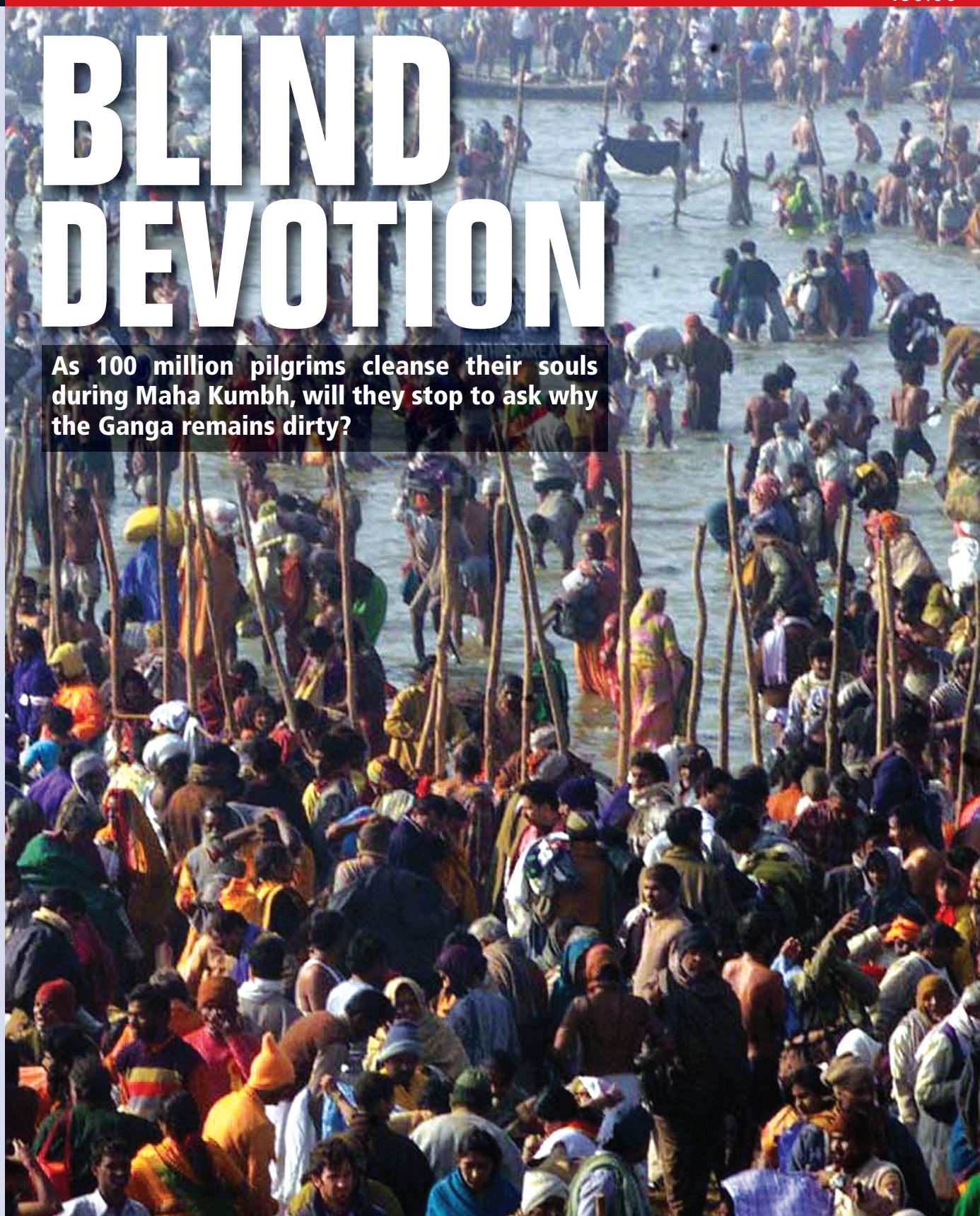
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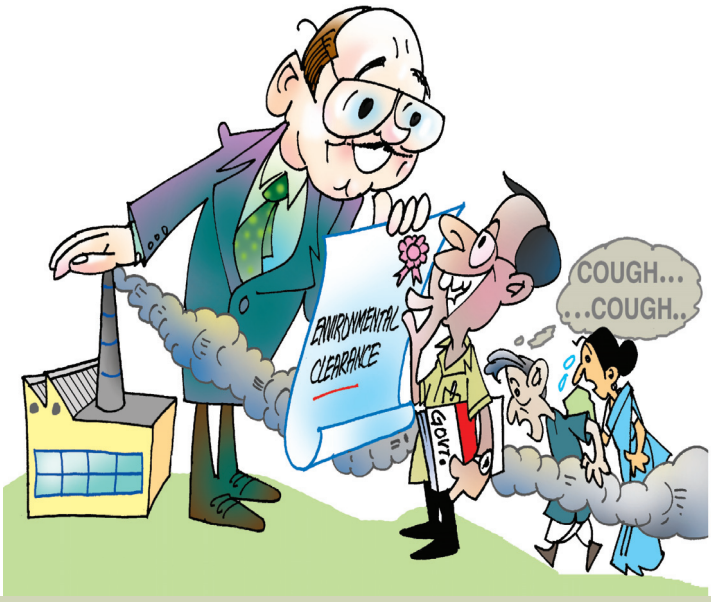


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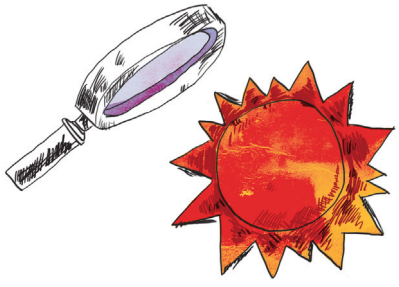
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For a place in the sun

How will solar energy be made to work in India? As I discussed in my previous article there are three key challenges. One, how will the country pay for solar energy in a situation where there is no money to pay for even the crashed costs of installation. Two, what is the best model for the distribution and use of this relatively expensive energy in a country where millions still live in the dark? Three, how should India combine the twin objectives of supply of clean energy and creation of domestic manufacturing capacities?

The government proposals for funding the differential costs of solar are twofold. One, under the National Solar Mission phase II draft guidelines the Ministry of New and Renewable Energy has proposed a viability gap funding for new projects. In other words, it wants to go back to the era of capital funding, which has been riddled with problems. For instance, wind energy suffered because the operator had no real incentive to generate power; it only eyed benefits of capital finance and depreciation. The plants' performance was abysmally low; therefore, generation-based incentive was introduced. It paid the differential but only based on actual power generation. Reversing this will be disastrous in a sector where there is a huge gap in performance of systems. Capital funding will be used without consideration for efficiency and output.



The second option—open to states—is to fund solar through renewable purchase obligations or feed-in tariffs, where the power utility is required to buy a certain proportion of its energy from renewable sources. Andhra Pradesh and Chhattisgarh have recently announced ambitious solar policies built on this premise. Tamil Nadu has gone a step further in solar purchase obligations on big end consumers. But this looks good only on paper. The fact is all energy utilities are bleeding. They cannot pay the cost of energy they procure, let alone more expensive solar energy. Banks will not lend money to any solar entrepreneur if they are told that state utilities are guaranteeing the viability of the project through payments. It will just not work.

This is when costs of solar are definitely down and the costs of energy through other sources like coal or gas are definitely going up (see 'Going off-grid to power solution', *Down To Earth*, September 1-15, 2012). Today, it is estimated that the levelised cost of diesel-generated power is ₹8-15 per unit. This will only go up as diesel gets de-regulated. The cost of solar is ₹7-9 per unit. But the problem remains that the average pooled power purchase cost—the price utilities pay for power—remains ₹3-5 per unit.

The only option is to build a feed-in tariff mechanism, which will pay the differential costs, with guarantees of no default. The National Clean Energy Fund—built by collecting ₹50 per tonne of coal or lignite mined or imported—can be used to pay this cost. Currently, the fund grows by ₹3,500 crore per year but is not used for substantial benefits. Why not allocate a portion of the fund to doing what it is meant to do, that is generate clean energy?

But this is also related to the second question about who should benefit from solar energy. Should we continue to invest in large, grid-based solar projects, which feed the already fed? Or should we find innovative ways of upscaling decentralised solar energy—rooftop panels and mini-grids—to reach remote villages and institutional users? Currently, when we think of this option we tend to think small, literally. So we think of distributing individual solar lamps or panels that can light a few bulbs or power a fan. These are essential but do not match needs or aspirations. In other words, solar is considered only a transitional solution; it is for the poor, when they are poor. This is a limiting option and will not work.

The best option would be to build grid-interactive mini-power plants—also funded through a feed-in tariff paid through the National Clean Energy Fund. But these installations cost more, ₹15-20 per unit of energy produced and in addition the purchasing power is low in remote villages. Therefore, the differential will have to be paid partly through generation-based incentive and partly through tariffs collected locally by the developer. But the key is to provide viable opportunity for investment in providing clean energy to the very poor. A similar model should be evolved for rooftop solar as well. Getting this right would be the real game changer.

The third big question is how to incentivise domestic manufacturing in an over-supplied global market. One option is to mandate domestic procurement. There is another option as well. Today, Indian solar developers buy US products, not because they are cheaper or better, but because they get loans at low interest on the condition of buying US products. Since the cost of capital determines their project viability they accept the condition. The Indian government should do the same—provide low-interest loans to companies and mandate domestic equipment procurement. Surely, this is not too high a price to pay for triple benefits: clean energy, growth of domestic manufacturing and most importantly, meeting the energy needs of all, not some.

Solar is clearly the answer. But only if we know what is the question. ■

—Sunita Narain

SCIENCE AND ENVIRONMENT FORTNIGHTLY

Down To Earth

FEBRUARY 1-15, 2013

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CHEER, DON'T JEER



ANKUR PALIWAL / CSE

It is disheartening to see people like Sunil Dhingra criticise the great service Husk Power Systems (HPS) is providing ('Powered by husk', November 16-30, 2012). Small off-grid biomass power plants have lesser transmission and distribution losses and are much more successful than big grid-connected plants that are failing across the country.

Government involvement in such small-scale projects only creates problems. Government-supported biomass facilities fail because they lack long term commitment. What would happen if government withdraws its commitment to subsidise off-grid power plants? HPS would be stuck, unable to increase the price of its services and yet forced to pay for high operational costs. The company would not be able to cover the costs and the business model will ultimately fail. This would only discourage others from investing in similar ventures.

What is required are business models that are commercially viable without government subsidies; those are the only ones which will be able to deliver sustained quality service. The customers are more content with the service of HPS than they are with the kerosene the government is providing. They should be left to decide what's best for them. If they are willing to pay, it means HPS is better than any available alternative.

NIKHIL JAISINGHANI
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SICK SOCIETY

This is with reference to the editorial, "A year of leadership failure" (January 1-15, 2013). The angst expressed in Delhi and other cities is an expression of the frustration people feel against a non-responsive ruling elite rather than merely anger over non-governance. But this outpouring of emotions that we saw should lead to collective introspection by society. We want the government to do things which we ourselves are not willing to do.

All the people who saw the two beaten and bleeding victims and drove on



VAIBHAV RAGHUNANDAN / CSE

are as much at fault as the government and the police. The day we realise we lack compassion and care as a people and a society, and start learning to reach out to fellow human beings, we will elect the leaders who also reflect that. So long as we remain callous and indifferent, we will get that kind of a government.

KRISHNA
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✉ No good can come out of protests if we are not ready to evolve as a society. People will forget the incident after a few months. The rapists would get some 10-12 years in jail and the minor rapist would go to a remand home. Movies would continue to expose and degrade women onscreen; advertisements would use sexy pictures to promote their products. As a society which treats women as

sex objects, we all have a tiny share in all the rape cases happening in Delhi and all over the country.

SHRIKANT LIMAYE
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✉ I can't agree more with the editorial. My daughter and I were at the site peacefully protesting and there was no sign of any leader reaching out. Even if they didn't want to face the crowds they could have sent out the right messages and assurances to the public through the media. Compare this with how top leaders rushed to meet and negotiate with Baba Ramdev last year.

ANJALI NAYYAR
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FLOOD FACTOR

The article, "Flooded, by drains" (December 16-31, 2012), highlights the negligence of the government in maintaining and repairing drainage systems. The system needs to be extremely efficient in areas prone to waterlogging.



M SUCHITRA / CSE

Unfortunately, these are the areas that are most neglected. Now the government has diverted ₹3,361 crore for improvement and modernisation of drainage systems but efficient implementation is a problem. Contractors cannot work throughout the year as farmers oppose closure of drainage systems for extended periods. The only solution is splitting the work into smaller time slots after bringing this to the notice of the funding agencies.

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RICHARD MAHAPATRA / CSE

BLAME GAMES

Continuing problems of the panchayats in Jammu and Kashmir show that the chief minister of the state, Omar Abdullah, enjoys playing politics more than making efforts to resolve the issue ('The panchayat outrage', November 16-30, 2012). It is baffling to see him expressing helplessness about the reluctance of the members of Legislative Assembly (MLAs) from his party to cede powers to panchayats and blaming other political parties and the Centre for the debacle. The article exposes his deliberate attempt to deny any authority to the local bodies, due to which the terrorists are having a field day. It is time political parties stopped blaming each other and took steps to devolve powers for smooth administration.

K R SRINIVASAN
Secunderabad

✉ Mass resignations of panchayat members in Jammu and Kashmir are a shame for the 73rd Constitutional Amendment that empowers the village panchayats for good governance. Omar Abdullah says MLAs do not want to cede powers to the panchayats. He is elected by the MLAs and not by the panchayat members. Their support is imperative for his political survival and naturally he is all for MLAs' supremacy.

Everyone expected that as a young chief minister he would provide good governance at the grassroots level and not continue the trend of remote controlled politics in the valley. His "make-up kit" remarks for women panchayat members in Jammu and Kashmir show his arrogance. As a leader he needs to rise above such silly behaviour. The panchayat members who have resigned must take back their resignations and file petitions against the corrupt MLAs for not delegating the 29 functions detailed in the amendment.

