibiotic pollution with resistance by questioning the motives of the researchers. Much of the research in the Patancheru, Kazipally and Pashamylaram industrial areas comes from research groups in Sweden, while one study comes from Germany. Officials from pharmaceutical companies argued that these groups were trying to revive the flailing European manufacturing sector by maligning Indian drug makers. Calling the finding of high antibiotics in the environment "doubtful", P. Eshwar Reddy, executive director of Bulk Drug Manufacturers Association (BDMA) said, "Most of the reports are from foreign countries. We have to cross-check them ourselves."

In 2005, Cecilia de Pedro, a student of environmental sciences at Sweden's University of Gothenburg, began testing the effects of industrial waste water on a tiny transparent crustacean, the water flea. She decided to use samples from PETL's plant, which was already in the eye of a storm for being a big polluter. In fact, the entire Patancheru region — home to drug, pesticide and paint makers — is considered one of the most toxic environments in the world. And so, when de Pedro found out how poisonous the treated discharge from PETL was to the flea, no one was surprised. What wasn't clear, however, was what chemicals were causing the toxicity.

De Pedro's findings intrigued D.G. Joakim Larsson, an eco-toxicologist at the same university. He wanted to find out if the culprits were pharmaceuticals. It was still early days for research into the effects of pharmaceuticals on plants and animals. Scientists had recently discovered that male fish in rivers polluted by estrogens, possibly excreted by women taking birth-control pills, were growing eggs. But with all the focus on excreted drugs, no one was really testing if pharma companies too were dumping drugs in the environment. "There were a couple of reports on pharmaceutical discharges from manufacturing," said Larsson, "but they were not really cited. They were treated as odd sins or exceptions."

So Larsson decided to jump in. PETL's core process to treat effluent remains the same today as it was back then: the plant mixes effluent with some domestic sewage, aerates the mix to allow sewage bacteria to break down organic pollutants, and removes the broken-down sludge. The treated water is let out. Larsson's team tested this treated output for 59 pharmaceuticals. The findings were a bombshell.

The team found 11 drugs in high quantities, of which six were antibiotics. But the real surprise was the quantity of antibiotics found. While typical measurements of drugs in sewage from households and hospitals across the world were around a microgram per litre, PETL was dumping ciprofloxacin at a rate of 31,000 micrograms per litre. It was more than the concentration of ciprofloxacin in the blood of people who were being treated with the drug. It was enough to kill aquatic species such as algae. And at 45 kg, a day's discharge from the plant was equivalent to the amount of ciprofloxacin consumed by the entire population of Sweden in five days.

The finding was a turning point for Larsson. "When we found out that the highest drug levels were in fact antibiotics, I changed my line of research," he said. Instead of looking at whether pharmaceuticals were toxic to fish, he began to study antibiotic resistance due to environmental pollution.

In the next few years, Larsson collaborated with other researchers to publish a series of papers analysing data from Hyderabad. First they looked for antibiotic-resistant bacteria in the PETL discharge, and found plentiful. While these were mostly environmental bacteria, like *Bacillus thuringiensis*, that don't hurt humans, there were also opportunistic pathogens (which cause infections in already ill people). For example, strains of *Providencia rettgeri*, which causes urinary-tract infections in people wearing catheters, were resistant to over 30 antibiotics. It was like nothing Larsson had ever seen before. "The bacteria in these polluted environments are exceptionally multiresistant, more so than in any other investigated environment I am aware of," he

said.

But merely finding antibiotics along with resistant bacteria doesn't prove that the former caused the latter. So, the researchers did another study, comparing lakes in Kazipally with the Himayath Sagar and Osman Sagar lakes of Hyderabad, both far from the pharma industry and unlikely to be as polluted. For good measure, they sampled two unpolluted Swedish lakes too. The analysis was telling. Neither the Indian nor Swedish controls had resistant bacteria in numbers as high as the lakes in the pharma cluster.

That wasn't all. The microbes in the Kazipally lake had integrons and plasmids, which are bits of genetic material that let resistance genes hop from one bug to another. When lake bacteria were mixed in the lab with the *Escherichia coli* bacterium (some strains of which can cause diarrhoeal disease in humans), the genes jumped across with alacrity, turning the *E. coli* multidrug resistant.

"This is scary," says Larsson. Some plasmids carried resistance genes that they had never been known to carry before — which meant that these genes had newly acquired a way to travel from one bacterium to another. For example, a gene called qnrVC1, which confers resistance to ciprofloxacin, was seen on a plasmid for the first time in Kazipally. This significant finding was published in the *Journal of Antimicrobial Therapy* in 2015.

The message was clear. PETL and the lakes in the pharmaceutical cluster were a reservoir of deadly genes, waiting for pathogens to help themselves. They could give multiresistant bacteria that already kill thousands today, another weapon to fight antibiotics. "Once a type of resistance has evolved in a pathogen, we cannot turn the clock back again," warned Larsson.

In May this year, the BDMA published a rebuttal which, according to them, challenged the idea that pharmaceutical pollution causes resistance. For the study, Dayananda Siddavattam, a professor at the University of Hyderabad, collected water and soil samples from near the facilities of companies like Aurobindo Pharma, Hetero Drugs and Virchow Laboratories. He then cultured bacteria from them, and tested for resistance against ten antibiotics. For comparison, he carried out the same exercise in the Nallagandla lake 50 km away from these companies.

The report says that there was no difference in the numbers of antibiotic-resistance bacteria near the companies and away from them. "Antimicrobial resistance is a problem, but it cannot be attributed to the pharma industry," Eshwar Reddy told *The Hindu*, citing the report.

But other experts, including Larsson, said this conclusion was a leap. Larsson pointed out that the study doesn't show what the association claims it does. Even if the overall numbers of antibiotic-resistant bacteria weren't very different in polluted and cleaner spots, a closer look gave a different picture. When the resistant bacteria were classified by the antibiotics they were resistant to, and then compared across samples, differences did pop up, he said. For example, the bacteria resistant to ampicillin, tetracycline, chloramphenicol and ertapenem were consistently higher in the polluted samples compared to the Nallagandla lake. This suggests that the antibiotics were indeed causing the resistance, Larsson said. Moreover, using only a single clean lake for comparison to multiple polluted sites could distort results, he added.

In general, evidence that antibiotic pollution leads to resistance is strong enough to take action, said Sumanth Gandra, a researcher who studies the problem at New Delhi's Centre for Disease Dynamics, Economics and Policy. Larsson's work forms only one part of this evidence. A review of metagenomic data (genetic data that gives a picture of all bacterial species in an ecosystem) from 864 places across the globe (including soil, air, water, and even human body organs like the tongue) found that environments polluted with pharmaceuticals, like the Beijing smog and pharma waste water, beat every other place in both the numbers and types of antibiotic-resistance genes.

During interviews with *The Hindu*, industry officials argued that pollution from pharma companies was a thing of the past. Since 2006, when Larsson's group began its work, much has changed in the Hyderabad cluster. "In 1993, there was a problem, which even we admit. Then the government began a number of initiatives, especially to control liquid pollution," said B. Ananda Reddy, managing director of Chromo Laboratories, a mid-sized company that makes the antibiotic moxifloxacin for eye drops. Around 86 of the 220 bulk drug makers in Hyderabad today have zero liquid discharge facilities, which means that they recycle all the liquid effluent. The only waste they generate is solid, which is incinerated or buried in landfills.

Meanwhile, PETL has spruced up too. Today, it does not dump its discharge into the local Isakavagu creek, shipping it instead in an 18 km pipeline to a domestic sewage treatment plant near the Musi river. Here the discharge is mixed with treated sewage and diluted before being released into the Musi. The quality of effluent that comes to PETL today is more tightly controlled too, as pharma companies pre-treat it. Large firms like Dr. Reddy's Laboratories and Mylan Pharmaceuticals, who have zero liquid discharge, don't send anything to PETL.

How effective these measures have been, though, is disputed.

To begin with, zero liquid discharge is good, but not a panacea for pollution. For example, after the Gandigudem fish-kill in October this year, the Pollution Control Board shut power supply to several companies that had allowed contaminated water to flow into the Kazipally well. At least one of the penalised drug makers, Lee Pharma, employs zero liquid discharge, despite which contamination from its facility escaped into the environment.

The seepage of contaminated water from drug manufacturers is common during rains, said Thatikonda Shashidhar, an assistant professor of civil engineering at IIT Hyderabad, who also serves on the Telangana State Pollution Control Board. Such seepage could be why pollution persists in ponds and lakes, despite the upgrades of the last decade. In 2017, a German study published in the journal *Infection* found sky-high concentrations of the antifungal fluconazole in the Kazipally well, unmatched anywhere else in the world. The concentration of several other antibiotics in sewers in Patancheru were also enough to promote resistance.

If seepages still plague the pharma industry, so does the illegal dumping of effluents. Companies without zero liquid discharge, which are required to ship their effluent to common treatment plants like the PETL, don't always toe the line. One reason is that they are hoping to cut costs. It takes around 7,000 to treat a 10 kiloliter tank of effluent with low levels of dissolved solids at PETL. For a company generating around 20 kiloliters of effluent a day, the costs can add up quickly. "So, it is much more convenient for them to dump in open drains," said Anil Dayakar, an environmental activist who runs Gamana, an NGO that has been fighting to protect water bodies in Hyderabad for 15 years now.

Dayakar is unconvinced about the changes in PETL too. Rather than cut pollution, the 18 km pipeline from PETL is only transferring contaminants to Musi, he said. In 2016, to combat the perception that the plant was still dumping antibiotics, the Telangana State Pollution Control Board tested its discharge for four antibiotics. They found all drugs to be undetectable. But this finding is contradicted by the independent research of one of the board's own members, Thatikonda Shashidhar.

Forty-year-old Shashidhar sits in one of a maze of cubicles in the sprawling campus of IIT Hyderabad. Next to him, on a bulletin board, are clippings of news articles about his research. "Musi River a factory of drug-resistant germs," says one. "Drug makers pumping antibiotics into aquatic system of Hyderabad," says another.

When Shashidhar joined the institute in 2011, he decided to look at the problem of antibiotic resistance in Musi river since the Patancheru pharmaceutical cluster was already well known to be polluted. No pharma company today draws groundwater in this region, because it is so contaminated.

Shashidhar began carrying out experiments in the Musi river, which originates west of Hyderabad in the Anantagari Hills, cuts across the city and joins the river Krishna before emptying into the Bay of Bengal. From a river that inundated great parts of Hyderabad city in a major flood in 1908, the Musi has turned into a drain today. The Osman Sagar and Himayath Sagar dams that were constructed to prevent a recurrence of a 1908-like event have tamed its flow to a trickle, meaning that the river consists almost entirely of sewage.

It is to this river that a pipeline brings treated discharge from PETL today. First the discharge goes into the Amberpet Sewage Treatment plant, where it mixes with domestic sewage or waste from households, as well as discharge from two other effluent treatment plants that contain pharma waste. These are then treated, and the blend enters the river.

Shashidhar and his doctoral student Rithu Gothwal collected samples from the inlet to the Amberpet plant, which includes PETL water, as well as from the outlet. In addition, they collected water and sediment from 16 points along the shore of the Musi, starting from the Osman Sagar reservoir, and ending where the Krishna meets the sea.

They found that while the Osman Sagar reservoir, west of the city, contained small amounts of antibiotics, by the time the river reached Musarambagh, in the centre of the city, concentrations exploded. Musarambagh is far from the pharmaceutical clusters of Hyderabad, with no industries nearby. Meanwhile, the Amberpet plant inlet, which contains PETL and other pharma discharges, was even worse, with around 5,528 micrograms per litre of ciprofloxacin.

It is plain from these findings that PETL and other common effluent treatment plants are still pumping out large amounts of antibiotics, said Shashidhar, because the levels in the Amberpet inlet cannot be explained by domestic sewage. To be sure, domestic sewage has antibiotics too, from human excreta, which can trigger resistance. But concentrations in sewage are typically lower, and exert a smaller selection pressure on microbes.

What's also evident is that companies are dumping effluent illegally into the Musi, which explains the levels at Musarambagh. "You never know who is dumping effluent where. The catchment area of Musi is really big," said Shashidhar. There are several cases of companies dumping illegally in and around Hyderabad's outer ring road, which encircles the city and cuts across the Musi, according to him. All of effluent can be washed into waterbodies and Musi's tributaries through rainwater.