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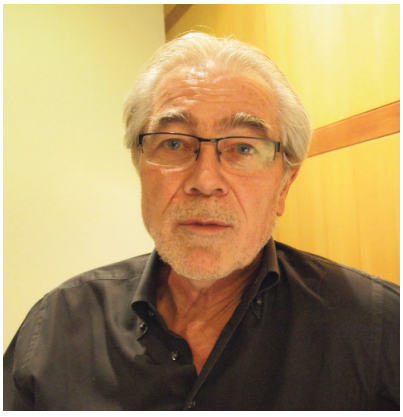
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BACK TO THE ROOTS

The interview with Hans Rudolf Herren ('Agro-ecology is the only way', December 16-31, 2012) sheds light on a global agricultural problem. We in India have been emphasising on the new eco-agro revolution, which goes beyond Green Revolution. We generate over 5 million tonnes of agro-waste per year, which would be an excellent source of organic carbon for our soil. With its traditional agricultural wisdom, the country is in a unique position to give a new eco-agriculture model to the world. The need is to take the initiative on a massive scale and reach the remotest areas.

M H MEHTA
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✉ While working in South America and Africa I propagated the concept of agro-climatological classification based on data from India, west Africa and northern Australia. In India most people at the top, from politicians and bureaucrats to agricultural scientists, protect the interests of multinational companies over that of the people. We need more people like Herren to educate our policy makers and researchers.



S JEEVANANDA REDDY
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✉ The problem in India is the government's agenda to promote GM crops. We are, therefore, ridden with the most serious conflict of interest. Given this situation, science, good thinking and right debate are unlikely to change the agricultural policy. The change, it seems, needs to be forced.

ARUNA RODRIGUES
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ERRATA

The article, "Bamboo rising" (January 16-31, 2013), states Jitendra Kumar Sahoo works for Vasundhara. We failed to mention that Vasundhara is a non-profit responsible for popularising FRA in villages of Kandhamal. Also, Trinath Patra, not Akshya Patra, is the secretary of Kalahandi Jungle Manch. We regret the errors.

Down To Earth welcomes letters, responses and other contributions from readers. Send to Sunita Narain, Editor, *Down To Earth*, 41, Tughlakabad Institutional Area, New Delhi - 110 062. Email: editor@downtoearth.org.in

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Trick or treat?

Countries approach communities to say yes to nuclear disposal site near them

ANKUR PALIWAL

THE United States, the world's biggest nuclear waste producer, will soon seek approval of its communities to build repositories for disposal of toxic waste in their area.

Implementing the proposal, however, seems difficult because getting approval from communities for disposal sites has been a contentious issue across the globe. So far, no country has managed to build such a repository.

A strategy document released by the US Department of Energy on January 10 states that a protocol will be prepared to seek communities' consent. 'Strategy for Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste' says that by 2021, a pilot interim repository will be built to store nuclear waste from across the country. This will be followed by a larger interim repository by 2025 and a permanent underground or geological repository will be in place by 2048.

The pilot repository, says the document, is important to build trust among stakeholders for a consent-based siting process and commitments made with the host community for the facility itself. The pilot will also demonstrate whether the repository would be safe for a few decades or even a couple of centuries. The final repository will have to be safe for up to a million years.

At present, more than 68,000 metric tonnes of heavy metal (MTHM) of used nuclear fuel is stored in the US' 72 commercial power plants. About 2,000 MTHM gets added to it every year. The US government has majorly defaulted on its 1982 agreement with the nuclear industry where it took the responsibility to manage and dispose of nuclear waste.

Under the deal, power utilities, since 1982, have been paying about $750 million per year to the US Treasury for waste management. But the US government did not fulfil its obligation to manage the waste by 1998, and has accumulated around $1 billion per year in liability cost. The pilot interim repository will fix two problems—remove nuclear waste from power utilities and offload the government's liability.

But Jack Spencer, nuclear policy analyst with Washington-based think-tank Heritage Foundation, smells a rat. He says by building an interim repository, the US may get rid of immediate problems. However, the strategy certainly delays and possibly prevents building of a permanent repository that the country needs.

The strategy document largely reiterates the recommendations of Blue Ribbon Commission set up by President Barack Obama in 2010 that seeks a plan of action for America's nuclear waste management and disposal. The commission recommends formation of a

People protest a proposed nuclear waste site in the Lake District, the UK



ITV

body dedicated to implement waste management programme. But the strategy paper is vague in clarifying the status of the body. It says, the body will have "an appropriate balance between independence… and the need for oversight by Congress". This body will identify repository sites.

Communities' consent

Nuclear experts across the globe agree that geological repository, which is built underground, is the safest way to dispose of radioactive waste. "But finding sites has always been politically difficult," says M V Ramana, member of International Panel on Fissile Materials (IPFM), an independent group of non-proliferation experts from 17 countries. Earlier attempts have mostly met with strong public opposition.

A recent example is Yucca Mountain in Nevada, which was a proposed repository site in 1986. The project was scrapped last year by the government after spending $15 billion. Communities opposed it fearing water contamination. Also, Yucca is a volcanically active mountain.

Communities don't welcome a radioactive disposal site near them. There are concerns about its effect on water, agriculture and tourism. So far, communities in only Sweden and Finland have consented. But approval of repositories is stuck at the licensing stage.

The Environmental Court of Sweden and the Radiation Safety Authority are reviewing the site for public safety. "The regulator is raising questions on long-term safety of the copper canister and bentonite clay buffer, the technology chosen by KBS, the Swedish nuclear industry body," says Johan Swahn, head of Swedish non-profit Office for Nuclear Waste Review. The site, close to Sweden's Forsmark reactor, is on a tectonic fault zone.

The Swedish and Finnish programmes may collapse like projects in other countries, says Swahn. An IPFM report states that it is still not clear which technology is safe for geological disposal.

Swahn also points out discrepancies in the community consent process in Sweden. "There was better chance for consent as these communities were already living close to the reactors, but the inhabitants were given one-sided information," he says. Communities were promised jobs during construction of the repository. The company also promised to invest hundreds of millions of Swedish krona in infrastructure and local development projects. It also tried to integrate with local societies by supporting sports events, local teams and cultural activities. "It is such propaganda packages that communities sometimes buy," says Ramana, who has written *The Power of Promise: Examining Nuclear Energy in India.*

Consent is easy when the poor are bribed and when communities are living close to the reactor

Communities, he says, generally consent on two conditions—when a poor community is bribed into accepting a repository with job opportunities and compensation; and when communities are living near an operating nuclear facility. In this case, the risk they face is two-pronged. Accidents are likely to occur when nuclear waste is stored on the surface level on reactor sites, as happened in Fukushima. In case of geological repository there is the risk of groundwater contamination. But this happens tens of thousands of years later. Some communities then decide that the latter is lesser of the two evils.

Communities are fighting among themselves in Canada and the UK over the question of allowing repositories.

A plan floated in 1970s of having a repository shared by many countries is still to find takers. Many believe each country has an ethical responsibility to manage its waste. While there is global consensus on speedy geological disposal of spent fuel stockpiled at reactor sites, issues are far too many before it becomes a reality. ■

Waste countries produce

Only two countries have got consent for disposal sites from people

Country	Spent fuel inventory (heavy metal in tonnes)	Spent fuel policy	Community consent
United States	61,000	Direct disposal	No
Canada	38,000	Direct disposal	No
Japan	19,000	Reprocessing	No
France	13,500	Reprocessing	No
Russia	13,000	Some reprocessing	No
South Korea	10,900	Storage now	No
Sweden	5,400	Direct disposal	Yes
United Kingdom	5,850	Reprocessing	No
Germany	5,850	Direct disposal	No
Finland	1,600	Direct disposal	Yes

Source: IPFM's 2011 report 'Managing Spent Fuel from Nuclear Power Reactors'

Reprocessing waste

India and Japan have a policy to reprocess waste to fuel next generation reactors. This produces highly radioactive waste such as Plutonium-239, which must be safely stored. India has three reprocessing plants, at Tarapur and Trombay in Maharashtra, and Kalpakkam in Tamil Nadu. In Japan, the plant at Rokkasho is yet to become operational. The plant, with a capacity to reprocess 800 tonnes of spent fuel a year, cost $20 billion.

Almost all of Japan's 17,000 tonnes spent fuel is currently kept at reactor sites. Soliciting communities to host a geological repository is yet to yield result. The devastating impact of tsunami and earthquake has increased fears. In India, the next generation reactor at Kalpakkam will start operations by year-end. "Research has begun on finding a geological site which will be required after 30-40 years," says P K Wattal, director, nuclear recycle group at Bhabha Atomic Research Centre. "Spent fuel is continuously being reprocessed. We cannot divulge how much Plutonium inventory we have. This is our national policy," he says.

Ban on junk food in plastic bags

Himachal court tells state to stop sale of non-essential items in non-biodegradable packs

KUNDAN PANDEY *in Delhi* and
AAKARSHAN CHAUHAN *in Shimla*



MEETA AHLAWAT / CSE

TAKING a strong stance on the adverse effects of plastic on health and the environment, the Himachal Pradesh High Court has ordered a statewide ban on the sale of junk food in non-biodegradable packets. The ban, effective from April 1, will not cover essential items such as edible oil and milk.

In its January 10 order, a division Bench said, "We are not in any manner issuing directions that such items are banned because that is not within the purview of the court but if we follow the Himachal Pradesh Non-Biodegradable (Control) Act of 1995, the least we can do is to direct that these harmful items should be sold only in bio-degradable packing." It said such packing might increase cost of products, "but it would be worth paying that extra money to protect environment and health of the children".

The order came in response to three petitions filed in 2010 to reduce indiscriminate use of plastic. At that time the court had set up a committee to suggest ways to reduce use of plastic packaging in food items. The committee, headed by the then additional chief secretary to the state, however, failed to follow the order. Consequently, another committee was formed. After much dilly-dallying, the committee gave the list in January this year (see box). In its order, the court said the list is not final and more items could be included. The next hearing is on March 15.

The order has evoked mixed reactions. Ali Raza Rizvi, Principal Secretary, Health and Family Welfare, Himachal Pradesh, says it will help improve people's health, while the state environment ministry, responsible for managing plastic waste, chose not to comment. Prem Kumar, additional chief secretary (Home, Civil Supplies and Consumer Affairs), says, "We are consulting the law department to look into the provision of filing a special leave petition in the Supreme Court." A number of products termed as junk food are manufactured in Delhi. It remains to be seen whether the manufacturer will specifically make goods for the state, adds Kumar.

In 2009, PepsiCo had introduced chips in biodegradable packs, but within a year it reverted to plastic, saying it was not received well by the consumers.

"Biodegradeable packing does not ensure durability of products and might lead to loss," points out Nikhil Sood, a wholesaler of chocolates and chips in Shimla. Such a packing is not easily available. Though controlling plastic use will be good for the environment, it will cause inconvenience to customers," says K L Radhakrishnan, chief editor of journal *Indian Food Packer*, mouthpiece of All India Food Processors' Association in Delhi. He adds, "The health of the children is linked to their food habits. It will require much more effort to spread awareness on balanced food habits." Vipin Kumar, an Uttarakhand-based expert on waste, says the alternate ways to pack food items like tetra packs and tin suggested by the court could also create problem, as their disposal is difficult. "Instead, the administration should levy tax on manufacturing companies and that money could be used to dispose of the non-biodegradable wrappers," he suggests.

Bharati Chaturvedi of Delhi's Chintan Environment and Research Action Group agrees. The authorities should push for paper and corrugated fiberboard for packing, she says. Since transporting these products in paper-based packing over long distances would be difficult, the government would have to promote local production of items, she adds. ■

Inputs from Avimuktesh Bhardwaj

What junk

Before giving its verdict, the Himachal Pradesh High Court had constituted a committee to make a list of junk food sold in non-biodegradable packets. It includes chips, biscuits, namkeen, candy, wafers, chewing gum, ice-cream, chocolates, noodles, corn-flakes, pizzas, French fries, soft drinks, fruit beverages and cakes. The committee said these items can lead to obesity, diabetes, high BP, cardio vascular problems and colon cancer.

Pentavalent takes its toll

The vaccine is suspected to have killed at least 13 infants. Experts want data analysed

KUNDAN PANDEY



ON JANUARY 10, a day after a 42-day-old was administered pentavalent vaccine in Kerala, the infant developed fever and died. This was a repeat of what happened at Chalakudy Taluk Hospital on December 30. A 47-day-old was injected the same vaccine; it slept at night but did not wake up. Parents of both the infants suspect the vaccine caused the deaths. A doctor at the forensic department of Thrissur Medical College, where the post-mortems were conducted, said on condition of anonymity that the vaccine may be the cause as there was no other reason for the death.

At least 13 deaths have been reported from Kerala, Tamil Nadu and Haryana, all pointing towards pentavalent vaccine. Demanding analysis of mortality data from the two states, academicians, health activists and paediatricians wrote a letter to the health secretary, Ministry of Health and Family Welfare, on January 15. They pointed out that the National Technical Advisory Group on Immunization (NTAGI) had stated that the vaccine would be extended to other states only after data from Kerala and Tamil Nadu were reviewed and the vaccine was proved safe.

The vaccine was introduced in Kerala and Tamil Nadu as a pilot project before being introduced in the country's universal immunisation scheme. But

Before checking pilot project results, Centre decided to introduce the vaccine in more states

before analysing data from the two states, the Centre ordered its introduction in five states and a Union Territory—Gujarat, Haryana, Karnataka, Goa, Jammu & Kashmir and Puducherry. Haryana has already introduced it, while Puducherry plans to introduce it by January-end.

The vaccine is designed to provide protection from diphtheria, pertussis, tetanus, HiB and Hepatitis-B. It has replaced DPT in the country's immunisation programme, which protects only against diphtheria, pertussis and tetanus.

There has been a long-standing demand to check the vaccine's efficay in India. In the letter to the health secretary experts wrote, "When each death is seen in isolation it is reasonable to consider them as mere coincidences, but it is not acceptable if it happens repeatedly."

Hidden facts

Replies to an RTI application filed by Jacob Puliyal, head of paediatrics department, St Stephen's Hospital in Delhi, reveals there is more to extension of the vaccine in other states than meets the eye. In November 2010, GAVI Alliance, an international body, had threatened NTAGI of diverting the money sanctioned to India for introduction of the vaccine, to other countries. GAVI Alliance had approved US $46.50 million to introduce the vaccine in Tamil Nadu and Kerala. It threatened to divert US $118.5 million to other countries if India failed to introduce it in other states within six months. Just before the lapse of six months, the government decided to introduce the vaccine in six more states.

Puliyel says the vaccine is killing more children than the diseases it is supposed to protect the children from. Replies to the RTI application reveal that in the first six months of the introduction of the vaccine in Kerala, 24 children developed reactions after being vaccinated. Of these, five died.

Using this data, Puliyel analysed the mortality trend. According to him, if five children died for every 40,000 vaccinated, there would be 3,125 deaths due to the vaccine in India. It is estimated that 25 million children will be administered pentavalent across the country.

An ealier study shows that Hib meningitis affects seven in 100,000 children below the age of five. Considering a 10 per cent mortality rate, there would be 1,750 cases of HiB in the country.

Thus, vaccine-related deaths are much higher than the deaths likely to be prevented from meningitis. Puliyel's report was published in British Medical Journal on December 20.

Use of vaccine has caused deaths in Sri Lanka, Bhutan and Pakistan as well. In November, three deaths were reported in Vietnam due to use of this vaccine. The Vietnam government stopped the programme with immediate effect. Will India take action, too? ■

Parties steal Congress show

BJP-ruled Chhattisgarh enacts its own food security law, non-Congress states to follow

JITENDRA

THE Central government has gone on an overdrive to get the National Food Security Bill, UPA's big-ticket programme for the 2014 general elections, passed in the forthcoming budget session. But it lost the race to states ruled by opposition parties, which are initiating their own food security laws.

The budget session is the last opportunity for UPA to keep its election promise and get the bill passed. If enacted, the country's 75 per cent rural and 50 per cent urban population will get subsidised foodgrain as entitlement.

On December 22, Bharatiya Janata Party (BJP)-ruled Chhattisgarh enacted its own state food security law. Odisha, Madhya Pradesh, Bihar and Tamil Nadu, all ruled by non-Congress parties, are expected to enact their laws soon. Political analysts say it is a masterstroke by the opposition parties.

Unlike the national bill, Chhattisgarh does not put a cap on the number of persons entitled to subsidised foodgrain. In fact, it takes a step ahead and covers even the Antyodaya (poorest of the poor) households. Food rights activists praise Chhattisgarh for making 90 per cent of its population entitled to foodgrain. The state also seeks to increase the commodities under the public distribution system.

The BJP took the initiative in Chhattisgarh to counter the Congress' direct cash transfer programme, say political analysts. "UPA put its flagship programme on the backburner to push the direct cash transfer programme," says Harsh Mander, food rights activist and former member of Sonia Gandhi-led National Advisory Council. Chhattisgarh waited for four years to get the state food bill passed. Mukhtar Abbas Naqvi, national BJP spokesperson, says, "The step was taken seeing the Centre's lukewarm approach towards the national food bill."

Congress under pressure

"The bill, in its present form, is unacceptable to most non-Congress states," says Biraj Patnaik, principal adviser to the Supreme Court-appointed Commissioners on the Right to Food case.

Intense debates are likely to take place in the budget session which may derail food bill's enactment

On January 17, the parliamentary standing committee submitted its report on the bill, paving the way for its enactment. But with most states opposing it, intense debates are likely to take place in the budget session which may derail its enactment. The states demand universal entitlement to foodgrain, financed by the Central government.

Soon after the bill was tabled in Parliament in 2011, the Tamil Nadu Assembly, supported by AIDMK, passed a resolution against it, saying the state had already covered all the people in Tamil Nadu under subsidised foodgrain schemes. Chhattisgarh chief minister wrote to the prime minister against it, while Bihar's chief minister protested it. Odisha chief minister appealed for universalisation of the food security bill. "In its present form, the bill will serve only 6.5 millions of the BPL population in Bihar," says Shyam Rajak, state minister of food and civil supplies. The current BPL population in Bihar is 13.5 million, he says.

The Congress is in a dilemma with states eager to match Chhattisgarh's steps in the national bill. The standing committee report added fuel to fire. While it sticks to the bill's proposal of covering 75 per cent rural and 50 per cent urban population, it gives states the responsibility to increase coverage.

The Centre is caught between economic prudence and people's interests. "Additional ₹94,419 crore, besides the present food subsidy of ₹52,490, would be required to implement the bill," says Praveen Jha, who teaches economics at Jawaharlal Nehru University in Delhi.

There was heated discussion over the bill at the brain-storming session of the Congress in Jaipur on January 20, attended by party chief Sonia Gandhi and the prime minister. While some leaders want the bill operationalised, the party wants to push the direct cash transfer programme. This may be critical for the Congress, for the party sees direct cash transfer programme and the food bill as its key vote winners. ■

Chhattisgarh entitles 90 per cent of its population to subsidised foodgrain



APARNA PALLAVI / CSE

The MoEF-NHAI roadblock

Two Central government arms fight over de-linking of forest, environment clearances

KUMAR SAMBHAV SHRIVASTAVA

THE Union Ministry of Environment and Forests (MoEF) has tied itself up in knots on the issue of clearances for highways. To ease the process of starting linear projects like roads, the ministry has allowed project work to start in non-forestland even before the forest clearance is granted to forest patches that may fall in such projects. MoEF has, however, refrained from modifying the current norm which stipulates that forest clearance should precede environment clearance. As per the law a highway project cannot start without an environmental clearance.

On January 9, the National Highway Authority of India (NHAI) approached the Supreme Court to direct MoEF to de-link the environment clearance from forest clearance for its project. It alleged that 22 projects worth around ₹25,000 crore are stuck for want of forest clearance. "All these are road widening projects and include little forestland. They have been recommended by the MoEF's expert appraisal committee for environment clearance but we cannot start them because forest clearance is pending," says an NHAI official.

At the centre of the debate is a 2011 MoEF order that made it mandatory for projects involving forestland to obtain forest clearance before applying for environment clearance. Before this, the two clearances were independent of each other. As a result, in many cases project developers put pressure on the government to grant forest clearance on account of investing huge amounts of money after getting environment clearance. MoEF's order was endorsed by the apex court in June last year while it passed a judgement in the Lafarge case.

NHAI says the linking condition holds good for localised projects like mining but not in the case of highway projects. "The projects of the applicant authority are linear projects, in which there is minimal involvement of forests. In case forest clearance is not granted, those parts (forest) of the highway would not be touched," states NHAI's court application. It adds many contractors have terminated their contracts due to delay in receiving clearances. Recently, GMR Infrastructure pulled out from the ₹7,200-crore Kishangarh-Udaipur-Ahmedabad highway project.

Just after NHAI had announced its decision to approach the court, MoEF issued an order on January 7, saying linear projects can be allowed to start work on non-forestland even if the forest clearance is pending, provided the proponent certifies that in case the clearance is declined the project can be executed on an alternate alignment. Many saw the order as a step that will address NHAI's concerns. The order, however, did not say anything on de-linking of the clearances. An MoEF official said, "It will apply only to the projects which either do not require environment clearance or have already received it. To de-link we will have to seek the modification from the court in its guidelines issued in the Lafarge judgement."

In a separate application to the court, NHAI has also demanded exemption from taking approval of gram sabhas for widening of roads under the Forest Rights Act. NHAI claimed the land along the highways traditionally belonged to it in which it had carried out plantation. To conserve those plantations the status of those areas were upgraded to protected forests. Since the tribals did not depend on those land traditionally, NHAI should not be insisted to take permission of gram sabhas, it said. A committee of secretaries, formed by the Union law ministry to fast-track clearances for highways, has favoured the NHAI demands. ■



COURTESY: SKYSCRAPPERCITY.COM

Key to gridlock

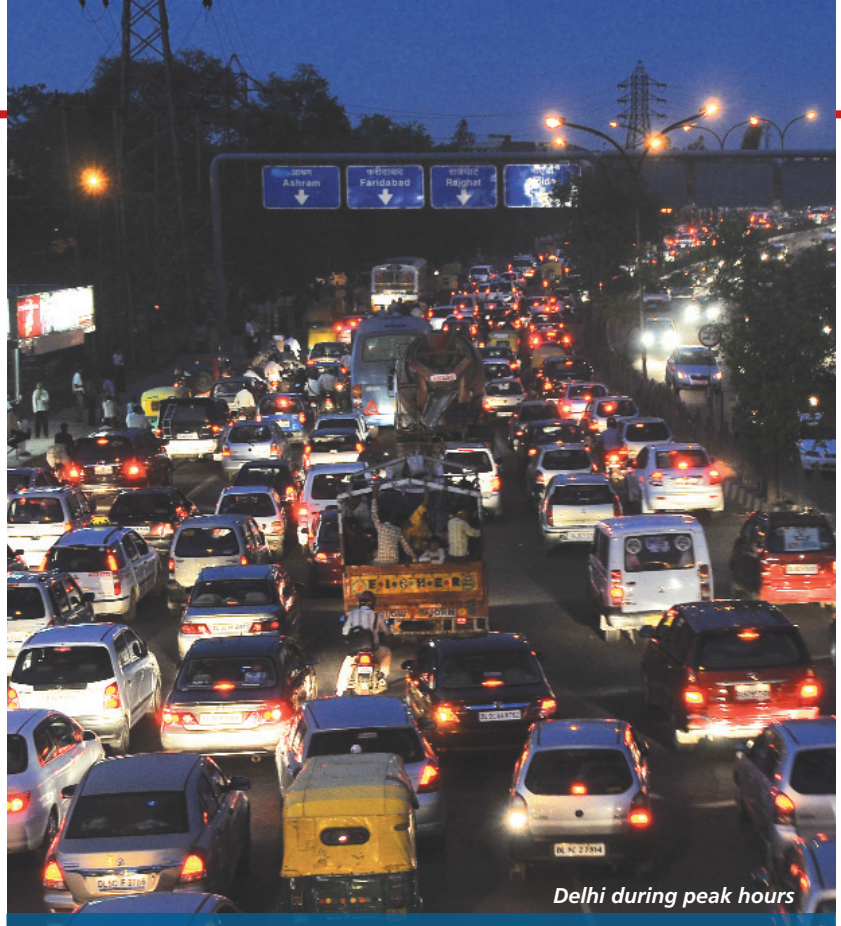
Government plans to levy charges on cars to ease congestion in cities

SHASHANK GANDHI

To curb heavy traffic on city roads, the Union Ministry of Urban Development is considering levying charges on car users, who occupy maximum road space. The ministry has issued a policy advisory in this regard to state governments for adoption based on its potential and viability. The advisory has been prepared by the ministry's autonomous body, the Institute of Urban Transport.

Congestion charge is a fee levied on entry of vehicles to a legally defined zone where heavy traffic causes delays, waste of fuel and time, and pollution. The charge is expected to decongest such zones. For instance, people may avoid the congested areas or shift to public transports like bus or Metro. A study by the School of Planning and Architecture (SPA), Delhi, shows imposing a congestion fee of ₹10 will reduce traffic flow by 20-25 per cent in Connaught Place, Delhi's financial hub. Several global cities, including Singapore, Stockholm and London, have successfully implemented the scheme (see 'To London's relief').

Congestion charge was first proposed in the National Urban Transport Policy of 2006, but then the ministry did not take it on board. This time, the move seems to have received impetus from the 12th Five Year Plan, which proposes introduction of congestion charge and hiking of parking fee to control the use of personal transport and thereby augment public transport. The Plan suggests analysing forms of road pricing followed worldwide to manage mobility in large cities. A study by urban infrastructure consulting firm Wilbur Smith Associates for the ministry in 2008 forecasts that by 2030 the peak hour traffic speed in large cities in the country is likely to drop to 6 kilometres per hour. This means traffic in these cities will virtually come to a halt.



Delhi during peak hours

MEETA AHLAWAT / CSE

To London's relief

- Traffic levels fell by 25 per cent within two days of introducing congestion tax in 2003. Congestion has since decreased by 30 per cent
- Up to 60 per cent of this reduction is due to shift to public transport; the rest due to car-sharing, use of motorbikes and cycles and avoiding congestion zones
- Traffic speed on weekdays increased by 10-20 per cent; bus speed during peak hours improved by 20 per cent
- Tailpipe emissions (particularly NOx and particulate matter) down by 13-15 per cent

A public transit system

Experts agree on the benefits of congestion charge but doubt if the scheme can be successfully implemented owing to the huge differences in the size of cities, their population and travel patterns. They emphasise on introducing a strong public transport system to make the scheme effective. P K Sarkar, professor at SPA, says it is important to scientifically estimate traffic reduction through congestion charge. "Proper knowledge and handling of logistics and administration and management of such a system are also imperative."

Piyush Kansal of RITES Limited, an engineering consultancy enterprise of the Government of India, says, "We tend to underestimate the intelligence of our commuters and their willingness to pay. People in metropolitan areas need good infrastructure and are ready to pay extra for it. This is evident from surveys done in Mumbai for transport infrastructure. We were ready for congestion charging five years ago, but no attempts were made." Kansal emphasises on informing people about the benefits of congestion charging and on implementing the scheme in phases.

There are substantial costs associated with implementation of congestion pricing, related to technology, public outreach and alternative modes of transport. But benefits to society are also immense, which include reduction in congestion, pollution and fuel consumption, time saving, increase in revenue from the charge as well as from fares from improved public transport ridership. The balance between the costs and benefits will help cities take a decision. A strong public transport system can clinch the deal. ■

Look at the sun

Government has made half-baked efforts to promote solar pumps, a cost-effective irrigation tool

ANKUR PALIWAL *from Sri Ganganagar* and
ALOK GUPTA *from Nalanda*

"Peter takes away all our money," say farmers in Bihar, bristling with anger. They want to get rid of Peter but can't. Peter is the diesel pump used widely in the state for irrigation due to power shortage. The three horse power (HP) pump consumes a litre of diesel (₹50) in an hour. Last year, the state government initiated a pilot offering an economical and sustainable alternative for free—solar-powered pumps. But its faulty implementation has marred hopes of eliminating noisy Peter.