When asked about Shashidhar's findings, P. Vishwanatham, joint chief environmental engineer at the Telangana State Pollution Control Board, was sceptical. "There are no industries around Musarambagh," he told *The Hindu*. "So how can levels be so high?" He also denied that illegal dumping was rampant in the city.

Even as evidence of antibiotic pollution builds up, government regulations are taking time to catch up with it. As of today, India does not limit antibiotics in pharma waste water. Few countries do. India's first concrete move to tackle the problem was the 2017 National Action Plan for Antimicrobial Resistance, which talks about imposing limits on antibiotics in industrial waste. But a member of the Central Pollution Control Board, tasked with deciding on these limits, told *The Hindu* that these regulations are at least three years away.

Even when these regulations come, reining in the pharma industry will be tricky. With an annual turnover of around 1,853 billion (in 2015-16), the industry employs thousands and makes essential drugs for the country. Hyderabad alone makes around 40% of bulk drugs for India, including antibiotics. Shutting down a large company can have a snowball effect on the local economy, given how many industries depend on them, said Shashidhar. Add to this the fact that in cases such as seepages, it is hard to track the source to a single company.

What India needs to keep in mind, though, is that the cost of antibiotic resistance will be enormous for both the country and the world. One estimate puts the expense of treating a resistant bloodstream infection at 42,000 more than a susceptible infection. This could devastate the healthcare system, which today takes antibiotics for granted. In contrast, the cost of better pollution-control isn't that high. Even companies in Hyderabad admit that complying with pollution norms doesn't need more than 3-4% of the production cost. "The cost isn't the issue," said Eshwar Reddy. The issue is whether pharma companies are willing to listen to the science.

The definition of harassment needs to be constantly updated, and the process for justice made more robust

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## Own the crisis

Delhi, where 25 million people reside, has struggled to breathe this month. A thick layer of smog, initially deemed “severe” and then an “emergency”, enveloped the national capital region. The average concentrations of hazardous particulate matter were nearly seven times the safe standards last Thursday.

Breathing has certainly become injurious to health in Delhi. Yet, those of us who live here and have vocalised our breathlessness, struggle to acknowledge that we too have somehow contributed to what the social media has termed an “apocalypse”. Instead, an accusatory finger is repeatedly pointed in a direction away from us — off late towards the fields of Punjab and Haryana.

Every year, starting late-September and through October, farmers from the northern states set their paddy fields on fire after harvesting. This is a low-cost straw disposal practice that reduces the turnaround to the next wheat crop. The alternative, purchasing machinery to manage stubble, is an impossible cost to take on without state support.

This smoke gets carried all the way to Delhi and, in fact, across the entire northern-Gangetic plain.

The farmers argue that their “once-a-year” practice only adds to particulate matter already in place due to the capital’s “polluting factories, diesel vehicles, thermal power plants and dust generated from construction sites.” They are vehement that it is not just them who contribute to the pollution and they cannot be blamed for the year-long consequences of the city’s consumption patterns.

The problem is far more complex than to reduce it into a simple binary of pro-environment and anti-environment measures — to say that farmers in Punjab and Haryana aren’t “caring” about the capital is to discount all that Delhi should have, but has not, done.

Numbers show that air quality isn’t superior in other Indian cities. In fact, Delhi did not feature among the top 10 most polluted cities in the world in the 2016 WHO analysis. Instead, Gwalior and Allahabad took the dubious distinction of being the second and third most polluted cities in the world, with Patna and Raipur among the top 10.

What does Delhi in is that its landlocked geography contributes to trapping pollutants. Several source apportionment studies have repeatedly underscored the contributing factors for the bad air with clear numerical proportions. Last week, Chief Minister [Arvind Kejriwal](#) inaugurated 20 additional monitoring stations making Delhi the most-watched city in India for the air it breathes.

In spite of the availability of increasingly reliable and granular numbers throughout the year, and access to studies by premier national institutes pinpointing exactly what the issues are, the problem of “air pollution” is manifest only when it confronts us, when eyes burn and we are left breathless.

Recently, Environment Minister Harsh Vardhan who was representing India at the climate change conference in Bonn said the central government “shall do everything possible to bring about improvement in the air quality” in Delhi and NCR. He also said the current high levels of smog in some areas was the result of “meteorological conditions” and “hoped” the situation will improve in the near future.

At a press conference held a month ago in Delhi, the minister — who is also a doctor — argued that there is no clear empirical evidence to link air pollution with severe health problems. The

Centre has repeatedly said that it has requested state governments in NCR to take effective steps to mitigate the levels of air pollution and bring them to acceptable levels. The National Green Tribunal has also repeatedly urged states to sit together and look at the problem, collectively. The Delhi government has oscillated between blaming others — state and central governments — and urging for “cooperation” for the “greater good”.

Yet, like Amitav Ghosh in *The Great Derangement*, “politics has become a matter of personal moral reckoning rather than an area of collective action”. Terms such as “greater good” and political “cooperation” have become empty words and rhetoric serving only to further political agendas. This is especially surprising, in the case of a party like the [Aam Aadmi Party \(AAP\)](#), which not only had air pollution as a part of its election manifesto but also rose to power by stressing on the need for collective, concerted action as an effective means for solving these problems.

In the context of climate change, Ghosh reflects that over the time we live in as one where the “dominant culture in which the idea of the collective has been exiled from politics, economics and literature alike” and adds, “Quite possibly then, this era, which so congratulates itself on its self-awareness, will come to be known as the time of the Great Derangement.”

To extend the argument, the facts are there — Delhi’s air was “hazardous” for days. In other words, the people of India’s capital are breathing in poison. The situation, though unfortunate, is neither surprising nor was it unavoidable. This can no longer be an individual issue — where the city and its people point outwards, towards the farm fires of Punjab. The air belongs to us all, and if we don’t realise that we must be deranged.

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## Rent-a-roof policy can give residential solar energy the push it requires

The [Centre is planning a rent-a-roof policy to support its ambitious](#) plan to generate 40 gigawatts (GW) of power from solar rooftop projects by 2022, MINT reported this week. The government's solar power target is 100 GW; of this 60 GW is expected to come from ground-mounted, grid-connected projects. If the new policy comes through, solar developers — these companies provide end-to-end service to those interested in installing solar systems — can rent rooftop space, fit it with solar panels, and feed the power to the grid. If the policy takes off, householders will not have to bother themselves any more with the time-consuming, bureaucratic nitty-gritty that precedes the installation of panels.

India offers a big opportunity for solar energy. Its 750GW potential is driven by roughly 300 sunny days a year, with an average solar radiation range of 4-7 kilowatt-hours per square metre. Despite this, and attractive fiscal incentives, households haven't exactly taken to solar power. As a result, financial incentives are not being utilised and consumers are not availing significant potential savings on their electricity bills, even as the burden on electricity distribution companies to meet power demand from the grid is growing. A Greenpeace analysis shows that all the major metros are far from meeting rooftop solar targets as laid down by state governments and the ministry of new and renewable energy. This is despite a significant national incentive in the form of a 30% capital subsidy, and a range of state incentives and schemes.

The success of the rooftop solar is critical for India which is faced with the challenge of decarbonising its electricity sector and tackling air pollution, some part of which is caused by coal-fired power plants generating electricity. A Global Burden of Diseases report says air pollution accounts for 1.2 million deaths every year, and costs India 3% of its GDP.

Large solar plants require land, lots of it. Therefore, it is important that policies support rooftop and decentralised solar power generation, both off grid and on. The proposed policy could empower the solar energy industry to focus on households; it also gives every home a chance to be energy independent. However, it cannot magically transform the sector unless other issues are addressed.

For one, people must be better apprised of the benefits of solar power (for instance, the government must give solar the same push it gives to Swachh Bharat Abhiyan); and the perceptions that households will have to make a huge upfront investment or that solar installations will make rooftop space unusable have to be removed. These may sound like small issues, but can work as deterrents when households take that leap of faith.

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## Battle lines drawn over coal at U.N. climate talks

Police vehicles drive into the premises of the Weisweiler coal-fired power plant near Aachen, Germany on November 15, 2017. According to the dpa news agency environmental activists occupied coal supply routes of the plant. | Photo Credit: [AP](#)

A score of mostly wealthy nations banded together at U.N. climate talks on November 16 to swear off coal-fired power, a key driver of global warming and air pollution.

To cap global warming at "well under" 2°C (3.6°F) — the planet-saving target in the 196-nation Paris Agreement — coal must be phased out in developed countries by 2030, and "by no later than 2050 in the rest of the world", they said in a declaration.

The dirtiest of fossil fuels still generates 40% of the world's electricity, and none of the countries that truly depend on it were on hand to take the "no coal" pledge.

One country participating in the 12-day talks, which end on November 17, has made a point of promoting the development of "clean fossil fuels": the United States.

The near-outcast status of coal at the U.N. negotiations was in evidence earlier in the week when an event featuring White House officials and energy executives was greeted with protests.

The U.S. position "is only controversial if we choose to bury our heads in the sand and ignore the realities of the global energy system" countered George David Banks, a special energy and environment assistant to U.S. President Donald Trump.

Led by Ministers from Britain and Canada, the "Powering Past Coal Alliance" committed to phasing out CO<sub>2</sub>-belching coal power, and a moratorium on new plants that lack the technology to capture emissions before they reach the atmosphere.

"In a few short years, we have almost entirely reduced our reliance on coal," said British Minister of State Claire Perry.

The share of electricity generated by coal in Britain dropped from 40% in July 2012 to 2% in July 2017, she noted.

Other signatories included Austria, Belgium, Canada, Costa Rica, Denmark, Finland, France, Italy, Mexico, Netherlands and New Zealand.

Germany — where coal powers 40% of the country's electricity — was asked to join, said Environment Minister Barbara Hendricks.

"I asked them to understand that we can't make a decision like that before forming a new government," she told journalists.

Most of the enlisted countries don't have far to go to complete a phaseout.

Deadlines range from 2022 for France, which has four coal-fired plants in operation, to 2025 for Britain, where eight such power stations are still running, and 2030 for the Netherlands.

Warm, warmer: on climate change

“This climate meeting has seen Donald Trump trying to perversely promote coal,” said Mohamed Adow, top Climate analyst at Christian Aid, which advocated for the interests of poor countries. “But it will finish with the U.K., Canada and a host of other countries signalling the death knell of the world's dirtiest fossil fuel in their countries.”

But not all countries are in the same boat, said Benjamin Sporton, president of the World Coal Association.

“There are 24 nations that have included a role for low-emissions coal technology as part of their NDCs,” or nationally determined contributions, the voluntary greenhouse gas cuts pledged under the Paris treaty.

Coal continues to play a major role in powering the Chinese economy, and will see “big increases in India and Southeast Asia”, he told AFP.

Making coal “clean”, Mr. Sporton acknowledged, depends on the massive expansion of a technology called carbon capture and storage (CCS), in which CO<sub>2</sub> emitted when coal is burned is siphoned off and stored in the ground.

The U.N.'s climate science panel, and the International Energy Agency, both say that staying under the 2°C temperature threshold will require deploying CCS.

The problem is that — despite decades of development — very little CO<sub>2</sub> is being captured in this way.

There are only 20 CCS plants in the world that stock at least one million tonnes of CO<sub>2</sub> per year, a relatively insignificant amount given the scope of the problem.

One reason is the price tag: it costs about a billion dollars (900,000 euros) to fit CCS technology to a large-scale, coal-fired plant.

“If you could develop cost-effective technology that would be permanent and work at scale, it could be a real game-changer,” said Alden Meyer, a climate analyst at the Washington-based Union of Concerned Scientists. “But you have to be realistic about the prospects.”

At the same time, the price of wind and especially solar power has dropped so much that CCS may no longer be economical.

The crucial issue is not retro-fitting old plants, but avoiding the construction of new ones, Mr. Meyer added.

“There’s really no economic rationale for coal, and there’s certainly no environmental rationale for it,” he told AFP.