Under the pilot, Bihar's minor irrigation department, along with Delhi-based Claro Energy Pvt Ltd, has fitted 34 community tubewell pumps with solar panels in Nalanda district. As per the agreement, Claro maintains the pumps while the department looks after the underground water channel. A solar community pump (7.5 HP) caters to 20 to 30 fields.

By shifting to the solar pump from Peter, many residents of Gonkura village saved ₹30,000 to ₹50,000 in the last summer season. But the happiness was short-lived. Over the past five months, only few fields in Gonkura are receiving water. "PVC pipes that run from the pump through the fields have holes. Consequently, some fields get over-flooded while some get less water," says the pump caretaker. He cycled 13 km twenty times to lodge a complaint with the minor irrigation department, but to no avail.

Another problem is that some pipes do not reach the farmers. They run for 200 metres, while many fields are farther away. "This rabi season we may have to supplement irrigation with Peter," rues a resident demanding quick repair and extension of pipes.

Farmers, meanwhile, point out that the pump had reduced their input cost considerably. "We have to pay only ₹5 per *kattha* (1.33 hectares), per irrigation cycle to water fields," says a resident of Gonkura.



PHOTOGRAPHS: ANKUR PALIWAL / CSE

An unsubsidised 3 HP solar pump (worth ₹4.5 lakh) has negligible recurring cost, while a diesel pump (₹70,000), assuming it runs five hours a day, has an annual recurring cost of ₹80,000. The cost of the solar pump can be recovered in four years, while for diesel the spending never ends.

When asked why the pilot was started if the pipelines were faulty, Kartik Wahi, CEO of Claro, said, "We were not aware of it." Vidya Bhusan, assistant engineer (tubewell), state minor irrigation department, says the authority is aware of the situation. "The project is an experiment. We are planning to overhaul the water channels."

Avinash Kishore, a senior fellow at the International Food Policy Research Institute in Delhi, says solar pumps have a massive potential in states like Bihar, Jharkhand and West Bengal where groundwater is enough. "These states practise less irrigation because of power shortage. They mostly cultivate kharif and rabi crops. The pump can help farmers grow summer and cash crops, and save money," adds Kishore, who has written a paper on solar-powered pump irrigation and India's groundwater economy. But the pilot project's poor implementation has limited the potential of the solar pump, he adds. The state auditor general, in a 2008 report, states: "Almost all underground distribution system of tubewells were partially damaged due to substandard work of laying of pipes."

On the one hand, the state is promoting clean energy and on the other, it is giving 30 per cent subsidy on diesel. This may prevent people from buying solar pumps in the future. Diesel cannot be done away with immediately, says a state government official requesting anonymity. "The disbursement of the subsidy has been patchy. As a result, farmers are buying diesel at market price," points out Kishore.



PRASHANT RAVI



(Above) A 3 HP pump consumes a litre of diesel per hour. Bihar is irrigating 10 per cent of its potential

Rajasthan: less water, big goals

Despite water scarcity, Rajasthan is actively pushing for solar pumps. Its horticulture department provides 86 per cent subsidy on pumps, while the rest is borne by the farmer. Till date the department has installed 1,725 pumps, and plans 3,000 more this year. There are certain conditions for selecting the beneficiary: those who practise horticulture on a minimum of 0.5 hectare (ha), have tubewells or farm ponds (*diggi*s) to store rain or canal water, and drip irrigation system. "These conditions may limit the use of pumps," believes Nidhi Tewari, policy researcher with International Water Management Institute (IWMI). Less than 10 per cent of farmers in Rajasthan practise horticulture and fewer have the drip. "Many farmers are not even aware of solar pumps and government makes no effort to reach them," says Ajay Jakhar, president of Bharat Krishak Samaj. Kishan Das of 15 Z village in Sri Ganganagar is one of them. He grows mustard and wheat on his small farm. "For irrigation I use water from the Indira Gandhi Canal, but the supply is decreasing. Earlier, water was released weekly, but now it is done fortnightly," says Das who neither has a *diggi* nor the drip system.

According to the horticulture department, the solar pump is meant "only for progressive farming and promotion of cash crops and water saving." Rajendra Singh Khichar, agriculture research officer at the Directorate of Horticulture in Rajasthan, says, "What is wrong if solar pumps encourage farmers to invest in drip irrigation and *diggi*?" The state in addition provides 90 per cent subsidy on drip irrigation and 50 per cent on *diggi*s.

Kishore contends that linking drip irrigation system with solar pump may not ensure its use. "Many farmers buy the drip to get the pumps but do not use it. They use the pump for running sprinklers which is a less water-efficient technique." In some areas where water table is low, farmers use high-capacity motors. "Solar pumps should not be promoted in such areas because when farmers get free energy, they over exploit groundwater," says Kishore.



In Rajasthan, solar pumps have been installed in farm ponds (diggis)

"Irregular power and high diesel cost actually deter exploitation of groundwater in these areas," he adds.

Besides water availability, the demand for solar pumps is also guided by cropping seasons. In states like Uttar Pradesh, Bihar and Madhya Pradesh, where 80 per cent of energy demand is in winters, the use of solar pumps will remain restricted due to cloud cover or fog, points out Jakhar. "Solar has its limitations, but low water discharge is sufficient during winters as requirement is less," says Wahi of Claro. In such a situation, diesel could be used to supplement irrigation, adds Kishore.

Sorting out money

The biggest hurdle in widening the use of the solar pump is its cost. A 3 HP solar pump costs ₹4.80 lakh. Even after subsidy, the amount the beneficiary has to pay, as in the case of Rajasthan, is high. "High capital subsidy is difficult to sustain. It leads to gold plating of appliances by companies to increase margins and cost remains high," says Kishore. In many cases, the government does not disburse the subsidy amount to the companies on time, adds Amarjeet, vice-president of Claro. "We have raised money from unsecured loan sources on high rates of interest which is piling up."

It is due to such reasons many entrepreneurs are exploring other financing models. Claro is in talks with NABARD to work out a financing mechanism. The banking sector, however, is reluctant because of lack of experience in the field. "Some past experiments with renewables have failed because of high default rate. This affects the bank's portfolio," says an official of a rural bank requesting anonymity. Farmers say defaults happen because their income is seasonal and insufficient. "Solar pumps have an advantage. Their use is linked to increase in farm income which will help people pay installments. Banks need to show confidence for such projects to take off," says Wahi.

In April last year, Bihar's minor irrigation department rejected NABARD's proposal of connecting tubewells with solar, saying the technology is costly.

Lack of economic options for farmers is fuelling the growth of new players that provide solar pumps at low costs. Take for instance Navneet Sharma in Rajasthan's Bikaner district. He sells a 3 HP pump at ₹1.60 lakh which includes the cost of four batteries for power backup, something the state government-empanelled companies do not cover. Seeing such low cost options, a farmer in Sri Ganganagar has filed a public-interest petition in the Rajasthan High Court against the empanelled companies for selling expensive pumps.

Sharma has till now installed 30 pumps. While farmers using his pumps have reported no problems, some companies have raised questions regarding product quality. Sharma says, "We cannot afford to supply substandard material because we operate in a local market. We procure material from the place others do. It is just that we bargain, ensure timely payment and do not have incremental costs of standardisation." Like empanelled companies, Sharma also gives 25 years of warranty. He asks, "What is the guarantee of the quality of solar equipment supplied by the empanelled companies?" An empanelled company has to send its products for testing to the lab of the Ministry of New and Renewable Energy. "These companies send the best product to get the approval. What is actually installed could be substandard," says Krishna Bhambhoo, a dealer of Waaree, a solar panel manufacturer, in Rajasthan. "There are no local testing facilities. The verifying team generally sees if the pump is running," says Tewari of IWMI. Khichar, however, defends that quality cannot be compromised as there are quality inspections before the despatch and installation of the material.

Rajasthan plans to install 3,000 solar pumps this year, while Tamil Nadu is aiming at 20,000 by 2016

Grid *v* solar

It is often argued that solar pumps may find it difficult to gain ground in areas where subsidised electricity is in good supply. But experts say this is a rarity in most parts of the country. They advocate use of solar pumps although they are expensive because the installation cost of the grid is high.

According to the Rajasthan horticulture department, an investment of ₹700 crore in solar pumps can save installation cost of 70,000 farm connections. And farmers can recover the cost of the pump within a year or so. A major reason behind the promotion of solar pumps is poor financial health of state discoms and a long pending list of farm connections. "The hours of power supply are also limited," says Tewari.

In Bihar, however, use of solar pumps may face competition from electric pumps. Last year, the state announced the Bihar Agriculture Road Map under which a separate 1,500 MW power grid will be set up exclusively for agriculture. This makes the state's stand on clean energy confusing.

To make solar pumps successful in agriculture, the government needs to clearly define policies, says Kishore. ■

Lean, mean scheme

Budget to start process of reforming Central rural schemes, 45 years after first demand

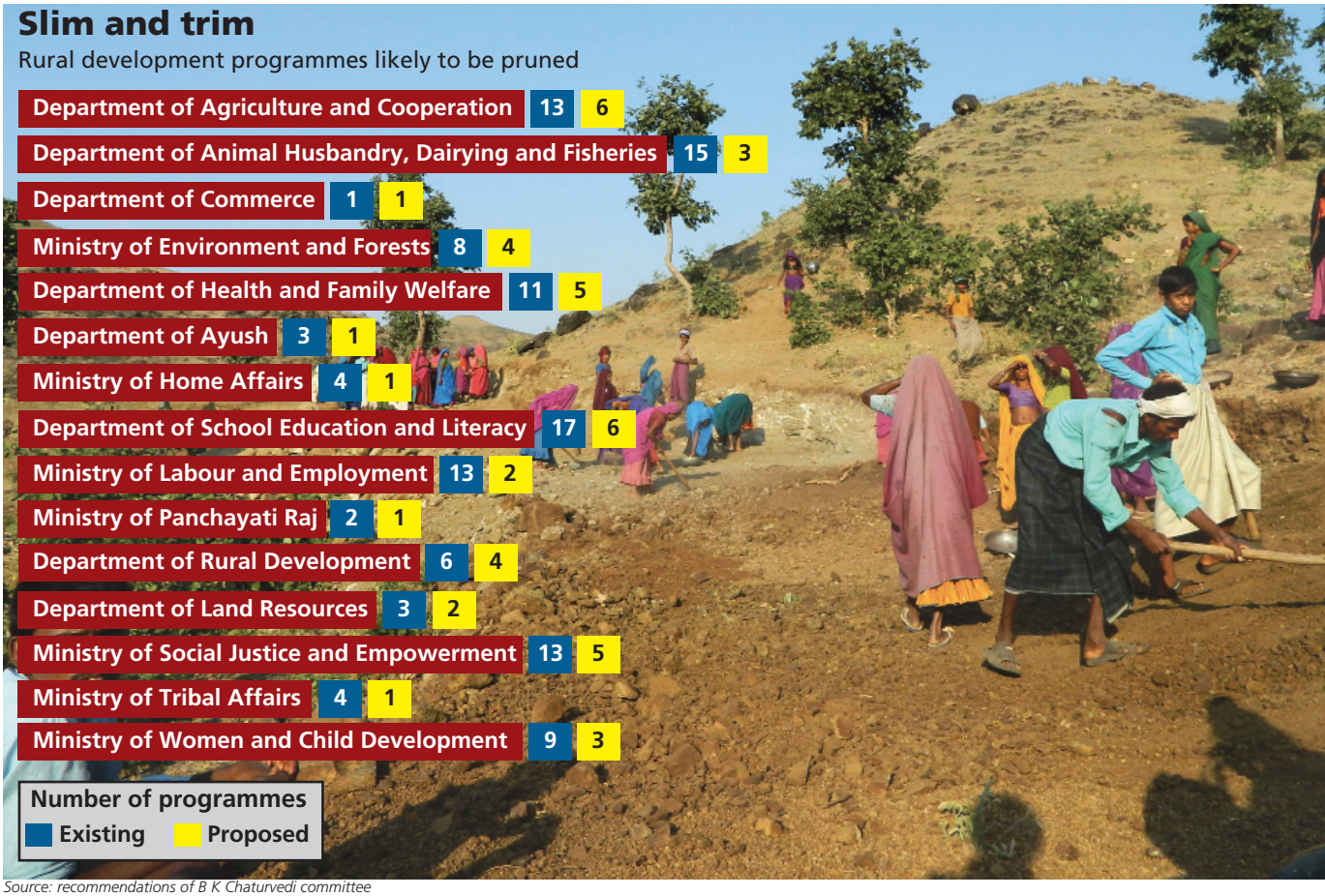
RICHARD MAHAPATRA

India's rural development programmes are in for an overhaul. After the approval of the 12th Plan by the National Development Council (NDC) on December 27, 2012, the government has started restructuring of the behemoth called Centrally sponsored schemes (CSSs). In the Plan (2012-17) the Centre has committed ₹541,276 crore for CSSs covering rural development, the highest ever budgetary support.

The 12th Plan recommends bringing down the number of CSSs and giving states a major say in their implementation. Though such demands have been made consistently in the past 45 years, this is the first time a concrete step has been taken to prune the ever-increasing number of schemes. A revenue-strained Union finance ministry just sniffed an opportunity to bring in some fiscal discipline.

The changes will be reflected in the budget for 2013-14. Going by officials involved in the budget preparation, the government may cut the current 147 schemes to 59. Of the 24 CSSs directly related to rural development, 11 may be retained, including the nine flagship programmes. Last year, a high-level committee headed by B K Chaturvedi, member of the Planning Commission, submitted a report suggesting such changes. The Centre is set to accept another recommendation of the committee: wind up schemes with annual outlay of less than ₹100 crore. Of the six CSSs under the rural development department, four will be retained, while the District Rural Development Agency and the Provision for Urban Amenities in Rural Areas may be done away with.

During the two-year-long consultation for the 12th Plan, it became clear that the money spent on programmes could not bring about much change in the living conditions of rural communities. This was because many schemes were implemented in isolation and did not give importance to local needs. What's more, states, including those ruled by the Congress, have been demanding more say in the way CSSs are implemented, something the Chaturvedi Committee had also suggested.



MOYNA / CSE

Source: recommendations of B K Chaturvedi committee

2011-12: revamp on the way

Rural development programmes have gone through many transitions in the past two years

MAHATMA GANDHI NATIONAL RURAL EMPLOYMENT GUARANTEE ACT

Rules amended in 2012. Due to fall in job demands 30 types of works included to suit local needs

INDEPENDENT EVALUATION OFFICE

An independent body to evaluate rural development programmes to be set up under the Planning Commission. It will replace the current practice of independent experts evaluating programmes in isolation

INTEGRATED CHILD DEVELOPMENT SCHEME (ICDS)

An inter-ministerial group formed in 2012 suggested complete revamp of the world's largest programme for early childhood development. It called for harmonising ICDS with the draft national food security bill and provisions of the high-level expert group on universal health coverage, along with those of B K Chaturvedi Committee

B K CHATURVEDI COMMITTEE TO RESTRUCTURE CENTRALLY SPONSORED SCHEMES

It has suggested drastic pruning of schemes and wants states to have more say in programme design and implementation

AUDIT BY THE COMPTROLLER AND AUDITOR GENERAL (CAG)

CAG has started auditing programmes of the ministries of rural development and drinking water supply and sanitation. In 12 states it has started auditing MGNREGA. All states are required to set up a three-tier vigilance mechanism to curb corruption

DISTRICT RURAL DEVELOPMENT AGENCY

The agency that was created to give professional help in implementation of Central schemes is under scrutiny. A committee set up by the rural development ministry in 2011 has asked for its abolition

According to the 12th Plan, the existing CSSs will be restructured into three categories—flagship, major sub-sectoral and sector umbrella. The flagship schemes will get the maximum support, while the rest two will get funding to the level states find difficult to fund.

In another major reform, and a long pending demand from states, from April this year the Centre will give states some degree of flexibility in managing CSSs. During the NDC meeting, chief ministers pushed for implementation of the Chaturvedi Committee's recommendation to give states some autonomy to design and implement CSS according to state-specific needs. The 12th Plan has agreed to allow states to use up to 20 per cent of all Central scheme funds for projects designed by them. In addition, the rural development ministry has declared it will set up a ₹40,000 crore Rural Development Flexi-fund for states to take up self-designed programmes. The Centre will contribute 70 per cent of this fund; states will shell out the rest.

'We want less'

This is not for the first time NDC has debated pruning CSSs. NDC has discussed it in 14 of its meetings where chief ministers demanded changes in the increasing number of the CSSs, citing intrusion into states' jurisdiction. In 1967, NDC formed a sub-committee on CSSs that recommended reduction in the number of Centre-assisted schemes to a minimum. After two decades, NDC again constituted a committee, headed by the then human resources minister PV Narasimha Rao, which recommended Central schemes not only be minimum but also their scope be limited to subjects having inter-region characters.

The approval of the 12th Plan marks the end of two years of hectic efforts to make expansive and expensive rural development programmes effective (see '2011-12: revamp on the way'). First, the rural employment programme went through a change with amended rules and an expansion of permissible works under the Mahatma Gandhi National Rural Employment Guarantee Act. This also coincided with the government asking the Comptroller and Auditor General (CAG) to audit the programmes of ministries of rural development and drinking water supply and sanitation in the face of widespread corruption cases involving flagship programmes. CAG will audit programmes at the Central, state and panchayat levels. Second, a committee set up by the rural development ministry last year to restructure the District Rural Development Agency (DRDA) recommended its abolition. The committee finds that DRDA is in direct conflict with the Constitutional mandate for panchayats, which are increasingly being assigned the responsibility of implementing rural development programmes.

The much-awaited reforms, however, are still not up to the states' expectations. For the past one decade, they have been demanding cash allocation from the Centre in lieu of CSS. This is because the Centre set the guidelines for the schemes, thus, taking away the autonomy to modify schemes to local needs. Financial flexibility will not address this concern. "The Centre's granting of flexibility is hardly a change. States should design CSSs according to our own needs," said Raman Singh to the media during the NDC meeting in Delhi. Former Jharkhand chief minister says, "The Centre should give us our share instead of designing the schemes. Every state has specific needs and thus a uniform scheme will not work." ■

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SAYANTAN BERA / CSE

Everybody loves waterbody

Amid murder of an activist, 4,000 missing ponds and 195 FIRs on encroachments in East Kolkata Wetlands, West Bengal mulls a wetland policy

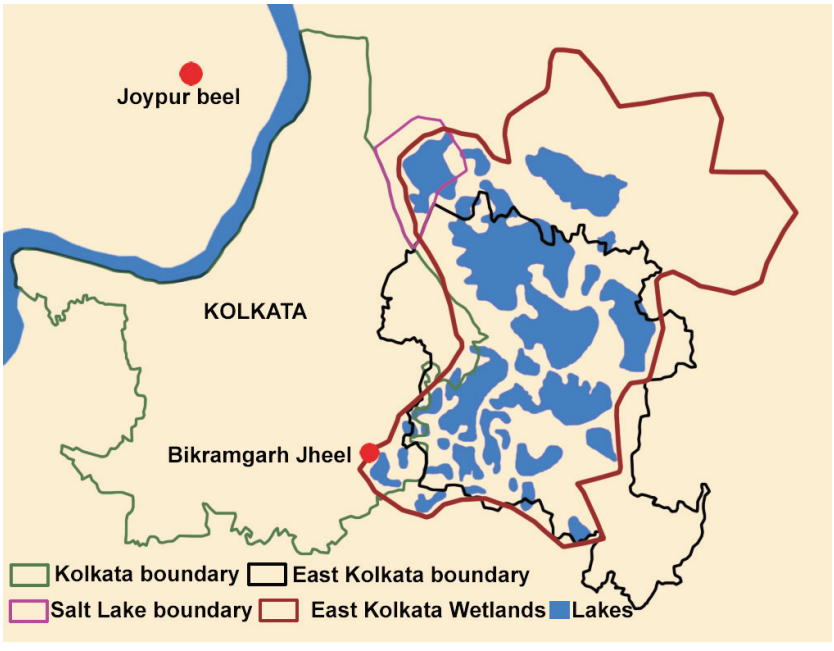
SAYANTAN BERA *Kolkata*

The composure on Pratima Dutta's face defies what she has endured. Rummaging through a pile of photographs, she takes out one where a girl is walking through a lane submerged in rainwater mixed with sewage. The photograph was taken a few years ago by Pratima's husband Tapan Dutta near their house. Tapan had meticulously collected evidence of how a consortium of contractors, Bengal Anmol South City Infrastructure Ltd, was illegally filling a 280-hectare (ha) wetland near Kolkata. Without the Joypur Beel, as the wetland is locally known, the low-lying habitations in Bali will face further submergence, Tapan made people understand. He gathered them, formed Bali-Jagacha Jalabhumi Bachao committee and filed a petition in the Calcutta High Court in 2009. Tapan was offered money and a flat to withdraw the case, but he refused. On May 6, 2011, Tapan was shot nine times. With his death, the petitioners fell silent except Pratima.

On January 14, 2013, the court, in its



COURTESY: EKWMA



(Left) Owing to encroachments, Bikramgarh Jheel in the heart of Kolkata has shrunk from six hectares to three. (Right) East Kolkata Wetlands nurture the largest wastewater-fed aquaculture system

final judgement, allowed construction to continue in the wetland, despite findings by government bodies that the work being carried out is illegal. "It is a big project... cannot be stopped," it said.

In 2011, following the court's instructions, the West Bengal Pollution Control Board (WBPCB) filed an inspection report. The report states: "The entire area (Joypur Beel) appears to be low lying marshland with abundant aquatic vegetation… . The site has been exclusively filled with fly ash." A high power committee, constituted by the high court, that visited the site in 2012 said, "The wetland has been serving major ecological functions for more than 100 years… as a natural reservoir of flood water and recharge (ing) the groundwater." The district land and land reforms department had converted the land status of the project area from wetland on which any construction is illegal to agricultural land where construction can be done. The project is yet to take mandatory clearance from the State Environment Impact Assessment Authority or a consent to establish from the pollution control board, said the committee which was formed following a 2011 petition filed against encroachment on wetlands in the state.

Although the high court has given its final verdict, Pratima has a long battle ahead. In the criminal case of her husband's murder, she has moved high court, seeking a CBI inquiry. The state CID failed to investigate because of involvement of a state Cabinet minister among others, alleges Pratima who, along with her young daughters, lives under constant threats.

A regular offender

South City Infrastructure, a partner in the construction on Joypur Beel, is not new to encroaching on wetlands. Starting 2003, it constructed two 40 storey towers by filling 0.4 ha of Bikramgarh Jheel in the heart of Kolkata.

Witnessing the increase in encroachments, NGO Vasundhara approached WBPCB in January 2006. Three months later, WBPCB formed an independent committee to recommend corrective measures. The committee said two of the four towers be demolished and held IAS officers and WBPCB's chief engineers responsible for giving permission to fill the wetland. The recommendations, however, were not implemented because of "considerable delay". Over the years, Bikramgarh Jheel has reduced from six ha to three. "South City paved the way for more encroachment," says Arjan Basu Roy of Nature Mates. The NGO has reclaimed portions of Bikramgarh Jheel with excavators. Ironically, South City builders and flat owners pitched in with funds.

Owing to encroachments, half of the city's ponds have disappeared, points out Mohit Roy of Vasundhara and author of Old Mirrors: Traditional Ponds of Kolkata. In 2006, the National Atlas and Thematic Mapping Organization published a list of 8,736 ponds within the Kolkata municipal area. "But while mapping on Google earth, I could locate only 4,500 ponds," says Roy.

South City Infrastructure did not give any response on the issue.

Toll on East Kolkata Wetlands

The 12,500 ha East Kolkata Wetlands (EKW) is the only Ramsar site (implying a wetland of international importance) in the state. Managed by statutory body East Kolkata Wetland Management

Authority (EKWMA), EKW acts as the city's kidneys. It consists of 250 sewage-fed fisheries and processes nearly 750 million litres of sewage daily. The treated water is used in aquaculture to produce 15,000 tonnes of fish per year and 150 tonnes of vegetables per day. "The key ecosystem service is provided by an interplay of wastewater, sunshine, algae, fish and the creative intervention of farmers.... as a result of this intervention pathogens within the wastewater get destroyed... the nutrients are entrapped by the algae in presence of abundant sunshine, and finally treated water is released to irrigate paddy fields," writes Dhrubajyoti Ghosh in his book *Ecology and Traditional Wetland practice: lessons from wastewater utilisation in the East Calcutta Wetlands*. Ghosh is the former chief environment officer of West Bengal and an expert on wetlands.

Despite their pivotal role, the wetlands are facing crisis. Since EKWMA's inception in 2006, the authority has filed 195 FIRs and 25 stop-work notices against illegal land conversion and encroachments. On many occasions, the field staff was severely beaten during site inspection, says Bonani Kakkar, NGO member of EKWMA. The encroachments include educational institutes like Bengal Institute of Technology and Heritage Institute.

In August last year, EKWMA filed an FIR on a real estate project, Sabujayan, which is selling 100 plots in 8 ha. "Everyone wants a waterfront house with greenery. The real estate industry is providing exactly that at a steep price; the folly being there will neither be water nor any greenery left in a few years," says a senior officer in the state environment department requesting anonymity.

The Calcutta High Court has allowed construction on wetlands, while its committee recommends restoring them

The Salt Lake municipality and the New Town Kolkata Development Authority, meanwhile, are dumping solid waste in EKW after EKWMA turned down a request for a dumping facility last year. "Without political will, laws are ineffective in stopping the rapidity and rabidity with which wetlands are disappearing," says Ghosh. It was during his tenure that EKW was notified under the Ramsar Convention. Sadly, says Ghosh, the Ramsar Convention has wide gaps, especially when it comes to monitoring infrastructure. For instance, EKWMA has only 16 staff members—all on contract—headed by an IFS officer. The mobility of the staff members is restricted as they only visit the field with police personnel.

A 2010 photo by activist Tapan Dutta shows wetland being filled with fly ash



TAPAN DUTTA

State acts… not

When NGO Forum for Human, Legal and Ecological rights filed a petition against encroachment at the high court in 2011, it resulted in the constitution of the high-power committee to suggest remedial measures. "We wanted the court to act as wetlands were destroyed across West Bengal despite legal provisions. Tapan's death was a wake up call," says Kunal Guha Roy, general secretary of the NGO. Within weeks of its formation, the committee received 27 complaints. It visited Joypur Beel and other wetlands in April last year and submitted recommendations to the state chief secretary in August.

The recommendations, which are yet to be made public, include formation of a state-level management authority for wetland and other waterbodies, since the existing Acts and rules relating to wetland protection vest with different departments. As the records of wetlands are held by multiple authorities (land and land reforms department, fisheries department and municipal authorities), the committee recommends that the state environment department be charged with the assessment of status of any waterbody in case of any inconsistency in the records held by different departments.

Among its other recommendations are a "monthly action taken report" against filling of wetlands from district authorities to be sent to the state-level authority, and preparing a detailed inventory of wetland and waterbodies in every district. In accordance with the Inland fisheries Act, all wetlands illegally filled up in the last five years are to be restored, suggests the high-power committee. In spirit of the Forest Rights Act of 2006, the committee recommends legal entitlements to those dependent on the waterbodies.

A draft state wetlands policy on similar lines was submitted to the state government in July 2012. But nothing has moved since then.