A book on geological history that explains climate change

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**MNRE organises panel discussion on 'Innovative Financing and Market Evolution to achieve 175 GW Renewables by 2022' at CoP 23, Bonn, Germany****MNRE organises panel discussion on 'Innovative Financing and Market Evolution to achieve 175 GW Renewables by 2022' at CoP 23, Bonn, Germany****India committed to its Renewable Energy Targets to provide Equitable Sustainable Development**

The Ministry of New and Renewable Energy (MNRE), Government of India, in partnership with the Confederation of Indian Industry (CII), organised a panel discussion on 'Innovative Financing and Market Evolution to achieve 175 GW renewables by 2022' on 16th November 2017 at the India Pavilion at Conference of Parties (CoP) 23, Bonn, Germany.

Reaffirming India's resolution to go ahead with the set agenda with determination and clarity, Shri C.K. Mishra, Secretary, Ministry of Environment, Forests and Climate Change, Government of India, said that India has been pursuing its goals of setting up renewable energy capacities and changing its energy mix, and will continue to do so to provide equitable sustainable development.

Speaking about the Government's interventions, Dr. P.C. Maithani, Adviser, MNRE said that policies are being drafted on a continuous basis to address challenges as the market evolves. Giving examples of how the question is no longer about availability of finances but that of cheap finances, Shri K.S. Popli, CMD, Indian Renewable Energy Development Agency Limited (IREDA) said that the markets have matured and one indicator of that is seen in how the bond markets have progressed.

Dr. Ajay Mathur, DG, The Energy and Resources Institute (TERI) stressed upon the need to push for higher research in storage technology which could compliment the infirm renewable power. There is an imminent need to look at bringing down storage costs, he added.

India's renewable energy journey has come a long way since it set its ambitious target of 175 GW by 2022. Prices of solar and wind have dramatically reduced to 3-4 cents per Kwh as against 9-12 per unit in 2013, even as capacities have scaled up to 47.5 GW. Policymakers and industry are now confident of accelerating this growth trajectory to provide electricity, along with storage, at an estimated Rs 5 per unit before 2025.

Explaining the scope of the renewables market, Shri Rahul Munjal, MD, Hero Futures Energy said that there has been an exponential expansion of the industry, with almost 10,000 firms operating in the ecosystem. This is a result of the market being conducive to business and investments. Echoing a similar thought and projecting high optimism, Shri Rajiv Ranjan Mishra, MD, CLP India said that renewables are becoming more an imperative for economies like India which have to reach power to large sections of the people. Shri Ratul Puri, Chairman, Hindustan Power Projects Pvt Ltd (HPPPL) highlighted the need to make power available at affordable rates and said that Indian industry is working towards achieving that goal.

The panel also included Mr Frank Determann, Principal Project Manager, KfW Development Bank; Shri Reji Pillai of India Smart Grid Forum, among others.

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## Asian cities should be focal points for climate action

The global response to climate change has so far been focused entirely on nation states. Until the Paris Agreement and the recently concluded Kigali Agreement, the inability of nation states to broker any agreement resulted in inadequate positive action. This is amply borne out by the increase in both the duration and frequency of extreme climatic events. It is only now that the emphasis of the climate change debate is shifting to cities, particularly mega cities.

**Cities and climate change:** Cities cover less than 2% of the earth's surface, but consume 78% of its energy. According to the International Energy Agency's World Energy Outlook (2008), urban areas account for over 71% of energy-related global greenhouse gases (GHGs), particularly carbon dioxide (CO<sub>2</sub>) emissions, mainly through concentrated and increased energy consumption by transport and industry, and biomass use. This figure is expected to rise to 76% by 2030. Thus, there is large-scale urban contribution to global warming. As long as the present trend of urbanization continues, it is unlikely that the energy and fossil fuel consumption of cities, and the resultant GHGs emissions, will decrease.

An increase in sea levels and large storm surges due to global warming leave crucial infrastructure of mega cities (with a population of over 10 million) especially vulnerable as most of them are along coasts and/or river banks. Cities will have to bear the brunt of not only physical catastrophes in the form of stressed water resources and sewage systems, but also reduced availability of agricultural produce and consequent higher prices. The Intergovernmental Panel on Climate Change (2007) indicates a probability of 10-40% loss in crop production in India with increases in temperatures by 2080-2100. Hence, climate change will exacerbate urban pressures of rapid population growth and sprawl, poverty, and pollution.

**Asia's mega cities:** Of the world's 31 mega cities, as many as 18 are in Asia. China is home to six mega cities, and India has five. The combined population of these cities is a staggering 310 million (2016). By 2030, according to the UN World Cities Report (2016), the number of mega cities is projected to rise to 41, and added to the list would be six Asian cities.

Moreover, among the fastest-growing cities, 40 are located in Asia (20 in China alone), with an average growth rate of 6%. During the next decade, several of the biggest cities in South Asia, including Mumbai, Kolkata, Chennai in India, Dhaka in Bangladesh, and Karachi in Pakistan, will rank amongst the largest in the world. Therefore, not only is Asia home to the largest number of mega cities, the continent continues to urbanize fast and has the largest number of fastest-growing cities.

**Power, transport, water and sanitation:** The power and transport sectors are the major generators of GHG emissions, particularly CO<sub>2</sub>. In many South Asian cities, this is due to dependence on thermal power plants using coal with high ash and sulphur content, and use of private vehicles due to inadequate public transport. Integration of the transport sector with land-use planning and transit-oriented development needs to be discussed within municipal corporations and development authorities charged with this mandate. Enough examples from the developing world are available: Bogotá in Colombia, and Curitiba in Brazil.

The water and sanitation sectors also generate large amounts of non-CO<sub>2</sub> GHG emissions like methane, which is classified as a short-lived climate pollutant. Empirical evidence shows that methane is 25 times more potent than CO<sub>2</sub> as a GHG. Methane from sewage treatment plants and landfills is usually flared but has rarely been considered an energy resource.

South and South-East Asian cities which are being viewed as environmental hot spots, actually

offer huge possibilities and opportunities for efficiency improvements in power, transport, and water and sanitation infrastructure for the mitigation of GHG emissions responsible for global warming and climate change. Cities have enormous potential to be centres of innovation to deliver cost-effective solutions. The case for efficient public transport and sewage systems is, therefore, far more compelling for South and South-East Asian cities today than it was for East Asian cities half a century ago.

It is clear that unless each city begins to worry obsessively about climate change and improves efficiency in power, transport, and water and sanitation, it may not be able to save the very resources of its sustenance—water, air quality, and green cover. The biggest challenge in cities is also the biggest opportunity in forging links with global climate change. The immense opportunities for stabilization of GHG emissions can have an immediate impact on climate change. Climate change is, hence, a reason to promote a sustainable urbanization pattern and transform transport, power, and water and sanitation.

However, the entire focus on nation states rather than mega cities has resulted in misplaced responsibility wherein municipalities have not been involved in climate change mitigation. Mayors and municipal commissioners of mega cities have to become the torch-bearers of positive action in the fight against climate change. It is only by focusing on Asian cities that we can protect the cities and the people that are most vulnerable to climate change.

*Naini Jayaseelan is a former Indian Administrative Service (IAS) officer.*

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

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## Delay in the protection of corridors threatens tiger population

Precious time Construction of a vehicular flyover designed to facilitate animal movement has been delayed. | Photo Credit: [I. P. Bopanna](#)

It is not just poaching or habitat loss that threatens India's tiger population. Delayed action to protect crucial wildlife corridors — despite the availability of relevant ecological knowledge — is also killing these big cats, shows a study published in conservation journal *Oryx*.

For species like tigers which move across large distances, wildlife corridors, protected patches of land connecting two habitats, are crucial. Uttarakhand's Chilla–Motichur corridor is one such patch connecting the eastern and western tracts of the Rajaji Tiger Reserve. It is the only way tigers from the eastern tract (part of a larger, more connected landscape) can colonise the isolated western one. Over the years, however, the corridor has been deteriorating due to reasons including the expansion of nearby townships and the construction of a national highway and rail line.

### Multi-pronged approach

Scientists at the Panthera, Nature Conservation Foundation and the University of Kent, U.K., used a multi-pronged approach to study the status of the Chilla–Motichur corridor. First, they studied tiger presence in the area using presence–absence surveys of tiger signs, assessing change in tiger presence from data gathered between 2002 and 2009. While the eastern tract showed a high presence of tigers, the western one showed a distinct decline in tiger numbers and presence.

Second, the team studied the corridor's connectivity using remotely-sensed night-time lighting as an indicator of urbanisation.

They found that since 1993, urbanisation had decreased opportunities to restore the effectiveness of the corridor considerably.

The team compiled 31 research articles on the corridor and made 14 distinct recommendations to restore corridor connectivity. Only five recommendations have been incorporated into government management plans, and delays in mobilising funds and approvals from state departments followed by the lack of deadlines to implement these actions exacerbated the problems.

“Institutional failings are mirrored in the inability of many state and central departments to work together for the restoration of Chilla-Motichur; this case typifies what happens with most wildlife corridors across the country,” says lead author Abishek Harihar (Panthera and Nature Conservation Foundation). “If immediate action is not taken, the population in the western tract could go extinct.”

Tux brushing tussar, cards being exchanged like cocaine packets, billionaires mingled at Illuminating India

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## Asia's cities could save the planet

The world's cities will add 2.5 billion more residents by 2050, more than half of them in Asia. The effect of this great migration on climate change will depend in part on what kind of homes, factories and office buildings they live and work in.

It's a seemingly minor but significant issue that should attract attention from officials gathered at this week's United Nations-sponsored climate talks in Bonn. (Michael Bloomberg, the founder and owner of Bloomberg LP, is the UN special envoy for cities and climate change.) Buildings generate almost 20% of energy-related greenhouse-gas emissions — a proportion that's likely to rise as onetime farmers move into more energy-intensive modern homes. Yet less than 10% of the \$4.6 trillion spent on construction in 2015 went into energy-efficient "green" buildings.

The reasons are many: Some energy-saving technologies and designs have only recently become widely accessible. There is a widespread belief among many developers, especially in poorer countries, that building green costs considerably more than traditional methods. Officials in many countries are lax about enforcing building codes for energy efficiency.

But there is now software that can give architects and engineers access to the most efficient designs and quickly certify their work. As for cost, the International Finance Corporation estimates that building green raises construction costs less than 2% on average. And new business models, such as so-called energy savings companies, popular in China, can enable commercial developers to better afford energy-efficient technologies.

The challenge also presents rich countries, which are supposed to be contributing to a Green Climate Fund to assist poorer ones in reducing their carbon emissions, with a more politically palatable way to help. Europe, for instance, has plenty of knowledge to share on designing green certifications and building codes. More important, Western banks could play a critical role in marshaling new financial instruments, such as green construction bonds, to pay for all these new buildings.

Asian governments also need to do more to encourage homeowners and builders to make greener choices. Part of the task involves providing reliable certifications and educating the public about the virtues of energy-efficient buildings, so that property buyers choose and will pay a premium for them. At the same time, officials must do a far better job of getting local governments to adopt and enforce tougher building codes.

Asia's urban leaders need to worry about much more than buildings, of course. They'll have to map out cleaner and more efficient systems for public transportation, waste, water and so on. At the same time, if the world's fast-growing cities can make more of their new buildings more green, they will play a crucial role in fighting climate change. **Bloomberg Views**

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## U.N. climate envoys agree on way forward, despite Trump

A picture taken on November 16, 2017 shows a view of an installation titled "climate refugees" created by Danish artist Jens Galschiot and displayed at the Rheinaue park during the COP23 United Nations Climate Change Conference in Bonn, Germany. | Photo Credit: [AFP](#)

Negotiations to bolster the climate-saving Paris Agreement, crafted over two decades, closed in Bonn on November 18, deflated but not derailed by Donald Trump's rejection of the treaty and defence of fossil fuels.

The U.S. President's decision to yank the United States from the hard-fought global pact cast a long shadow over the talks, which ran deep into overtime. Negotiations were marked by revived divisions between developing countries and rich ones.

With a wary eye on America, which sent negotiators to a forum it intends to quit, envoys from nearly 200 countries got on with the business of designing a "rule book" for enacting the agreement, which enters into full force in three years' time.

"The Trump administration failed to stop the global climate talks from moving forward," said Greenpeace observer Jens Mattias Clausen.

Closing two weeks of talks, negotiators agreed in the early hours of November 18 to take stock in 2018 of national efforts to cut fossil fuel emissions.

The Paris treaty calls for limiting average global warming to "well under" 2°C (3.6° F) compared to pre-industrial levels, or 1.5°C if possible.