Guha Roy puts it succinctly: "West Bengal was an industrial cemetery for decades and now, real estate has emerged as the frontier sector. There is no political will to unsettle this cash cow." ■



CAN FAITH HEAL?

Billed as the largest gathering of humanity in recorded history, Maha Kumbh has commenced in Allahabad. Over the next few weeks, pilgrims will jostle to take a dip at Sangam—the confluence of two polluted rivers of the country, the Ganga and the Yamuna. **SOMA BASU** reports on its impacts on the Sangam City and villages downstream, while **BHARAT LAL SETH** analyses why the rivers will remain dirty

REUTERS

Sometime in 1895 after visiting Kumbh Mela, Mark Twain wrote: "It is wonderful, the power of faith like that, that can make multitudes upon multitudes of the old and weak and the young and the frail enter without hesitation or complaint upon such incredible journeys and endure the resultant miseries without repining. It is done in love, or it is done in fear, I do not know which it is. No matter what the impulse is, the act borne of it is beyond imagination, marvelous to our kind of people, the cold white." Surely, the American writer was left awestruck by the grandeur of the event. But given the event's size as it is today and associated complexities one wonders whether the centuries-old Hindu festival would still have evoked similar sentiments in him.

Kumbh Mela is held every three years at one of the four locations—Prayag, Haridwar, Nashik and Ujjain—where it is believed that drops from a *kumbh* (pitcher) containing the nectar of immortality were spilled as gods and demons struggled over it. The festival gains special significance at the end of the 12-year cycle. Called Maha Kumbh, it attracts the largest throng: 70 million devotees in 2001 made it the largest gathering in recorded history. This year, 2013, is that 12th year and the festival has begun at Prayag in Allahabad city of Uttar Pradesh. By the time it comes to an end on March 10, a staggering 100 million would have congregated at Sangam—confluence of the Ganga, Yamuna and the mythical Saraswati.

People who flock to Sangam are mostly those propelled by tradition or the urge to seek salvation. Legend has

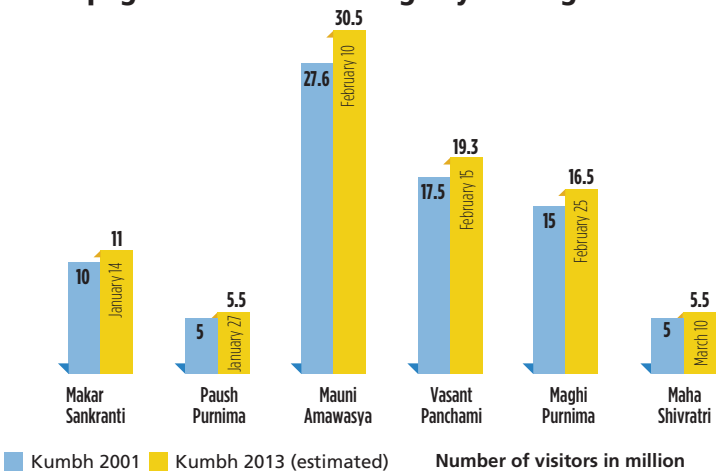
ABOUT 100 MILLION PILGRIMS AND TOURISTS ARE EXPECTED TO ATTEND THE MAHA KUMBH THAT FALLS ONCE IN 12 YEARS

PHOTOGRAPHS: MEETA AHLAWAT / CSE



The first shahi snan of Maha Kumbh attracted 7 million pilgrims and tourists

Number of pilgrims on main bathing days during Maha Kumbh



it that a dip in the holy confluence during Maha Kumbh will wash away sins of lifetime and previous births and help one attain *moksha*, the state of liberation from rebirth and sufferings. Then there are others who are drawn by the desire to witness the spectacular show of faith and experience the power of congregation.

The inaugural day of the 55-day congregation was marked by the first Shahi Snan (royal bath) of 13 *akhada*s, which represent different sects of sadhus. It began much before daybreak, with thousands of Naga sadhus, naked, carrying silver tridents, maces and swords, their faces doused in ash, their matted hair coiled like serpents upon their heads, sprinting into the chilly waters in religious ecstasy. There was a mad frenzy in the national and foreign media, with photographers rushing to get award-winning shots of the Naga sadhus. There were also heavily decked-up chariots, some in silver and gold, winding their way to the Sangam, with hundreds following in procession on foot, beating drums, blowing conch shells and waving saffron flags. It was a unique blend of austerity and opulence.

Water provision

Service/ Infrastructure	Kumbh 2001	Kumbh 2013
Drinking water (in kl)	56,000	80,000
Length of pipelines (km)	340	550
No. of tap connections	15,430	20,000
No. of active tube wells	28	40

Health and sanitation

Service/ Infrastructure	Kumbh 2001	Kumbh 2013
Allopathic hospitals	14	14
Homeopathy hospitals	07	12
Individual toilets	20,481	35,000
Sulabh complex (10-seat)	20	340
Eco-trench toilets	17,100	7,500
Biodigester toilet	0	1,000

Power

Service/ Infrastructure	Kumbh 2001	Kumbh 2013
Power consumed	18 Mva*	30 Mva*
Length of electricity lines (in km)	565	770
No. of street light points	16,865	22,000
No. of private connection	69,489	130,000

*Mva: Megavolt ampere
Source: kumbhmelaallahabad.gov.in

The sadhus reserve the right to take the first dip in the confluence at an astrologically appropriate time. This year it was 5.15 in the morning. Elaborate arrangements were made at the *ghat* (bathing place along rivers) reserved for the sadhus and religious leaders. The fraternity was led by Mahanirvani *akhada* and followed by Niranjani, Anand and Juna *akhadas* among others. A *ghat* was rese-



(Left) The first Shahi Snan attracted 11 million pilgrims and tourists; (below) the authorities have put up hoardings requesting people to keep the Ganga clean



rved for politicians, celebrities and those considered VIP by the administration.

The inaugural day also laid bare how a sacramental congress could be turned into a fanfare of muck and mire, and exposed gaping holes in the arrangements made by the mela authorities for the world's largest gathering of people.

Cleanliness *v* godliness

More than 11 million people who followed the godmen to take the ritual bath had to jostle for space at 34 *ghat*s, extended over a little more than one kilometre. A holy bath was no less than an achievement given that each one got about 13.5 seconds to take a bath, offer prayers and move out.

Ahead of the Maha Kumbh, sadhus had protested over inadequate water in the Ganga. Tirth Maryada Raksha Samiti, a conglomerate of religious organisations, demanded additional water be released to ensure enough clean water for the holy dip. They asked the government to set up a cell to monitor river flow during the gathering. There were also interventions from the Allahabad High Court, which is hearing public interest petitions on the Ganga pollution, and Prime Minister Manmohan Singh who heads the National Ganga Basin Authority. Following the pressure, on December 20, Jawed Usmani, chief secretary of the Uttar Pradesh government directed officials to release 71 cumec (cubic metre per second) of water from Narora barrage in Bulandshahr, from January 1 to February 28. The barrage is more than 500 km upstream of Sangam. The supply will be reduced to 42.6 cumec from March 1 until March 10 since fewer people are expected and only one Shahi Snan would remain. The quality of water at the confluence improved within 10 days. Even then it barely meets the bathing standards.

The monitoring station downstream Sangam shows several parameters of water quality have improved, though they barely meet the standards. For instance, the BOD (biochemical oxygen demands, indicating the amount of organic pollutants in water) was 4mg/l. Water above 3mg/l BOD is not suitable for bathing (see 'A momentary sparkle' on *p*32).

But pollution can be no deterrent for a devotee who must take a sip of the holy water as part of ritual. He must also fill bottles with the Ganga water to carry home as gifts for friends and relatives.

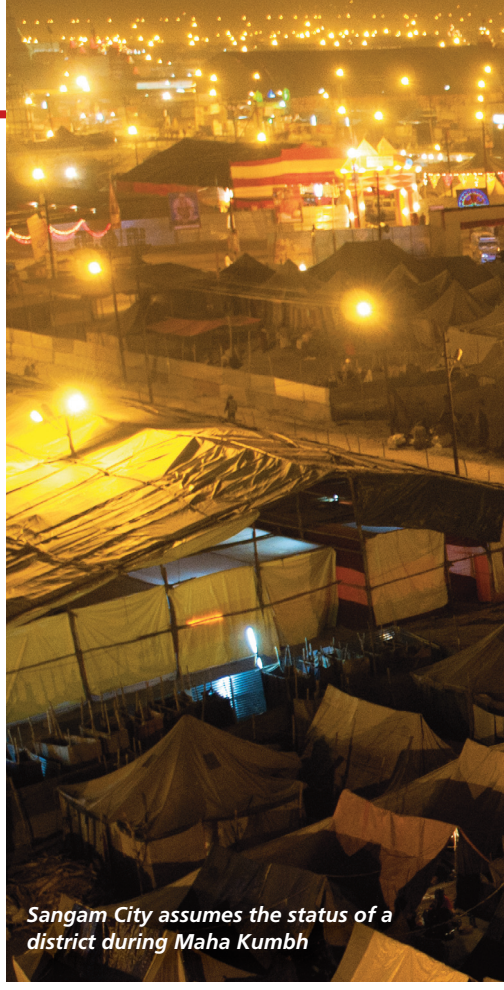
EVEN AFTER RECEIVING WATER FROM NARORA BARRAGE, WATER QUALITY AT SANGAM BARELY MEETS BATHING STANDARDS

"How can the Ganga be dirty?" asked Pinaki Ghosh, a resident of Kolkata. "People store Ganga water in bottles for years but it never smells. Water from any other source, if kept in a container, starts smelling within weeks. There must be a reason to it."

Anshu Patel, a resident of Vadodara in Gujarat, said, "We have read articles about the water being dirty but there are several researches that show the water has healing properties." He escorted his parents for a holy dip at Sangam. Enthusiasm was palpable among devotees and tourists who turned up in record numbers on the day of the first Shahi Snan. The mela authorities say they are anticipating 10 per cent increase in the number of pilgrims from the last Maha Kumbh Mela in 2001. On important bathing days, which include the days of Shahi Snan, their number may go up (see graph on *p*27).

To host them, a vast tent-city has sprung that has been given the status of a district for the mela period. An IAS officer, Mani Prasad Mishra, has been given the charge of managing the festival. The mela authorities have increased the fair area: from 15 sq km divided into 11 sectors in 2001 to 19 sq km and 14 sectors. Tents, hospitals, electricity lines, mobile towers, sanitation facilities, water pipelines, overhead tanks, pontoon bridges and a maze of roads; they have all been set up at a whopping ₹256 crore. The congregation is 80 times bigger than the host city of Allahabad, five times of the country's commercial hub Mumbai and 2.5 times of Tokyo.

Managing such a huge population for nearly two months is no easy task. Apart from the challenge of providing them with basic amenities like food, water, electricity and sanitation facility, there is always the risk of stampede and disease outbreak. A press release issued by the authorities claims that extra arrangements have been made to ensure cleanliness and hygienic atmosphere in the Sangam City to prevent any disease outbreak. But on the first day of the festival, it took only six hours to turn the fair ground, prepared for two months, into a cesspool.

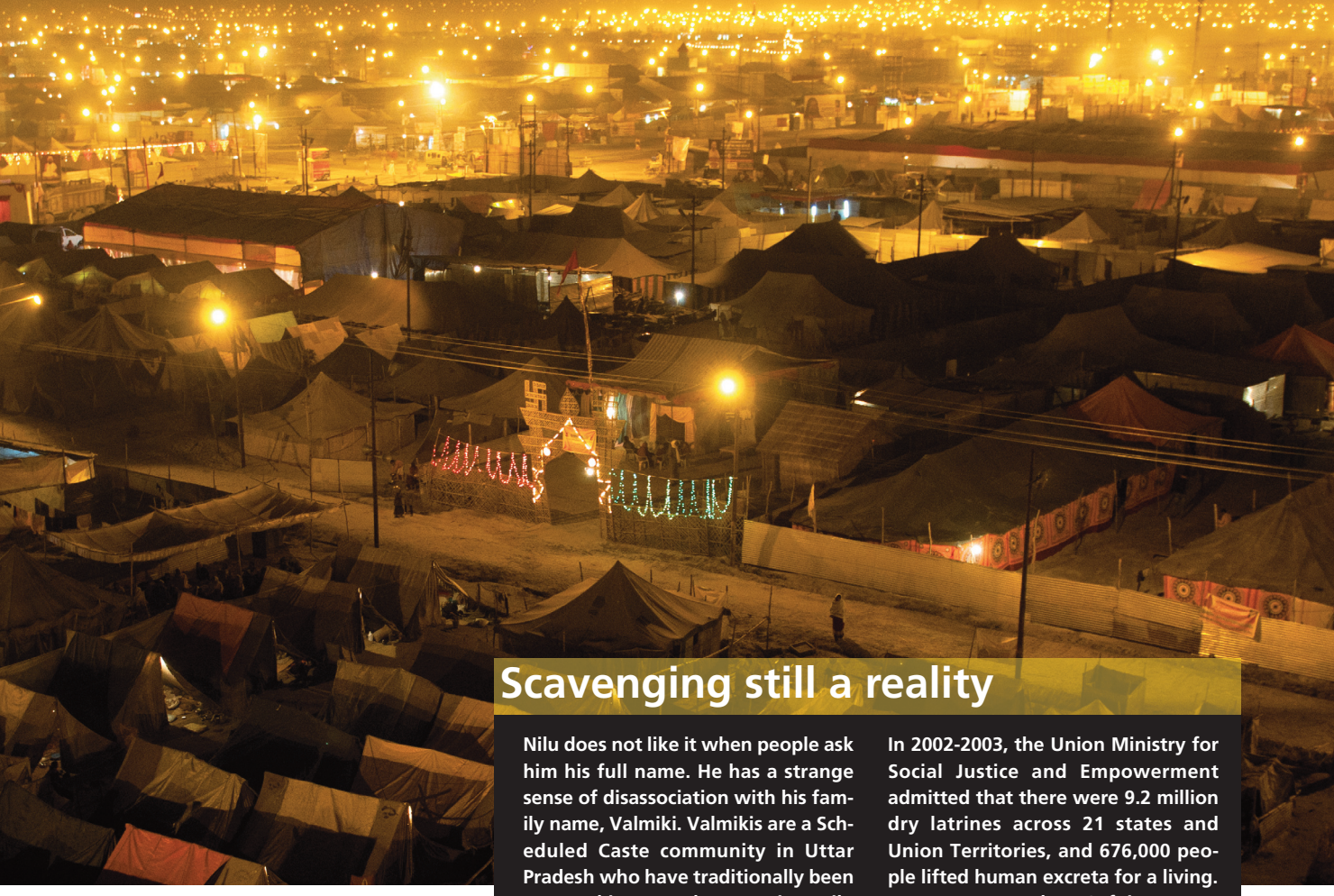


Sangam City assumes the status of a district during Maha Kumbh

Holy ground turns unholy

Soon after paying offerings to the goddess Ganga, the devotees had left their mark in the form of urine, faeces and plastic at the confluence, which was illuminating with sodium lamps till daybreak. Despite a ban, innumerable polythene bags, plastic bottles of *ghee*, honey and even beer cans were seen floating in the river or strewn on the sandbank formed in the middle of the river.