Anything over 2°C, experts say, dooms the world to calamitous climate change, with more extreme superstorms, droughts, floods, and land-gobbling sea level rise.

A report this week warned that emissions of carbon dioxide, the main planet-warming gas, were set to rise by two percent in 2017 after three years of hardly any growth.

"Starting now, emissions need to decrease to zero over the next 40 years to prevent us breaching the 1.5°C threshold," Piers Forster, a professor of climate change at the University of Leeds, said.

Nations have submitted voluntary emissions-cutting commitments under the Paris pact championed by Barack Obama.

But scientists say current pledges place the world on course for warming of 3°C or more, and counsel an urgent upgrade of the global commitment to phasing out greenhouse gases produced by burning coal, oil and natural gas.

"While the Paris Agreement represents a remarkable diplomatic achievement, it will be judged by history as little more than words on paper if the world fails to take the level of action needed to prevent the loss of entire island nations," Maldives Environment Minister Thoriq Ibrahim told delegates Friday.

The stocktake agreed on November 18 must quantify the shortfall to determine what more needs to be done.

In Bonn, negotiators also worked on a nuts-and-bolts rulebook, to be finalised at the next U.N.

climate conference in Katowice, Poland in December 2018, for putting the Paris Agreement into action.

Some progress was made, but observers and delegates complained that things were moving too slowly.

Many lamented the void in "political leadership" left by the departure of Mr. Obama, and by German Chancellor Angela Merkel's failure to set a timetable for phasing out coal-fired power plants, which produce 40% of Germany's electricity.

The talks saw rich and poor nations butt heads on several issues — mainly money.

Developing countries demand detailed progress reports on rich nations' promise to boost climate finance to \$100 billion per year by 2020.

The world's poorer nations — often the first to feel the sting of climate change impacts — need cash to make the costly shift away from atmosphere-fouling coal, and to shore up their defences against extreme weather.

Donor nations, in turn, insists that emissions cuts by developing countries be subject to verification.

The United States, which under Mr. Trump has slashed funding for climate bodies and projects, took a tough stance in the finance negotiations in Bonn, a position that angered some delegates.

Adding to the tension, White House officials and energy company executives hosted an event on the conference margins to defend the use of fossil fuels.

On November 16, 20 governments from both wealthy and developing nations, led by Britain and Canada, countered with the launch of a coal phase-out initiative.

The United States is the world's biggest historical greenhouse gas polluter, second only to China.

"In a year marked by extreme weather disasters and potentially the first increase in carbon emissions in four years, the paradox between what we are doing and need to be delivering is clear," WWF climate head Manuel Pulgar-Vidal said of the talks. "Countries must act with greater climate ambition, and soon."

Observers hope that the "One Planet Summit" hosted by French President Emmanuel Macron in Paris on December 12 will boost momentum.

Mr. Macron has invited some 100 heads of state and government, but not Trump, as well as business leaders, to discuss finance for climate projects.

A book on geological history that explains climate change

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## In Asia, a path to cleaner air

Cancer. Stroke. Heart Disease. Asthma.

These are some of the life-threatening diseases caused by air pollution, a problem that kills more than six million people worldwide every year, and also the most pressing environmental health risk humanity faces. In 98% of cities in low- and middle-income countries, air quality exceeds World Health Organisation safe levels and is having a severe impact on peoples' health. The youngest, the oldest and the poorest among them are most affected.

For urban residents across the South-East Asia region, the situation is dire. As urbanisation proceeds, inadequate planning is compounding an already fraught scenario. Every day, more and more people are exposed to the deadly particulate matter from motor vehicles, diesel generators, smokestacks and power plants. And every day, those particulates are having a devastating impact on our immediate and long-term health.

### Small but key steps

Despite the magnitude of the problem, change is possible. Each one of us can do our part.

Choosing to use public transport over driving a private vehicle is a good way to make an immediate difference that not only decreases emissions but also saves money and encourages physical activity. Similarly, if and when we do use a private vehicle, we can ensure that its engine is well-tuned and running efficiently, thereby decreasing emissions and maximising fuel mileage. Though these steps are simple, they can have a wide-ranging impact. Private vehicle use remains a significant contributor to urban air pollution across the region. In and around the house we can also make small but important changes. For example, instead of burning wood and other biomass fuels for cooking or heating, we can switch to using natural gas or liquefied petroleum gas (LPG). The household use of wood and other biomass fuels (including kerosene) is the cause of approximately 1.69 million deaths in the region every year — each one of them preventable. Importantly, we can also make concerted efforts to cut down on and have better disposal of waste, including ending open burning.

### From the top

In aiding private citizens' actions, government interventions can be of crucial importance.

It is now being seen across the region that from the municipal level up, governments are aiming to provide the infrastructure needed to provide healthier environments and taking steps to encourage public forms of transport. This is being done by building quality bus and rail systems, and making cities pedestrian- and bicycle-friendly through the provision of footpaths and bicycle lanes. Schemes are being implemented to provide incentives for households to switch to cleaner energy sources that are benefiting the poor and the vulnerable. Biomass continues to be burned largely as a result of cost incentives and there is a realisation now that demand can be shifted to other forms of household energy through subsidies and other innovative pricing mechanisms.

Empowering and engaging the health sector is also important. Not only can the health sector identify and assist vulnerable groups to prevent exposure to air pollution, thereby mitigating its effects but it can also provide critical support to the society-wide struggle for clean air. Health institutions and workers have the power to raise awareness and promote change at the personal and policy levels — a role that should be encouraged and, where possible, supported. As a part of this wider push, city administrators ought to mobilise individuals and the cities they live in to take

action against air pollution. Though air pollution represents a massive moral and practical challenge, it also represents a chance to chart a bold new path — one where clean air is an integral part of healthy economic development and growth. Indeed, as countries across the South-East Asia region develop and prosper, they needn't repeat the development tropes of a bygone era. They can and must write a different history.

Dr. Poonam Khetrpal Singh is Director, WHO- South East Asia Region (SEAR)

World Diabetes Day highlights the implications of neglecting women's health

The Cardiff University professor, who reported on the enzyme called New Delhi metallo beta lactamase, says China and Pakistan are more serious about anti-microbial resistance genes than India.

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## India Signs Loan Agreement with World Bank for USD 100 Million for “Shared Infrastructure for Solar Parks Project”

### India Signs Loan Agreement with World Bank for USD 100 Million for “Shared Infrastructure for Solar Parks Project”

A Guarantee Agreement for IBRD/CTF loan of USD 98 million and Grant Agreement for USD 2 million for the “Shared Infrastructure for Solar Parks Project” was signed with the World Bank here today by Mr Sameer Kumar Khare, Joint Secretary (MI), Department of Economic Affairs on behalf of Government of India, and Mr Hisham A. Abdo, Acting Country Director, World Bank India, on behalf of the World Bank. A Loan Agreement was also signed by Mr K S Popli, Chairman and Managing Director, India Renewable Energy Development Agency Ltd. (IREDA) and Mr Hisham A. Abdo, Acting Country Director, World Bank India, on behalf of the World Bank.

The project consists of two components viz. (i) Shared Infrastructure for Solar Parks (estimated total project cost of USD 100 million, including USD 75 million in IBRD loan and USD 23 million in CTF Loan) and (ii) Technical Assistance (USD 2 million in CTF Grant).

The objective of the project is to increase solar generation capacity through establishment of large-scale parks in the country. The project will help establish large-scale solar parks and support the government’s plan to install 100 Gigawatts (GW) of solar power out of a total renewable-energy target of 175 GW by 2022.

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## Low tariffs slowing new bids for wind, solar energy projects: ICRA

Winding down: State utilities prefer the bid tariff as it is significantly lower than the feed-in tariffs for wind projects.

The renewable energy sector is in the midst of a lull after the storm, as bidding for wind and solar energy projects is seeing a short-term slowdown, said rating agency ICRA on Tuesday.

“With very limited progress on the firm bidding plans by the State-owned distribution utilities to award the wind energy projects, this particular sector is facing near term headwinds and the capacity addition in the near term remains adversely impacted due to migration from feed-in tariff to bid tariff route,” ICRA said in a note.

“The wind energy sector is now following a bid based regime since February 2017, given the success of a reverse auction under two rounds of 1GW each by Ministry of New & Renewable Energy (MNRE) with a bid tariff discovery at Rs. 3.46/kwh in February 2017 & Rs. 2.64/kwh in October 2017,” said Sabyasachi Majumdar, senior vice-president & group head at ICRA Ratings.

This option is being preferred by the State utilities since the bid tariff level is significantly lower than the approved feed-in tariffs by State Electricity Regulatory Commissions (SERCs) for wind power projects. “The recent increase by about 15% (i.e. 6-7 cents/watt) in imported PV module prices, if sustained, could have an adverse impact on the viability of solar power projects with tariffs lower than Rs. 3.5 per unit,” the note added.

“The bidding activity for award of solar projects has slowed down in calendar year 2017 (till Oct.) as reflected in awarded project capacity of 3.75 GW as against 7.2 GW in the corresponding period of CY 2016.”

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## Sustainable Waste Management is the Need of the Hour: Puri

### Sustainable Waste Management is the Need of the Hour: Puri

#### National Workshop on “Processing and Use of Construction & Demolition Waste on Deconstruction & in-Situ Processing for Ecology and Economics Inaugurated

“Sustainable waste management is the need of the hour, which involves managing waste in an environmentally sound, socially satisfactory and techno-economically viable manner. The waste management hierarchy demands firstly, avoiding generation of waste, followed by reducing, reusing, recycling, recovering, treating and disposing whatever wastes produced. The fundamental objective should be to maximize re-use and recycling so that minimum land space is occupied for disposal and at the same time, natural resources and energy are saved” said the Union Minister of state (I/C) Ministry of Housing and Urban Affairs at the National workshop on “processing and use of construction & demolition waste on deconstruction & in-situ processing for ecology and economics which he inaugurated here today. Shri Durga Shanker Mishra, Secretary, M/o Housing & Urban Affairs, Govt. of India, Dr. Shailesh Kr Agrawal, Executive Director, BMTPC and senior officials were also present at the workshop.

During his address, Sh Puri stated that there is pressing need to bring awareness about the problem of waste management and the necessity to adopt proper procedure of collection, processing, recycling and use of C&D wastes in manufacturing of building components among different stake holders of the country. “In order to meet requirements of urban transformation and flagship programmes of our Government as regards housing and infrastructure, it is known fact that we can not continue to make use of conventional building materials which continue to depend on finite natural resources mainly drawing upon the carrying capacity of the eco system and often causes irreparable environmental damages. It is being increasingly recognized that raw materials from natural resources are being used at a faster rate than they are being replenished or alternatives being found. The challenge posed by the emerging trends of higher consumption levels has to be met within the concept of sustainable development, of which gainful utilization of waste is one of the important components”, he added.

Highlighting the problem, Sh Puri stated that often it is seen that building owners, waste haulers and demolition contractors improperly and illegally dispose off these wastes in gravel pits or ground water recharge areas, on farm land and prime residential property, borrow pits and low lying areas. Such stacks of wastes may choke the surface drains causing flooding of roads and low lying areas while wastes from individual house construction or demolition, often find its way to nearby municipal waste storage bin, waste storage depots, making the municipal wastes very heavy and unsuitable for further treatment, he said. The wastes which are buried at site itself, form impervious layer, which adversely affect the growth of vegetation and prevents the infiltration of surface runoff into the ground water table. Therefore, it is essential to properly manage the C&D wastes. The Ministry of Environment, Forest and Climate Change, Govt. of India, under Environment Protection Act, 1986 has recently notified Management of Construction and Demolition Wastes Rules 2016 to provide an institutional framework for management of C&D Wastes. This gives timelines for the state government to formulate policy,

identification of sites for collection and processing facility, commissioning and implementation of the facility and monitoring by State Pollution Control Boards, the Minister informed.

The proper implementation of the Notification is the collective responsibility of all stakeholders gathered here. Guidelines on Environmental Management of Construction & Demolition Wastes was brought out by Central Pollution Control Board (CPCB) in March, 2017. CPCB guidelines address the issues pertaining to abatement of adverse environment impacts specifically arising from C&D waste management activities. BMTPC has also published Guidelines on Utilization of C&D Wastes as a useful resource for building materials and components. All these guidelines supplement each other and provide a technical and legal framework for effective utilization and management of C&D waste. In many developed countries, substantial part of its construction & demolition waste are re-used and recycled. In India, there are some significant initiatives such as C&D waste processing plants at Burari & Shastri Park in Delhi, use of C&D waste in East Kidwai Nagar Project in Delhi by NBCC and C&D Waste processing plant at Ahmedabad.

The minister also mentioned that major municipalities like Surat, Mumbai, Hyderabad and Rajkot have floated tenders and are at the verge of putting up C&D waste processing plants and many more processing plants are also understood to be in the process of getting installed in other parts of the Country.

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## Far from keeping the world safe

“The science on climate change has been grim this year.” A replica of the Statue of Liberty which shows smoke emitting from the torch and a bronze sculpture titled ‘Unbearable’, both created by Danish artist Jens Galschiot, displayed during the climate change conference in Bonn, Germany. AFP

The 23rd meeting of the Conference of the Parties (COP-23) of the United Nations Framework Convention on Climate Change concluded on November 17 in Bonn, Germany. The two-week meeting was regarded by many as primarily intended to clarify processes for the implementation of the Paris Climate Agreement through the creation of a rule book, with technical guidelines and processes. This would explain what compliance with the Paris Agreement means and how it would be monitored.

The key topics of contention were related to financial support, mitigation action, differentiation, and loss and damage — the same knots of disagreements that came up at COP-21 in Paris. The questions raised in Bonn were: Are developed countries going to do their fair share to support poor and emerging countries, having occupied the bulk of the planet’s available carbon space? What actions have thus far been taken to reduce greenhouse gas emissions by rich countries? Shouldn’t there be greater emphasis to phase out coal? There was also some apprehension about the role of the U.S. in the discussions since President Donald Trump had earlier declared that it would leave the Paris Agreement.

Actions related to the Paris Agreement are intended for 2020-2030. However, the pre-2020 period is part of the second phase of the Kyoto Protocol. Both the first phase of the Kyoto Protocol (**2005-2012**) and the second (**2013-2020**) principally laid out the responsibilities for reducing emissions by rich countries. However, there has been little progress and the 2012 Doha Amendment, the agreement concerning the second phase of the Kyoto Protocol, has not been ratified by a sufficient number of countries to enter into force.

Under pressure from poor and emerging economies, actions on the pre-2020 Kyoto period were added to the agenda in the first week of the Bonn meeting. As a result, in 2018 and 2019 there will be additional stocktaking on progress made on the Kyoto Protocol. There will also be climate finance assessments and all of these will be part of the overall process undertaken before 2020. It is reported that several countries have since expressed interest in ratifying the Doha Amendment and all these changes indicate some advancement.

Another aspect of the obligations that **need** to be fulfilled by big emitters is related to economic and non-economic losses under the work programme on loss and damage. In Warsaw, Poland, COP-19 established the Warsaw International Mechanism for Loss and Damage to address the destruction likely from climate change, including extreme events (such as severe storms) and slow-onset events (such as sea-level rise). This track of negotiations recognised that even if the world were to drastically reduce its emissions, anthropogenic greenhouse gas emissions already in the atmosphere would cause warming. This would severely affect the poorest countries that are the most vulnerable to the impacts of climate change.

It is important that such countries have access to economic and non-economic support, especially since their actions have not led to these increased concentrations of harmful greenhouse gas emissions. The Paris Agreement recognises loss and damage and calls for enhanced action and support from the parties. However, loss and damage was not included in the agenda for the Paris rule book, and this was rightly a big bone of contention with poor and developing economies. There are no funds currently available for this stream and the discussion on this has been

postponed to 2018. This is alarming given that the world has already faced the wrath of numerous extreme events just in the last couple of years.

A third aspect of the support from rich countries is about providing finance, technology, and building capacity for poorer countries, both to protect themselves from the effects of climate change and to help them move along a low-carbon pathway. There were conflicts on financial support at various points, and on this topic, COP-23 was a failure. Without the means of implementation, the targets set by each country in Paris will not be achieved. There is also the promise of \$100 billion each year by 2020 into the Green Climate Fund, which has not seen much inflow to meet the goal. There was therefore little progress on the key issue of finance and several important decisions were moved forward to be discussed at the next meeting to be held in Katowice, Poland in 2018.

There have been a number of advances in renewable energy over the last several years. These were highlighted at various side events at COP-23. There were also several state and substate actors from the U.S. at Bonn, some of whom tried to distance themselves from the actions and statements of the Trump administration, along with a series of colourful protests and interactions.

On the plus side, negotiators did move forward on developing other details for the Paris Agreement implementation, a process that is carried out under the Ad Hoc Working Group on the Paris Agreement and a policy should be ready in 2018. There was also a draft of a document integrating positions from parties on information needed to communicate the Nationally Determined Contributions. Steps were also taken to spell out the details of the global stock-taking that will occur every five years starting in 2023 and on transparency measures that are part of the overall process.

Nevertheless, the science on climate change has been grim this year. Greenhouse gas emissions which appeared to have stabilised for a few years, probably for economic reasons, rose by 2% in 2017, perhaps due to additional electricity drawn from coal power plants in China. When coal will be phased out globally was a major question. In fact, there were protests organised by activists at Europe's largest open pit coal mine near the Hambach Forest in Germany, not far from the COP-23. Clearly, greater ambition on clamping down on fossil fuels is needed for the Paris Agreement to be successful. The Bonn meeting saw the launch of the Powering Past Coal Alliance, which was led by Canada and the U.K., and joined by numerous countries and substate actors.

There was small but significant headway made regarding agriculture where a work plan was proposed by Parties on items related to climate change and agriculture, including improvements in soil fertility and carbon, management of land use and livestock maintenance. For India, these developments could be an excellent opportunity for learning from others and sharing local knowledge.

Much more needs to be done for the international community to truly grapple with climate change — we are still far from keeping the world safe from its harmful consequences. And for India, there is unfortunately no time left for delaying action on multiple fronts on the landscape of sustainable development, which itself will be derailed by a warming world.

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

The definition of harassment needs to be constantly updated, and the process for justice made more robust

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## The simple economics of clean air

*(By E. Somanathan and Ridhima Gupta)*

By now, everyone in north-western India (and northern Pakistan) knows that one of the main reasons they are choking on smog is the burning of residue from the rice crop by farmers. Some people have also heard of the Happy Seeder, a machine whose use can do away with the need to burn residue. It fits onto a tractor and is capable of planting wheat without getting jammed by residue leftover after the rice harvest. What people don't know is that the cost of producing enough of the machines to eliminate burning entirely is very low.

Eight years ago, a survey conducted by one of us (Gupta) found that there were fewer than a hundred farmers using the Happy Seeder in Punjab. Now there are 3,000, showing that adoption has been proceeding rapidly. But there is still a long way to go. A policy brief by the National Academy of Agricultural Sciences estimates that 1.2 lakh Happy Seeders would be needed to cover the entire area under the rice-wheat cropping system in India. There are presently about 15 manufacturers of the machine, and if they get enough orders they can bring the price down to Rs 1 lakh rather than the current sale price of about Rs. 1.3 lakh per machine. Also needed is another machine — the Super SMS (straw management system) — that fits onto the combine harvesters for rice in order to spread residue evenly over the field, making the Happy Seeder more effective. These machines presently cost about Rs 1.2 lakh each and only half as many (60,000 machines) are needed since combine harvesters can cover a greater area. At a large scale, the production cost of each machine would be about Rs 1 lakh each, so this works out to a total cost of Rs 1,800 crore for the purchase of enough machines to cover the required area throughout India.

The government can announce a procurement policy for the Super SMS attachments and Happy Seeders for the next year with a guarantee to procure 80 per cent of the requirement with warranties and after-sales service to ensure quality. It can then auction the machines to farmers and hire-purchase operators who buy machines and rent their services to farmers. This would ensure the availability of enough machines giving farmers an alternative to residue-burning, next year. The policy of fines for residue-burning can then be strictly enforced without a political backlash. This needs to be combined with a public information campaign and an intensification of extension efforts. Together, these measures would ensure that there will not be a repeat of the problem next year, and in the years to come.

The difference between the purchase price and auction price of each machine will be the government subsidy. It is likely to amount to much less than the total cost of the machine if the government makes clear its intention to enforce the fines for burning, and provides enough publicity, because then there will be high demand for the machines. The government would thus need an outlay of only a few hundred crore for this programme, a tiny fraction of the agriculture ministry's budget of Rs 40,000 crore. This would prevent a recurrence of the current disaster next year. In the long run, it is necessary to move away from the power and fertiliser subsidies and selective procurement of grain — these encourage a wasteful farming system.

There are other big contributors to air pollution: Once a pollution cloud forms, the air gets trapped near the ground because sunlight is blocked. The normal process of air getting warmed during the day, and rising up and carrying away pollutants with it, stops. In winter, the cold and dimming from the pollution cloud cause increased lighting and heating demand, generating more pollution from heating fires by the poor and coal burning in power plants. And there is the ever-present pollution from diesel trucks and cars. Dealing with these other sources is also important and solutions may not be as immediate.

As always, prevention is better than cure. Diesel combustion produces many-times-more-polluting fine particles than petrol. Currently, petrol costs about 20 per cent more than diesel. All that is needed to prevent new diesel cars being produced is to lower the petrol tax and raise the diesel tax so that the price difference is reversed. The myth that diesel taxation falls more heavily on the poor has now been thoroughly debunked (for example, in the book *Fuel Taxes and the Poor* edited by Thomas Sterner) — it is the rich and middle class who own vehicles, and it is they who buy most transported goods.

A new study from the University of Maryland shows that sulphur dioxide (SO<sub>2</sub>) pollution declined by 75 per cent in China in the last decade while India's SO<sub>2</sub> pollution increased by 50 per cent. SO<sub>2</sub> gets converted in the atmosphere to sulphate particles that form smog. China implemented SO<sub>2</sub> pollution controls on coal power plants. Meanwhile, in India, regulations to control SO<sub>2</sub> were issued as late as December 2015, and recently the power ministry wrote to the environment ministry to delay enforcement in some cases to as late as 2022.

In many cases, there are lobbies that benefit from the status quo. Some auto companies opposed the advancement of Bharat VI standards to 2020 (previously 2024). As a result of the public outcry over air pollution last winter, the central government held firm on that issue. All governments respond to the demands made on them. Unless the public is vocal about demanding action on air pollution, progress will continue to be slow.

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## Delhi's air pollution is both a challenge and an opportunity

Air pollution in Delhi has dominated the headlines over the past few weeks and rightly so. The problem is especially urgent because Delhi is not the only polluted city in the country. Eleven of the 20 most polluted cities in the world are in India. Given the massive expansion we expect in the urban population over the next 20 years, and the need to attract investment to create quality jobs, we need to make our cities liveable and attractive to tourists. Success in Delhi could provide a much needed template for the other cities.

### Awareness of the problem

Recognizing the problem is the first step towards corrective action and there is progress in this area. A few years ago, an American journalist stationed in Delhi wrote a farewell piece saying that he was leaving Delhi because the air pollution monitors in the US embassy showed that staying in the Capital would put his children's health at risk. There was an outburst of nationalistic outrage that the embassy was probably exaggerating the problem. Since then, a number of government monitoring stations have been established in Delhi and they confirm that the problem is indeed serious.

The figure above reports the level of air pollution by PM 2.5 particles at the Siri Fort station in New Delhi for the 12 months from mid-November 2016 to mid-November 2017. The sharp spikes when readings go off the chart are frightening and attract headlines but the real problem is not these emergency situations. It is that the average for the year, at 142, is far too high. It is more than three times the national standard of 40, and 14 times the stricter WHO (World Health Organization) standard of 10. If the monsoon months are excluded, most of the readings are consistently in the unhealthy range.

Medical experts in India have warned that children exposed to this level of pollution will develop asthmatic problems much earlier than normal. Pregnant women exposed to high levels of air pollution are more likely to deliver low birth weight babies, with all the permanent health problems that it causes. Senior citizens are also at risk.

Many activists have been working hard at raising consciousness and even pushing the judiciary to act. But judicial pushing can only go so far. It is useful in cases where prohibition of activities is all that is needed. It cannot devise a carefully crafted strategy operating on many fronts. This is for the government to do and then implement.