Despite the administration making claims that 10,000 people have been assigned for waste disposal, there were just 50-odd people picking rubbish from *ghat*s after the crowd started dwindling. Officials said they had made pits of one square metre at several places for solid waste disposal. They were too busy with the security arrangements and controlling crowd to prevent people from disposing of waste into the river. Even if



they could prevent waste, what about the flowers, *ghee* and other scented assortments offered to the goddess Ganga? Going by a conservative estimate, even an insignificant 100 g of ritualistic offerings by each of the 11 million people who attended the first day of Maha Kumbh would have resulted in 1,100 tonnes of solid waste. To put it into perspective, Allahabad generates 500 tonnes of solid waste daily.

The state government handout boasted 47,000 toilets, which include 35,000 dry toilets and 7,500 eco-trench toilets where excreta gets collected in a tank and is treated with microbes. About 1,000 biodigester toilets were also promised. Based on technologies developed by the Defence Research and Development Organisation and IIT Kanpur, this toilet employs bacteria to feed on faeces in the biodigester tank and degrade it, and costs ₹8,65,000. But the promised number of biodigesters are yet to be delivered. Till the last week of January the Mela authorities had procured only 78 such toilets. Mishra said the delay in procurement was because the toilet is not manufactured on a large scale. Three biodigesters that *Down To Earth* could spot were locked. Just like 2001, open defecation was widespread.

Scavenging still a reality

Nilu does not like it when people ask him his full name. He has a strange sense of disassociation with his family name, Valmiki. Valmikis are a Scheduled Caste community in Uttar Pradesh who have traditionally been engaged in manual scavenging. Nilu has been lucky during this Kumbh. He is a *meth*, or head of 12 manual scavengers. He doesn't have to scoop out faeces himself. In Kumbh of 2007, he was not so lucky.

The Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act of 1993 prohibits carrying night soil on head and seeks demolition of dry latrines in the country. Following a Supreme Court order to implement the law, Uttar Pradesh had committed to complete conversion of dry latrines into flush ones by March 2011. Yet about 28,000 dry latrines have been built in the Kumbh area. The mela authorities have also recruited 5,000 people to keep these toilets clean, apart from cleaning health clinics and the maze of roads in the mela area. They are set to recruit 5,000 more. Most of these sanitation workers are manual scavengers like Nilu and are from Bhadwari, Majhima, Tandwari and Baveru blocks of Banda district.

Even the census of 2011 had found that the state has about 200,000 dry latrines. Uttar Pradesh is not the only one to violate the Act. In 2002-2003, the Union Ministry for Social Justice and Empowerment admitted that there were 9.2 million dry latrines across 21 states and Union Territories, and 676,000 people lifted human excreta for a living.

However, when Safai Karamchari Andolan filed a petition in the Supreme Court in 2003, most states denied employing scavengers and claimed that most of them had been rehabilitated in alternative professions. But the Maha Kumbh Mela exposes the lie.

During Kumbh of 2007, sanitation workers formed a union and protested against irregular and poor pay. This year, formation of union has been barred. They are being paid ₹156 for working 24 hours and are recruited through agents. They do not have a fixed contract. This is when upper caste people like the Kushwaha and Thakur, who are taking up sanitation works lately, are recruited through Zilla Parishads and are paid ₹15,000 a month for fixed working hours. Valmiks come to the fair with families. Their quarters are on the fringes of the mela area near open drains and water outlets. They do not have toilets for themselves and are not allowed to use toilets made for pilgrims. "We are untouchables. No matter how much the politicians give speech about us, people always call us *chhote log* and treat accordingly," says Nilu.



Bane for farmers

While the godmen were clamouring for release of extra water into the river during Maha Kumbh, water melon planters in the downstream villages were dreading the worst damage of all.

Allahabad's watermelon varieties are known for their sweetness and flavour. They are even exported to Nepal and Bhutan. Over 50,000 farmers depend on the crop in villages of Niva, Begumsarai, Kandhaipur, Kasrauli, Bamrauli, Asrauli, Hatwa, Mohammadpur and Rasulpur Maryadi. They grow the crop on the dry riverbed of the Ganga. Since the Ganga receded far this winter, thousands of farmers have planted watermelon in the reclaimed land. "The irrigation authorities have already released extra water in the Ganga for Shahi Snans. Even if the water level rises a bit, it would flood our plantations," says Md Gazi of Bamrauli, who has planted watermelon on his entire 1.2 hectares field. Besides, he adds, the Ganga has become so polluted that it makes plants wither. Farmers have installed bore wells on the sandbank to irrigate fields.

Md Giyas, a sexagenarian from neighbouring Mohammadpur, says: "When I was young, sick people used to camp near the Ganga for months. They would be healed just by drinking its water. Now, its water is not even suitable for irrigation."

Wastewater treatment tank at the mela ground

By noon, toilets started overflowing and the visitors were greeted with stench from open garbage pits and water holes filled with urine and human excreta. People started using cubicles, made for women to change clothes after bathing, as toilets. Despite a Central law banning manual scavenging, the authorities have employed people for scooping faeces out of dry toilets and sewage pits. But they had to race against time (see 'Scavenging still a reality' on *p*29).

The government claims to have laid 570 km of water pipelines and is providing 80 million litres of water a day (mld) to the pilgrims. But thousands of *kalpwasis* (pilgrims who stay on the riverside in tents for a month and spend their time meditating and performing rituals) complain of water shortage and foul drinking water. Jal Nigam officials admit they are supplying water from deep bore wells without filtration. However, they say, there is enough tap connection to cater to the needs.

But this is a far cry going by the WHO standards, which say a person needs at least 40 litres a day for sustenance. The water provision at the Sangam City works out to be less than two litres per person per day after taking leakage losses into account, or even lesser as sanitary workers use the water to spray on roads for settling dust. With 20,000 tap connections, there is only one tap per 2,000 people in the Sangam City. Pilgrims complain that in several pockets pipelines are yet to be laid. They walk for about three kilometres to fetch drinking water.

This, along with other unsanitary practices, is keeping the medical department busy. Doctors at Main Hospital say they are receiving a large number of patients with stomach ailments. In one of the 14 sectors, about 50 cases of diarrhoea were reported in the first week. There is just 0.1 bed per 10,000 people against the national average of nine, and 0.04 doctor per 10,000 people against the national average of six.

Yet pilgrims feel blissful amid the chaos. "We have been attending Kumbh Melas since 1989. Dirty toilets and cramped *ghat*s do not make much difference to us," says Pradip Agarwal, a resident of Allahabad. "A dip in the river rejuvenates us." Or, is it the power of congregation?

Based on studies of melas on the Ganga, Indian and British researchers have published a paper in peer-reviewed scientific journal PLOS *One* in October 2012. It argues that despite cold weather, endless noise, poor food and risk of disease, devotees who attend such events and participate in collective rites have higher levels of mental and physical wellbeing. Maybe, the study holds the answer to Mark Twain's quest. ■

With inputs from Avikal Somvanshi

Ravi Sankaran Inlaks Fellowship Programme

For Field Biology, Ecology and Conservation



The Inlaks Foundation calls for applications to this Programme, which provides funds for three activities:

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- A short research or implementation project within India

Only activities that have an explicit focus on biodiversity conservation will be considered for this Fellowship Programme.

We are particularly looking for young applicants with bold and unconventional ideas for tackling conservation problems.

The Fellowship will cover course and other fees and a suitable stipend, and, where appropriate, research or implementation funds will be given.

Applicants must be Indian nationals, must demonstrate a deep interest in biodiversity conservation and must hold a Bachelor's or higher degree.

Successful candidates will ordinarily be below the age of 30 on 15th April, 2013.

More details and application forms, will be available on the following websites:

www.ravisankaran.org and www.inlaks.foundation.org

Last Date for Receiving Completed Applications: 15th April 2013

A MOMENTARY SPARKLE

Temporary measures give a facelift to the Ganga during the Maha Kumbh. After March 10, it will be business as usual



The 55-day-long Maha Kumbh has brought the Ganga some relief, though short-lived. Just before daybreak on the first day of the festival, the river was relatively clean and with substantial flow. But this picture of India's longest river will last only till the festival lasts.

To placate the estimated 100 million sadhus, pilgrims and tourists attending the Maha Kumbh, the state government is following a three-pronged strategy to keep the Ganga clean and flowing. In keeping with the order of the Allahabad High Court, which has been monitoring pollution in the Ganga following a public interest petition in 2006, the government is releasing water from upstream reservoirs, treating sewage in Allahabad before releasing it into the river and has curbed effluent discharge from industries upstream.

As a result, the quality of the water at the confluence has improved, says Sanjeev Gogia, founder of Aaxis Nano Technologies. The company, based in Delhi, monitors water quality of the Ganga every 15 minutes at eight places along its course on behalf of the Central Pollution Control Board (see snapshot of monitoring report on *p*33). Data from the state pollution control board shows by 6 pm on the day of Shahi Snan, BOD leveles in the water of the confluence had risen to 7.4 mg/l, up from 4.4 mg/l from the previous day. "This increase is mostly due to mass bathing," says Gogia. "But it is insignificant when compared to the pollution load discharged by industries."

Before reaching the confluence in Allahabad, the Yamuna is the sewage receptacle for several towns and cities, including Delhi, although it is somewhat diluted by tributaries en route. The Ganga travels through several cities and industrial areas, including the leather hub of Kanpur. Every day, it receives approximately 250 million litres of industrial effluents and 1.3 billion litres of partially treated sewage (see map on facing page). At Allahabad, their confluence creates a cocktail of pollutants.

With its sewerage system in a shambles, Allahabad heightens the pollution levels. Water at Sangam has been deemed unfit for bathing since the 1990s.

Holy but without sewer system

Until December 31, 2012, the city had just two sewage treatment plants (STPs) with a capacity of 89 million litres a day (mld). This is about one-third of the sewage the city generates. These STPs were installed under the Centre's Ganga Action Plan, initiated in 1984 to check pollution in the river. Following the intervention of the high court in 2010, five more STPs have been installed. They became functional just before the Maha Kumbh. Getting the administration to meet this deadline was difficult. In 2011 the court observed: "We are constrained to observe the state government, which is the ultimate authority to see that the people of the state are provided unpolluted river water, has been lethargic in taking significant steps to check the menace of tanneries discharge and sewage discharge enter the river untreated."

As of now, these seven STPs are capable of treating 211.5 mld of sewage. Their capacity will be bolstered by 42 mld by June. But given that Allahabad is one of the oldest and populous cities of the country, most areas remain unconnected to the sewerage system (see map on *p*33). "Besides, every now and then, political establishments allow illegal and unauthorised colonies," says L K Gupta, general manager, Ganga pollution control unit of Uttar Pradesh Jal Nigam. "Each year minor drains appear which carry raw sewage from these establishments and release it into the 57 storm water drains across the city that outfall into the Ganga or the Yamuna. On paper, Allahabad generates 240 mld of

sewage but this is far less than the ground reality," he adds. Now with directive from the judiciary, the authorities are mechanically lifting sewage from storm water drains and treating it in STPs. But for this intervention, four of the seven STPs would not receive a drop of sewage. They are running at full capacity as they are intercepting, diverting and pumping the sewage flowing in nearby drains. "We will continue to do this until the yet-to-be-laid sewer lines bring sewage to the STPs," says Gupta, acknowledging that it is a pipe dream.

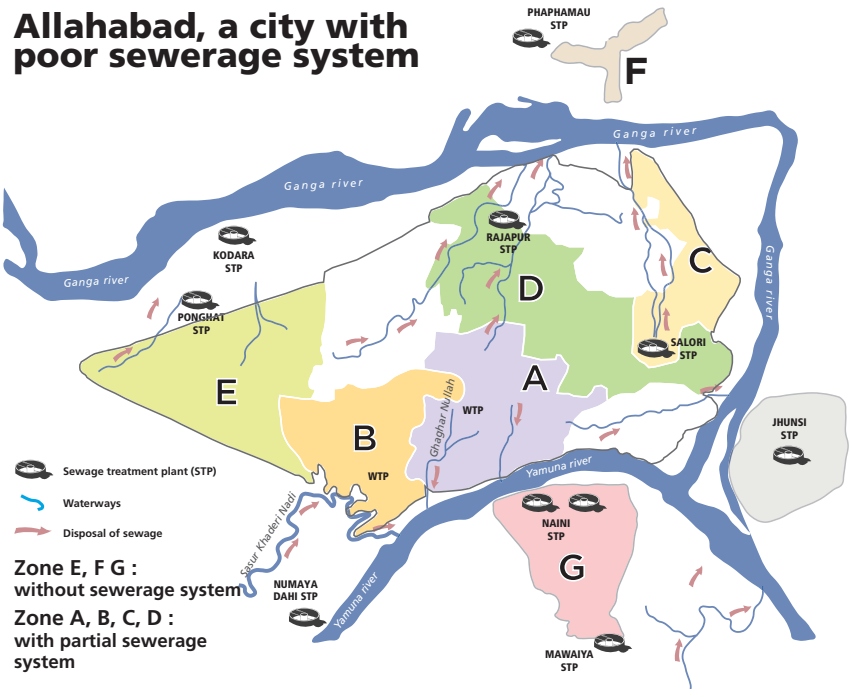
For the 35 untapped drains, the state government gave the go-ahead to employ a bio-remedial technique, which uses microbes to break down the organic matter. A Ghaziabad-based firm has supplied the microbial solution. The authorities admit that the bio-remedial technique is not a proven treatment

TANNERIES IN KANPUR SHUT DOWN FOR THE MELA PERIOD WILL RESUME OPERATIONS AFTER MARCH 10

practice as per the guidelines of the Ministry of Urban Development. Yet, they say, the colour and odour in the drains have reduced markedly, and are expected to meet the prescribed discharge standards after treatment. The technique is likely to be discontinued on March 31, which means come April the 35 storm water drains will once again begin to discharge untreated sewage into the Ganga and the Yamuna. "The state government has sanctioned ₹2.2 crore for the bio-remedial project just for the Mela period," says Gupta.