### Can pollution be controlled?

Until a few years ago, Beijing was more polluted than Delhi. There were many stories in the international press about the very high levels of pollution in the run up to the prestigious 2008 Olympic Games in Beijing. The Chinese government took firm action to control local industrial pollution, reduce the use of coal in power plants, and also restrain the sale of cars in Beijing. National Aeronautics and Space Administration's (Nasa) satellite data show a 17% decline in the concentration of fine particulate matter over China between 2010 and 2015. The same data show an increase of 13% over India in the same period. Pollution in China is still bad, but it is seen to be slowly coming under control whereas it is rising in India.

### An action plan for Delhi

If we want to bring pollution down from the average of 142 to the national standard of 40, we need to (a) reduce pollution by as much as 72% and (b) ensure that it stays at that level notwithstanding

growth of population and economic activity. This will require action on a massive scale by many central ministries and Delhi state government bodies acting on different areas.

The Environmental (Prevention and Control of) Pollution Authority (EPCA), established by the Supreme Court, has prepared a comprehensive multi-dimensional action plan for control of pollution in Delhi. It includes proposals for shifting to cleaner vehicles and fuels, restraining the growth in cars and expanding public transport as an alternative, stopping pollution from coal-based power plants, controlling pollution from industry, putting a stop to burning garbage, preventing pollution from construction activities and controlling burning of crop residues in neighbouring states. Some of the actions have to be taken by the central government and others by the Delhi state government and local bodies. Actions that have to be taken by the central government are also spread across different ministries.

Road dust contributes about 38% of the pollution. This component is particularly difficult to control since it reflects both poor road conditions with unpaved footpaths, and the use of traditional technology—hand-held brooms—for sweeping the streets. Such sweeping can shift litter to one side, to be collected separately. It does little to control road dust. It only throws it up in clouds and shifts it to the side, from where it is disturbed again by traffic through the day. Vacuum cleaning devices attached to mechanical sweepers will help, but that would require massive investment in equipment, which may be beyond the funding budget of the municipality. Similarly, proposals for sprinkling water over all the roads in the city would run into water-availability constraints.

Vehicle emissions account for 20% of the pollution and this component is likely to increase as the number of cars multiplies. There is much that could be done in this area. The decision to advance BS VI fuel to 2018 for Delhi, and 2020 for the whole country, is a welcome move. It needs to be accompanied by action to ensure that new cars are all equipped with engines designed for BS VI fuel. The two together will reduce particulate pollution by 70% to 80%. However, since the large stock of older cars will remain for many years, and the total number of cars is also expected to expand, the total pollution load from automobiles may not come down sufficiently over the near future. There is no alternative to actively discouraging car ownership and plan a massive shift to public transport in the capital.

Discouraging car ownership calls for many tough decisions. We need to increase the taxation of cars by introducing an annual or biannual licence fee, as we have for buses. We also need to introduce higher parking charges in the areas of the city that are congested and the charges should be high enough to discourage car usage. We need to eliminate the current favourable tax treatment of diesel compared with petrol to discourage the trend to use diesel vehicles, especially SUVs. The WHO has classified diesel as a No.1 carcinogenic, along with tobacco. Diesel need not be banned since its use in sparsely populated areas will not create excessive pollution, but it should definitely be discouraged in urban locations. A higher licence fee could be prescribed for diesel vehicles.

In the longer run, electrification of cars and scooters will solve the problem, but even if all cars sold from 2030 onwards are electric, it will be a long time before a substantial portion of the stock of cars becomes electric. To accelerate adoption of electric vehicles (EVs) we should announce that all taxis and three wheelers must compulsorily be made electric in Delhi, as soon as such vehicles become available.

Discouragement of cars needs to be accompanied by a parallel effort to expand bus and Metro services. This is widely supported, but it runs into financial constraints. The EPCA has recommended the creation of an urban transport fund to upgrade public transport. All receipts from parking charges, and also the licence fee on cars and buses should be paid into this fund. Those who support public transport often balk at measures to raise funds to finance it. The Central

government could offer to provide matching funds equal to what is raised by the cities.

We should definitely consider ending the use of coal in power plants located close to Delhi. There are gas-based power plants which are under-utilized partly because the utility prefers to buy lower priced coal-based electricity, and partly because gas is not available. Gas could be imported, but this will make gas-based power even more expensive. A regulatory intervention forcing coal-based plants to shut down, ensuring adequate supply of gas, and most importantly, allowing the price of electricity to rise, is needed. Higher energy prices will be resented but they are essential if we want to shift to more energy- efficient outcomes. The present cess on coal needs to be increased steadily over time.

Tough action is also needed to control of industrial pollution. Sunita Narain of the Centre for Science and Environment has been conducting a one-woman battle to ban the import of Pet coke, an exceptionally dirty fuel which is banned in the US, but which is freely imported by us (from the US) and used by many smaller industries. The use of Pet coke is banned in Delhi, and we can monitor domestic refineries to ensure that they don't sell the Pet coke they produce in Delhi. However, if large quantities are allowed to be imported, the ban on its use can only be enforced in Delhi by policing the consumers, which is near impossible. An outright ban on the import of this dirty fuel is a low-hanging fruit

Burning mixed municipal waste in Delhi is highly polluting. We need to shift within the next three years to an effective system of separating municipal waste into biodegradable waste which can be converted into compost and energy, recyclable waste including plastic which can be recycled, inert waste which can be converted into refuse-derived fuel for power generation, and residual non-combustible waste which has to go to scientific landfills. This is a challenge for the Delhi government which it should take on.

Since many ministries are involved, the ministry of environment should be tasked with (a) identifying the actions planned by different ministries, (b) estimating the effect of these actions on the trajectory of pollution, (c) determining whether the resulting trajectory is acceptable as a national commitment towards reaching the national target, and if not pushing for stronger action, and finally (d) monitoring progress on an agreed trajectory to see if pollution is indeed being reduced as projected. If progress is unsatisfactory, then the ministries have to go back to the drawing board.

Something along these lines would put us on a credible path to reducing pollution over time. It will take time, but at least we will know when we can start breathing easy. Anyone who doubts whether the costs are worth it should consider that researchers have concluded that if Delhi's air pollution could be lowered to the national standard, it would increase the life expectancy of Delhi's citizens by six years.

*Montek Singh Ahluwalia was the deputy chairman of the erstwhile Planning Commission.*

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## Centre Promulgates Indian Forest (Amendment) Ordinance, 2017 to Encourage Bamboo Cultivation in Non-Forest Areas

### Centre Promulgates Indian Forest (Amendment) Ordinance, 2017 to Encourage Bamboo Cultivation in Non-Forest Areas

Union Minister of Environment, Forest and Climate Change, Dr. Harsh Vardhan has said that under the visionary leadership of the Prime Minister, Shri Narendra Modi, the Union Government, in a landmark initiative, has promulgated the Indian Forest (Amendment) Ordinance, 2017 to exempt bamboo grown in non-forest areas from definition of tree, thereby dispensing with the requirement of felling/transit permit for its economic use.

Bamboo, though, taxonomically a grass, was legally defined as a tree under the Indian Forest Act, 1927. Before this amendment, the felling and transit of bamboo grown on forest as well non-forest land attracted the provisions of the Indian Forest Act, 1927 (IFA, 1927). This was a major impediment for bamboo cultivation by farmers on non-forest land.

Earlier, the Union Cabinet meeting chaired by the Prime Minister, Shri Narendra Modi, had yesterday approved the promulgation of the Ordinance on amendment of Section 2 (7) of the Indian Forest Act, 1927 in this regard.

Dr. Harsh Vardhan emphasised that a major objective of the amendment is to promote cultivation of bamboo in non-forest areas to achieve twin objectives of increasing the income of farmers and also increasing the green cover of the country. He also stated that bamboo grown in the forest areas shall continue to be governed by the provisions of Indian Forest Act, 1927.

The Minister underlined that the amendment and the resultant change in classification of bamboo grown in non-forest areas will usher in much needed and far-reaching reforms in the bamboo sector. He said that while on the one hand, the legal and regulatory hardships being faced by farmers and private individuals will be removed and on the other hand, it will create a viable option for cultivation in 12.6 million hectares of cultivable waste land. The measure will go a long way in enhancing the agricultural income of farmers and tribals, especially in North-East and Central India. The amendment will encourage farmers and other individuals to take up plantation/ block plantation of suitable bamboo species on degraded land, in addition to plantation on agricultural land and other private lands under agroforestry mission. The move is in line with the objective of doubling the income of farmers, besides conservation and sustainable development.

Dr. Harsh Vardhan said that some of the other benefits of amendment include enhancing supply of raw material to the traditional craftsmen of rural India, bamboo based/ paper & pulp industries, cottage industries, furniture making units, fabric making units, incense stick making units. Besides promoting major bamboo applications such as wood substitutes and composites like panels, flooring, furniture and bamboo blind, it will also help industries such as those dealing with food products (bamboo shoots), constructions and housing, bamboo charcoal etc. The amendment will greatly aid the success of recently constituted National Bamboo Mission.

Bamboo grows abundantly in areas outside forests with an estimated growing stock of 10.20 million tonnes. About 20 million people are involved in bamboo related activities. One tonne of bamboo provides 350 man days of employment. An enabling environment for the cultivation of bamboo will help in creation of job opportunities in the country. The amendment will unleash the potential of bamboo in terms of rural and national economy apart from ecological benefits such as soil-moisture conservation, landslide prevention and rehabilitation, conserving wildlife habitat, enhancing source of bio-mass, besides serving as a substitute for timber.

The current demand of bamboo in India is estimated at 28 million tonnes. Though India has 19% share of world's area under bamboo cultivation, its market share in the sector is only 6%. At present, India imports timber and allied products, such as pulp, paper, furniture etc. In 2015, India imported about 18.01 million cubic meters of timber and allied products worth Rs 43000 crores. The amendment will help in addressing some of these issues, besides meeting the demand from domestic production.

As per the assessment of United Nation's Industrial Development Organisation (UNIDO), the bamboo business in the North-East Region alone has a potential of about Rs. 5000 crores in the next ten years. "The amendment will therefore, help in harnessing this great potential and enhance the scope to increase the present level of market share and improve the economy of the entire country, particularly the North Eastern region", Dr Harsh Vardhan said.

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**Community awareness training plays a pivotal role in disaster risk mitigation, says Shri Hansraj Gangaram Ahir**

**Community awareness training plays a pivotal role in disaster risk mitigation, says Shri Hansraj Gangaram Ahir**

**MoS (Home) emphasizes that planned approach and a well-defined strategy is essential for Disaster Risk Mitigation And Management**

The Union Minister of State for Home Affairs, Shri Hansraj Gangaram Ahir has said Community awareness training plays a pivotal role in Disaster Risk Mitigation. He was addressing the school children at a programme on 'Initiative for Awareness and Management of Disaster' here today. He said the youth, including students in schools and colleges, play a vital role by being trained and in creating awareness about the proactive response to Disaster Management and risk mitigation. He said response to a threatening disaster situation requires a planned approach and a well-defined strategy. He said that during the time of disaster, which can be in the form of natural calamity or nuclear, biological, radiological and chemical disasters, the community awareness ensures that the arising emergent situation is addressed in a quick, efficient and effective manner.

Emphasizing on the importance of quality and holistic training in academic institutions, he said that students can be Champions and Leaders of the society by learning the quintessential basics of Disaster Risk Reduction and Risk Mitigation, Disaster Resilience Techniques and Technology. He underlined the need to be technologically well-versed and be knowledge-savvy on latest technology to mitigate disaster situation. He said that building construction in schools and colleges should be resistant to disasters.

Shri Hansraj Gangaram Ahir said that training of students in schools should be provided equal attention as normal education academic curriculum, sports and cultural activities along with necessary practical sessions to augment the learning process. He emphasized that 'School Safety Programme' should promote culture of disaster management in day-to-day curricula of educational institutions. He said that 'word of mouth' to parents and relatives of students can create awareness among the stakeholders and people in a holistic manner.

Commending the Governmental organizations such as National Disaster Response Force and Border Security Force (BSF) for their yeoman work in this sector of Disaster Management, the Minister said that the need of the hour is community awareness cum

training programs for better Management and Capacity Building.

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**MHA to conduct Multi State Mega Mock Tsunami Exercise 2017 tomorrow;  
MHA to conduct Multi State Mega Mock Tsunami Exercise 2017 tomorrow;  
involves 31 coastal districts across four States & a UT, international participants**

The Ministry of Home Affairs through National Disaster Management Authority (NDMA) and the Indian National Centre for Ocean Information Services (INCOIS) will conduct a multi-State mega mock exercise on tsunami preparedness tomorrow.

The exercise will be simultaneously conducted in 31 coastal districts across four States - West Bengal, Odisha, Andhra Pradesh and Tamil Nadu - and Union Territory Puducherry along the entire East Coast. The disaster scenario will simulate tsunami waves originating due to a high-intensity earthquake near the Andaman and Nicobar Islands, which will lead to a massive tsunami along the East Coast.

Participants from 11 Pacific Island countries will observe the entire exercise to take away key lessons and best practices to be adopted while preparing for and responding to a disaster situation.

The exercise is one of the various activities planned on the occasion of the 2nd World Tsunami Awareness Day held on November 5 this year. It began with an orientation conference on 8th November, which was held to ensure the smooth facilitation of the exercise.

This was followed by coordination conferences and table-top exercises at various State Emergency Operation Centres (SEOCs) wherein all the involved districts participated through videoconferencing. These exercises helped familiarise participants with their responsibilities, actions required and helped them evaluate their Standard Operating Procedures (SOPs) for tsunami warnings in the run-up to the exercise to be held tomorrow.

Officials from all the important departments such as the Army, Navy, Air Force, the National Disaster Response Force (NDRF), health, police, education, firefighting, Civil Defense, transport, electricity, public relations, etc. participated in these preparatory meetings.

Tsunami is a highly devastating natural hazard, and requires rapid response when it occurs as the reaction time is limited. A two-hour reaction time has been planned in this

scenario during which the entire State machinery will be mobilised in a defined manner to respond swiftly and efficiently. Evacuation drills will also be rehearsed at selected sites. This exercise aims to assess and help improve the preparedness, response mechanism and coordination among concerned agencies.

India's eastern coast is susceptible to both floods and tsunamis and many coastal districts have conducted similar mock exercises for better preparedness over the years. This is, however, the first time that the entire eastern coast will participate in a mock exercise simultaneously.

KSD/NK/PK/SS

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## Centre to seek 20,000 MW of solar bids

Harnessing sunshine:SECI will invite two bids for 3,000 MW of solar projects in December and January each.AFP

The government is planning bids for a total of 20,000 MW of solar energy plants projects in this financial year, of which 3,600 MW have already been completed, the Ministry of New and Renewable Energy said on Friday.

The Ministry is planning bids for 30,000 MW of solar projects in 2018-19 and 2019-20, each. In wind energy, the Centre on Friday announced the third wind power auction of 2,000 MW, the largest of its kind in India so far.

Power and New and Renewable Energy Minister R.K. Singh also said that the government would soon invite expressions of interest for the setting up of end-to-end solar component manufacturing in India of 20 GW capacity. "We need manufacturing in India in solar," he said. "There is no reason for imports, and so we will encourage manufacturing in India. We are planning a 20 GW auction, but only for those who are willing to manufacture in India. We will invite expressions of interest in the next four or five days."

As per the Ministry's plan, Solar Energy Corporation of India (SECI) will invite two separate bids for 3,000 MW of solar projects in December 2017 and January 2018 each. NTPC is to invite a bid for 5,000 MW of solar projects in February 2018, and another 6,000 MW will be bid out in March 2018 by SECI and other Central PSUs.

### '50% of 2022 target met'

In wind energy, the Ministry said it had already received bids for 32 GW of projects, which is more than 50% of the 60 GW target set for 2022. The government is expecting bids for a total of 8-9 GW this year, and 10 GW each in 2018-19 and 2019-20.

On problems faced by the sector, New and Renewable Energy Secretary Anand Kumar said. "One demand had to do with customs duty [being charged] for solar components." Earlier, they were exempt. "We have taken this up with the Finance Ministry... and the issue will be fixed in 10 days."

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**Government announces Trajectory to achieve its targets of commissioning 100 GW of Solar generating capacity and 60 GW of Wind power by 2022**

**Government announces Trajectory to achieve its targets of commissioning 100 GW of Solar generating capacity and 60 GW of Wind power by 2022**

**Government to conduct Third Wind Power Auction of 2000 MW Capacity**

**Power Supply Agreements signed by SECI with utilities of UP, Bihar, Jharkhand, Assam, Punjab, Goa and Odisha**

The Government today announced the trajectory for achieving its targets of commissioning 175 GW of Renewable Energy (RE), 100 GW of solar generating capacity and 60 GW of wind power, by 2022.

Addressing the gathering, Union Minister of State (IC) for Power and New & Renewable Energy, Shri Raj Kumar Singh said that there was a long pending demand from the Industry to declare the RE roadmap of the Government. Hence, today with the declaration of this trajectory, the Government has clearly spelt out its plan of speeding up of RE installation in the country and strengthening the RE manufacturing base in India.

Shri Singh informed that to encourage the Make in India in RE sector, Ministry of New & Renewable Energy (MNRE) is working out the scheme and going to issue an Expression of Interest (EoI) to the Industry, for establishing domestic Manufacturing facilities to the tune of 20GW, in the near future. Further, the MNRE is exploring innovative ways to achieve additional installed RE capacity through Floating Solar Power Plants over dams, Offshore Wind Energy Systems and Hybrid Solar-Wind power systems, which may provide over 10GW additional capacity. The MNRE team of experts has already surveyed the Bhakra Nangal dam for floating solar power plants and off-shore Gujarat and Tamil Nadu for wind power plants, the Minister added.

Expressing confidence of comfortably achieving a rather conservative RE target of 175GW by 2022 and even exceed it, along with providing 24x7 affordable, clean and efficient power for all, Shri Singh said that all these targets would be positively achieved with the cooperation of the States in ensuring that their power utilities/ DISCOMS remain financially viable. The Centre has provided all the required support, including funds under Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) and Integrated Power Development Scheme (IPDS), to the States to ensure 24x7 Power for All by strengthening the intra-State transmission networks and by ensuring mandatory presence

of metered connections. The Ministry is in talks with the States to ensure 100% metered connections through Smart/Pre-paid meters, Shri Singh added.

Talking about issues in Power Purchase Agreements (PPAs), Shri Singh made it very clear that the sanctity of the PPAs have to be ensured and they would have to be mandatorily honoured. The Ministry is in constant talks with State Governments, including Andhra Pradesh and Karnataka, to ensure the same. Talking about the Renewable Purchase Obligations (RPOs), the Minister that these obligations are mandatory and need to be adhered to strictly.

Elaborating the RE Development road map , Shri Anand Kumar, Secretary MNRE, said that for achieving 100 GW solar power target by 2022, the Ministry, along with the States, would lay out bids for ground mounted solar parks for 20 GW in 2017-18, out of which 3.6 GW have already been bid out, 3 GW will be bid out in December 2017, 3 GW will be bid out in January 2018, 5 GW in February 2018 and 6 GW in March 2018. 30 GW will be bid out in 2018-19 and 30 GW in 2019-20.

Further, Shri Kumar informed that against the target of 60 GW for wind power, 32 GW have already been commissioned. The Central Government in participation with the State Governments intends to issue bids of cumulative capacity of about 8 GW this year. Out of this, 5 GW (including present 2 GW) have already been bid out, 1500-2000 MW will be bid out in January 2018 and 1500-2000 MW in March 2018. A total of 10 GW will be bid out in the financial year 2018 and 10 GW in 2019, leaving a margin of 2 years for commissioning of projects. Further adding to this, Shri Kumar informed that the Ministry would soon be issuing the Wind Bidding Guidelines.

Shri Kumar also said that with wind power tariffs becoming competitive and State DISCOMs encouraged to buy more of Renewable Energy power, the Government has doubled the auction capacity for the third national level wind auction from 4GW last year to around 9GW in the current year. Regarding clarity on GST rates on Solar panels, Shri Kumar said that the MNRE is in talks with the Ministry of Finance and in the next 7-10 days all the issues would be resolved.

The present scheme of Wind Power Auction is for setting up of 2000 MW Wind Power Project connected to Inter-State Transmission System (ISTS). The bidder can bid for a minimum capacity of 50 MW and maximum up to 400 MW. The projects under this scheme are expected to be commissioned towards the end of 2019.

On the occasion, Power Sale Agreements (PSA) for purchase of wind power under second wind auction with States were also signed with Solar Energy Corporation of India with utilities of Uttar Pradesh, Bihar, Jharkhand, Assam, Punjab, Goa and Odisha. The reverse auction for SECI-II wind bid was conducted on 4<sup>th</sup> October 2017, which resulted in very competitive tariff of Rs.2.64/2.65 per unit.

It may be mentioned that the winners of SECI II wind bid namely Renew Power (250 MW at Rs.2.64/unit), Orange (200 MW at Rs.2.64/unit), Inox (250 MW at Rs.2.65/unit), Green Infra (250 MW at Rs.2.65/unit) and Adani Green (50 MW at Rs.2.65/ unit) would be setting up wind power plants in states of Gujarat, TN and MP to sell power to these utilities. PPAs with these winners are expected to be signed shortly.

Other dignitaries present on the occasion were Shri Praveen Kumar, Additional Secretary MNRE, Shri K.S. Popli, CMD IREDA, Shri J.S. Swain, MD SECI and other senior officers of the Ministry and State Governments.

**RM/VM/AS**

A Kiran MK-IA basic trainer aircraft of the Indian Air Force crashed minutes after it took off from Air Force Station Hakimpet on 24 Nov 17 at around 1415 hrs. It was on a routine training mission for the trainee pilot.

It crashed around 35 miles North East of the base. The trainee pilot ejected safely and landed on the ground with minor injuries. A court of inquiry has been ordered to ascertain the cause of the accident.

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**END**

**Multi State Mega Mock Tsunami Exercise 2017 held****Multi State Mega Mock Tsunami Exercise 2017 held****Tsunami disaster scenario simulated to assess preparedness along the vulnerable eastern coastline**

The Ministry of Home Affairs through National Disaster Management Authority (NDMA) and the Indian National Centre for Ocean Information Services (INCOIS) today conducted a first-of-its-kind multi-State mega mock exercise on tsunami preparedness covering the entire eastern coastline of the country.

Simulation exercises were conducted simultaneously in 35 coastal districts across four States of West Bengal, Odisha, Andhra Pradesh & Tamil Nadu and Union Territory of Puducherry along the entire East Coast, to assess and improve the early warning and response mechanism to mitigate the impact of a high-intensity tsunami.

The NDMA experts, who led the exercises from the State Capitals, briefed the participants about the proceedings of the day. The exercise scenario depicted a high intensity earthquake near the Andaman and Nicobar Islands, at about 0930 hrs. Within moments, the Indian Tsunami Early Warning Centre (ITEWC), INCOIS, issued a massive tsunami threat notification for the eastern coast through e-mails, fax and SMSes. It also put out detailed bulletins on its website.

A two-hour reaction time was notified within which the entire State machinery needed to be mobilised so as to efficiently respond to the situation such that the impact of the tsunami is reduced.

In less than half an hour, the State Emergency Operation Centres (SEOCs) were activated. Besides mobilising the State machinery to respond, public warnings were sent out to the communities. Evacuation instructions were issued, rescue teams were formed under Incident Commanders and kept at standby in the Staging areas.

Evacuation drills were conducted in coordination with various agencies, such as Traffic control, Fire Fighting department, Ambulances, Police, Coast Guards, Civil Defense and community stakeholders.

Post the simulated landfall of the tsunami, damage assessment was carried out at the SEOCs on the basis of information received from affected districts and first-hand

information by air sorties, both fixed wings and helicopters. This helped the administration in prioritising the response and dispatching the appropriate task forces to the affected sites.

Representatives from 11 Pacific Island countries observed the exercise for key lessons and best practices to be adopted while preparing for and responding to a disaster situation. Their participation was part of a training programme meant for enhancing their ability to improve the preparedness of their organisations to reduce disaster risks, especially for tsunamis.

After the drills, post-exercise analyses were carried out by NDMA representatives, in which all concerned officials took part. Detailed discussions were conducted on gaps and shortcomings, and ways to improve coordination among participating agencies and officials.

Initial reports and analyses suggest that the response of the State/UT machinery was effective and encouraging. A detailed analysis is underway which will help us further help improve our response to such disasters.

The exercise is one of the various activities planned on the occasion of the 2nd World Tsunami Awareness Day held on 5th November this year. It began with an orientation conference on 8th November, which was held to ensure the smooth facilitation of the exercise. This was followed by coordination conferences and table-top exercises at various SEOCs in which all the involved districts participated through videoconferencing.

Tsunami is a highly devastating natural hazard, and requires rapid response when it occurs as the reaction time is limited. The exercise is significant as India's eastern coast is susceptible to both cyclones and tsunamis. The region was one of the worst affected by the Indian Ocean tsunami of 2004. This exercise will go a long way in helping States/UTs in updating their resources, procedures and plans.

KSD/NK/PK

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## Bear-attack trends highlight need for conflict mitigation

Sloth bears can attack when tribes are collecting forest produce.

It's not wild elephants or man-eating tigers, but sloth bears that cause the most number of human deaths in central India's Kanha–Pench wildlife corridor. An analysis of bear attacks in central India, published in *PLOS ONE*, shows that there is an urgent need for conflict mitigation and improvement of compensation schemes for victims.

The sloth bear *Melursus ursinus* is endemic to the Indian subcontinent. Studies show that the largest population of sloth bears is in Central India. The species is common in the 16,000 sq. km Kanha–Pench wildlife corridor which connects the Kanha and Pench tiger reserves in Madhya Pradesh. The corridor is also home to 442 villages; many families here depend on fuelwood and forest produce such as tendu leaves used to make bidis for sustenance and livelihood. This brings them in contact with bears frequently — 255 bear attacks occurred in the area between 2004 and 2016.

Scientists at the Corbett Foundation interviewed 166 survivors of bear attacks from 120 villages in the Kanha–Pench corridor. Their results reveal that more than 80% of the attacks occurred in the forest, where the victims had gone to collect fuelwood and forest produce or graze their livestock; more than half of the victims did not see the bears before they attacked. Collectors entered forests in large numbers and engaged in the gathering activities silently and separately, increasing the chances of sudden encounters with sloth bears, write the authors.

Gathering information about the victims' socio-economic status, the team found that almost three-quarters of the victims were from the Baiga and Gond tribal communities.

While the State government provides compensation to victims of wildlife attacks, more than 80% received amounts as low as Rs.5,000 regardless of wound severity or gender; more than half the victims bore their medical expenses themselves. Victims unfamiliar with the process of applying for compensation were also at a huge disadvantage.

Apart from generating awareness of compensation schemes, ground models to improve conflict mitigation are key because sloth bears use not only forests but also human-dominated landscapes outside protected areas, write the scientists.

“We have conducted workshops in 30 villages on how best to avoid sudden confrontations,” says lead author Aniruddha Dhamorikar. The Madhya Pradesh government has also increased animal attack compensation rates since February 2016.

Energy equivalent to about one solar mass was emitted as a result.

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## What is particulate matter and how does it affect you?

The major man-made sources of particulate matter are emission from power stations, factories, industries, incinerators, diesel generators and automobiles. | Photo Credit: [AP](#)

With air quality in our country deteriorating, it is important to get a handle on what causes it. Here is a look at one important factor in air pollution, particulate matter (PM).

Particulate matter or particle pollution is the general term for a mixture of solid particles and liquid droplets found in the air. There are a wide range of minute particles in the air that can be seen only using an electron microscope. It includes sulphates, nitrates, black carbon, particle-bound water, metals (cadmium, copper, nickel, zinc) and hydrocarbons. In addition, biological components such as allergens (pollen, dust mites) and microbial compounds (fungi) are also PM.

PM<sub>10</sub>: inhalable particles, with diameters that are generally 10 micrometres (average human hair is about 70 micrometres in diameter).

PM<sub>2.5</sub>: fine inhalable particles, 2.5 micrometres and smaller.

The major man-made sources are

- Emission from power stations, factories, industries, incinerators, diesel generators and automobiles
- Dust from construction sites and unpaved roads
- Burning of garbage

When inhaled, PM can cause a wide range of respiratory disorders. "Continuous exposure to PM can cause asthma, chronic obstructive pulmonary disease and any type of bronchitis. PM can penetrate deep inside the lungs and damage it. Any bacteria or virus can now attack the lungs and this could even lead to serious life threatening infections," explains Dr. R.P. Ilangho, Senior Consultant, Respiratory Medicine, Apollo Main Hospital, Chennai. PM can also cause chest tightening, watery eyes, sneezing, and running nose. According to the World Health Organisation (WHO) almost 3.7 million premature deaths annually are attributed to outdoor air pollution. About 80% of those deaths are due to heart disease and stroke, while another 20% are from respiratory illnesses and cancers related to exposure to PM<sub>2.5</sub>.

According to the National Ambient Air Quality Standards of the Central Pollution Control Board (CPCB) of India, the 24-hour average for PM<sub>10</sub> is 100 microgram/cubic metre and 60 microgram/cubic metre for PM<sub>2.5</sub>.

During the Delhi smog, PM<sub>2.5</sub> reached as high as 999 microgram/cubic metre. On November 23rd, the PM<sub>2.5</sub> level in Manali, Chennai was 172 microgram/cubic metre.

According to the WHO Global Urban Ambient Air Pollution Database, more than 80% of people living in urban areas are exposed to air quality levels that exceed the WHO limits. "There are no protective masks that can filter these PM. As individuals, we should stop burning our garbage, use public transportation and take medications for allergies as the PM can worsen existing allergies. We need to raise our voice to sensitise the issue. All of us have seen vehicles which emit massive clouds of smoke. The State Pollution Control board should understand the

seriousness and start inspecting vehicles,” says Dr. D.J. Christopher, Professor and Head, Pulmonology Medicine, CMC, Vellore.

A book on geological history that explains climate change

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## No point pursuing coal over renewables

From Paris Agreement to International Solar Alliance, India sends a reassuring signal to the global community of its commitment to increasing the share of non-fossil fuel energy, particularly through greater use of renewables—solar and wind—in its power-generation capacity.

Yet, India's Economic Survey 2016-17 dampens hopes about the role of this renewable energy in resolving India's energy deficit. Estimating social costs of coal- and renewables-based power on undisclosed assumptions and calculations, the survey reports that renewables' cost at Rs11/kWh (kilowatt-hour) is three times higher than that of coal in 2017. Further, it predicts a decline in renewables' social cost as well as the gap between renewables' and coal's social costs. The survey concludes that renewable energy investments are crucial but emphasizes that meeting India's socioeconomic developmental goals also means tapping non-renewable cleaner energy sources.

In a lecture at The Energy and Resources Institute (TERI), Arvind Subramanian, chief economic adviser (CEA) to the government of India, takes the last point a step further. He argues that in the narrow window before renewables' costs decline to the level of coal, India should maximize the use of the black resource, focusing on accelerating coal expansion. While renewables may be the future, he contends that so-called "clean" coal will and should remain India's primary source of energy. Slamming advanced countries for "carbon imperialism", he calls upon the world to form a global green and clean coal coalition.

Subramanian raises important questions. However, his arguments supplementing the survey's black box calculations are superficial in economic reasoning, biased in supporting the case of coal against renewables. Consequently, policy recommendations are vague and exaggerated, and the government should exercise caution before adopting them.

For instance, the government should exercise caution when being advised to expand coal in the "narrow window" before renewables become cost-effective. Assuming that with increasing carbon concerns, coal costs increase over time, the narrow window where coal would be cost-effective would have to end in the late 2020s, by when Economic Survey numbers for mean renewables costs would have fallen below coal costs. However, coal plants tend to keep running for many decades. Hence investing in them in the 2020s would lock India into the wrong technology for the foreseeable future.

Moreover, new coal power plants and mines not only entail a long-term economic lock-in to coal, but also a logistical and political lock-in of the entire grid system and market policies—a complex system that can only slowly evolve. Therefore, CEA's advice further locks India into coal, only exacerbating India's worry of unaffordable coal closure costs. Coal expansion—upgrading existing or building new—is a doubtful prescription.

The government should be careful of the suggestion that coal be maintained as a measure of economic redistribution, helping poorer states. Resource curse makes it highly doubtful whether higher coal endowments at all improve development in areas with the weakest political institutions dealing with coal revenue redistribution and pollution issues. Undeniably, coal is on the very top of polluting businesses and allegedly associated with corruption at all political levels. Consideration should be given to alternative policies helping inter-regional economic redistribution before sustaining coal for this cause. For example, decentralized renewables technologies could have better redistributive impact than king coal, which is more likely to cause deadly diseases than healthy redistribution.

On the one hand, it is being suggested that the government reduce support for renewables to avoid what Subramanian calls a “double whammy”, while on the other, the government is being advised to invest heavily into developing clean coal technologies to render coal less polluting. A “double whammy” for the government is particularly associated with clean coal. First, transitioning to clean coal still leads to irrecoverable sunk costs of existing coal assets. Second, it would be very costly. In the CEA’s own words, developing reasonably clean coal technology would be an endeavour akin to the “Manhattan Project” that produced the first nuclear bomb. Given the colossal scale of the physical challenges of cleaning coal, the comparison has its point. It is ignored that for the Manhattan Project there was a clear target and known physics ready to be exploited to solve what seemed the single most urgent problem to secure liberty of an entire hemisphere against another. The effort suggested for cleaning coal, on the other hand, is for an unknown, limited gain in the use of an outdated technology—a desperate attempt to keep a to-be-overcome technology alive as newer and cleaner alternatives rapidly mature.

The government should exercise caution when William Nordhaus’ social costs of carbon estimates are employed. Such estimates are controversial, stemming from highly stylized models with strong assumptions, not necessarily paying careful attention to individual regions’ particular situations, using discount rates that may place too low a weight on damages that occur in the future.

India should be wary of superficial economic arguments that can undermine global harmony and collaboration, especially when all parties already have their own opportunistic biases. Putting all bets on yet-to-be-invented clean coal energy at a time when renewables projects start to become cheaper than the fuel-based alternatives means investing in long-lived coal plants and infrastructure based on a to-be-phased-out technology. It also means a country, particularly vulnerable to climate changes, sending wrong signals to a carbon-concerned world. Ultimately, a more balanced assessment is the need of the hour, a necessity if growing economies like India want to ever be able to enjoy abundant energy without frying our planet.

*Natasha Agarwal and Florian Habermacher are, respectively, an independent research economist affiliated with Research and Outcome, and a fellow researcher of the Oxford University Institute for New Economic Thinking and the head of energy modelling at Aurora Energy Research Ltd.*

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## Govt. working on new 'gas standards'

Choked: Delhi-NCR has been reeling under severe smog for the past one month. V. Sudershan V. Sudershan

The government is looking to prepare a unified testing methodology to ensure that all agencies that map air pollution use accurate instruments.

The Council of Scientific and Industrial Research (CSIR)-National Physical Laboratory (NPL) is in the process of setting up 'gas standards', or reference samples of Carbon Monoxide (CO), Sulphur Dioxide (SO<sub>2</sub>), Nitrous Oxide (NO<sub>2</sub>) and Particulate –Pb (lead), –As (Arsenic) and –Ni (Nickel).

Currently, the National Ambient Air Quality standards specify the upper limits for pollutants and, based on this, the Air Quality Index — that grades air quality in cities from 'Good' to 'Severe' — is prepared for several Indian cities.

### Devices not calibrated

"However we have noticed several times that these measurement devices are not calibrated and errors creep in," said D.K. Aswal, Director, National Physical Laboratory. "This month, we are ready with the standards for several pollutants."

Going ahead, he said, there would be talks with environment-monitoring agencies like the Central Pollution Control Board (CPCB) to see if these can become reference standards for use by all private and public agencies that measure pollution levels.

CPCB has prescribed guidelines for the maximum permissible levels of 12 gases and pollutants, depending on residential, rural or industrial locations. Standards for PM<sub>2.5</sub> were laid out in 2009, though CPCB is now mooting a proposal to revise these standards, a senior official in the organisation had told *The Hindu* earlier this year.

The NPL has also developed a custom air sampler that claims to measure PM<sub>2.5</sub> levels far more accurately than existing devices.

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