Ahead of the Maha Kumbh, the Prime Minister's Office also issued a directive to the Uttar Pradesh Pollution Control Board, asking it to ensure that industrial unit "comply with prescribed norms". But making erring industrial units shut down is easier than getting them to comply with norms, say pollution control board officials.

The government decided to shut down all tanning units in the upstream city of Kanpur. On record there were





Water quality of the Ganga downstream of Prayag on January 23

417 tanneries in Kanpur. Over the past two years, the administration has shut down about 100 tanneries as they were not meeting effluent discharge standards. Many, however, continued to function as the pollution control board turned a blind eye to the discharge. Earlier this month the regional officer of the state pollution control board in Kanpur was suspended for not carrying out his duties. The government is playing hard ball, for the moment.

"Since January 10, people come at odd hours to inspect as if we are in the drugs business," says Imran Siddiqui, director of Super Tannery Limited, one of the oldest units in Kanpur. The units will begin functioning on February 14 until 22, remain closed for three days, resume functioning again on February 25 until March 5 and finally resume without restrictions only after March 10, when the Mela ends. Siddiqui says the closure will result in damages up to ₹1,000 crore and affect nearly 100,000 people. "We are being made the scapegoat, while other industries continue to function," he adds.

"The four drains in Kanpur that carry the wastewater of tanneries do not have flow, at least in the day time," affirms Rakesh Jaiswal, founder of

Ecofriends, a Kanpur-based nonprofit that often monitors drains in the city for clandestine discharge. Gogia says the real time monitoring station shows the closure has had a noticeable impact downstream of Kanpur where BOD levels have reduced from 22-25 mg/l to about 6 mg/l in the past month.

The fallacy in such system of curbing pollution is that one cannot shut down a city. Kanpur generates over 400 mld of sewage, of which only 171 mld is treated. The remaining continues to be discharged untreated into the Ganga. The authorities only hope that it gets flushed out or diluted by the extra water released from upstream reservoirs.

Ganga filled half-heartedly

The high court had asked the state government to make sufficient water available at *ghat*s on the days of Shahi Snan, which receive the largest throngs of pilgrims and sadhus. Officials at the irrigation department claim they have been releasing 71 cumec of water from Narora barrage in Bulandshahr since January 1 and will continue to release the amount till February 28. "We will release an additional 11 cumec of water around the six important bathing days," says A K Srivastava, superintending engineer of the state's irrigation department. The flow will be reduced to 43 cumec from March 1 until March 10.

A report by WWF-India in December last year says given the presence of such a large number of people, water must be released during the Kumbh period to maintain the environmental flows at the confluence. To achieve and maintain the desired depth of 0.9-1.2 metres for bathing, environmental flow at the confluence should be in the range of 225 to 310 cumec. The report has been submitted to the Uttar Pradesh government.

This is an ambitious target for planners. In January during non-Kumbh years, water flow of the Ganga is 142 cumec at Allahabad, which is much less than that of the Yamuna when it joins the confluence. "If the Ganga is allowed to flow the way it is flowing during the Maha Kumbh, it will have serious impacts on drinking water and irrigation needs in the upstream catchment," says R K Srivastava, professor at the civil engineering department of Motilal Nehru National Institute of Technology in Allahabad, who has a team studying the environmental impacts of the Kumbh gathering. But the irrigation department did not do any studies to understand how the diversion of water from the Narora barrage for nearly two months would affect the rabi crop in the upstream catchments.

When the festival gets over, the barrage gates will close to hold back the

THE GANGA WILL REMAIN DIRTY

According to the Central Pollution Control Board, of the 12,690 km length of the river (including tributaries, the main stem of the Ganga is a little over 2,500 km in length), 42 per cent is moderately polluted or worse off. Half of the river is not fit for bathing or drinking.

***Excreta Matters*, a report prepared by the Centre for Science and Environment, a New Delhi-based nonprofit, in 2012 shows that the Ganga will remain polluted in spite of the fact that the bulk of treatment facilities in the country have been installed to prevent untreated sewage outfalls in to the river. The Ganga Action Plan, initiated in 1984 was a frontrunner in building treatment facilities, but the sewer lines, pumps and treatment plants fell far short because of the increasing volume of sewage. According to the study, most cities have inadequate sewerage, highly energy intensive collection and treatment systems, and cash strapped urban local bodies which cannot afford the cost of operations and maintenance. They take water from the river, only to return waste. In August 2009, the National Ganga River Basin Authority was formed and the river was given the status of a National River. The difference from the earlier Ganga Action Plan programmes is that the planning would be done on the entire basin of the river.**

A consortium of seven IITs and experts is developing a plan to meet the 2020 objective of not discharging untreated sewage into the Ganga. The plan was to be prepared by last year. There have been delays in receiving data from the government, says mission coordinator Vinod Tare of IIT Kanpur. What the plan will be, how all the capital infrastructure required will be financed, operated and maintained is yet to be seen.

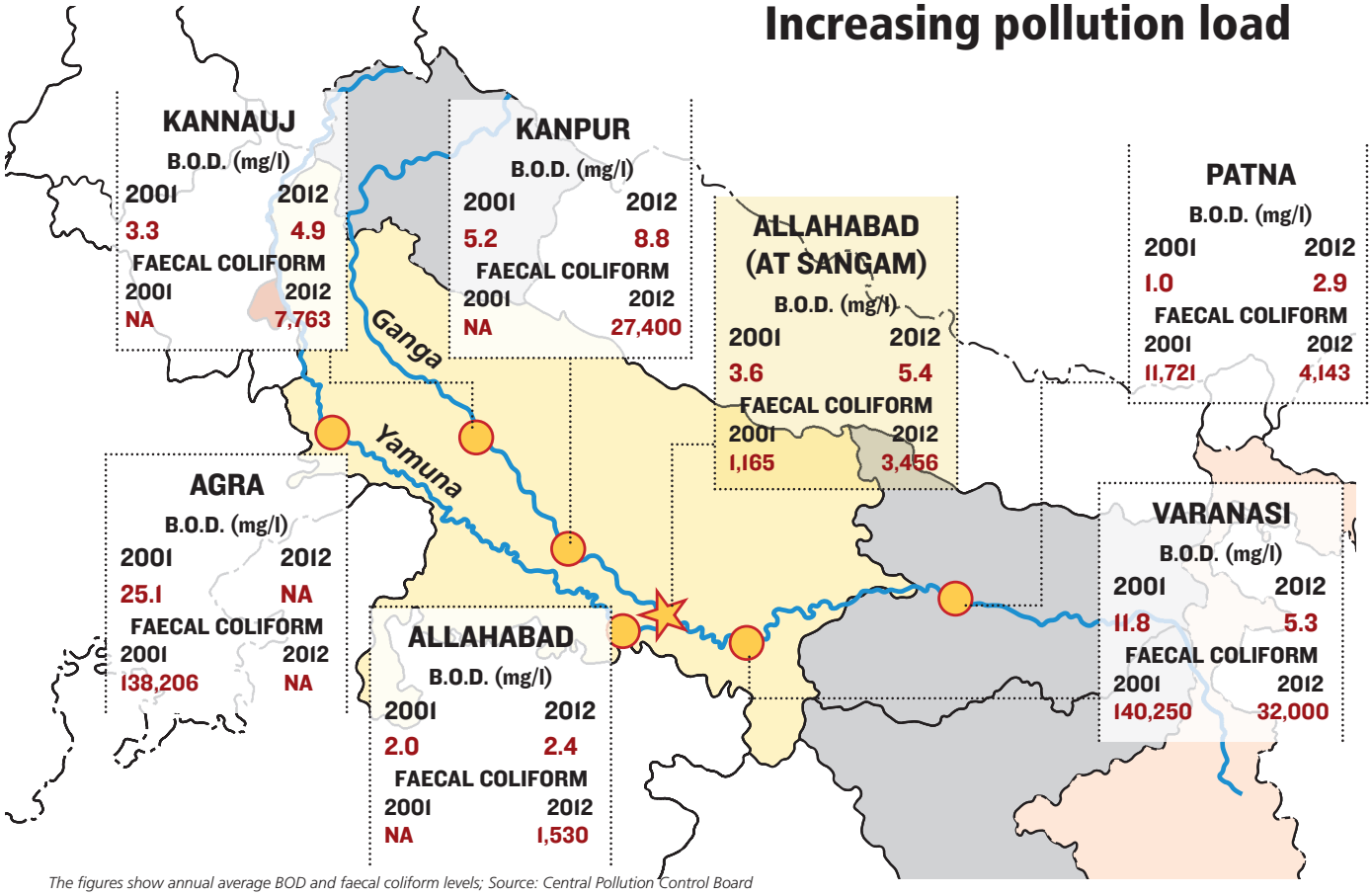
UTTAR PRADESH FACES CHALLENGE

City	Area (in ha)	Area without sewer cover (in ha)
Kanpur	25,810	18,252 (71%)
Allahabad	9,510	7,497 (78%)
Varanasi	10,058	8,432 (84%)

SEWAGE TREATMENT INADEQUATE ALONG THE GANGA

	Class I (179 cities)	Class II (147 cities)	Total
Sewage generation (in mld)	11,387	1,024	12,410
Sewage treatment (in mld)	4,991	79	5,070
Gap (in mld)	6,396	945	7,340

MLD: million litres daily; Source: Central Pollution Contro Board, 2011



The figures show annual average BOD and faecal coliform levels; Source: Central Pollution Control Board

waters, the pollution control boards will turn a blind eye to the discharge, clandestine or otherwise, from tanneries and other industrial units, and cities along the banks will continue to discharge untreated sewage into the Ganga. And the holy river will return to its usual way, sluggish, polluted and neglected.

Sadhus take up the torch

"Pollution in the Ganga is an aesthetic issue for us. However, it is not for those who are dependent on her for irrigation and drinking water," says Sadhvi Bhagwati Saraswati, an American who is associated with Parmarth Niketan Ashram, the largest ashram in Rishikesh, since 1996.

This is the first time the Kumbh gathering is being termed "green" and environment has become the talking point at several religious discourses and among seers and sadhus. "People listen to religious leaders, which is why faith-based environmentalism will work," says Saraswati. "Besides, one cannot talk to the common man in a scholastic way about pollution loads in a river." To keep the Ganga clean during the Mela

FOR THE FIRST TIME ENVIRONMENT HAS BECOME THE TALKING POINT AT RELIGIOUS DISCOURSES

period, Parmarth Niketan Ashram has launched an initiative, the Ganga Action Parivar. Every day sadhus and devotees associated with this Parivar clear out polythene and other rubbish thrown on the riverbank. They are also organising meetings on the riverbank to make people aware of the pollution load in the Ganga and ways to improve its health.

Swami Chidanand Saraswati, head of Paramarth Niketan Ashram, plans to call a meeting, which will be attended by chief ministers of five states through which the Ganga crisscrosses. The meeting will discuss how to maintain the purity of the Ganga.

Several non-profits have also joined the nascent movement of faith-based environmentalism. "It was during the Kumbh of 2007 that I got the idea of spreading awareness of cleanliness, hygiene and pollution among a vast gathering," says Kusum Vyas, president of Living Planet Foundation, a non-profit based in the US.

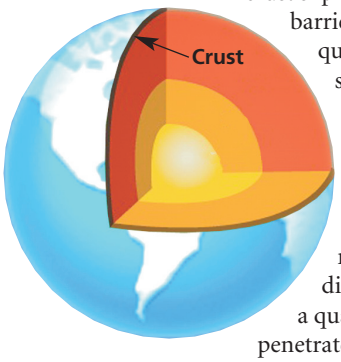
Some, however, are not as convinced of this approach. "Green political thought is good but we cannot expect much improvement given the population increase and model of growth we have adopted," says M P Dube, dean of the faculty of arts and social sciences at Allahabad University.

The Sangam City itself is a classic example of this contemporary society, where a pop-up mega city is constructed and deconstructed within a matter of weeks. Maha Kumbh is no Olympics, which leaves behind a legacy of infrastructure. Come March 10, the tents, stalls, offices, *ghat*s and pontoon bridges will be dismantled. The 100 million people will leave behind a mountain of waste, excreta and plastics for the residents of the host city and downstream villages to deal with, for long. ■

GEOLOGY

Fault finding

"Stable" zones of the earth's crust might not be so stable. These zones are more likely to cause massive earthquakes. It was thought that "stable" zones, where fault segments of the crust slip slowly, act as barriers to earthquakes and fast-slipping faults trigger them. But it has now been found that the stable segments behave differently when a quake rupture penetrates them. Instead of arresting the rupture as expected, they can actually join in and make the quake larger. This is how the magnitude 9.0 earthquake might have occurred in Japan in 2011, triggering the devastating tsunami. The finding can help identify earthquake-prone regions better. *Nature, January 9 (online)*




UCLA

HEALTH SCIENCES

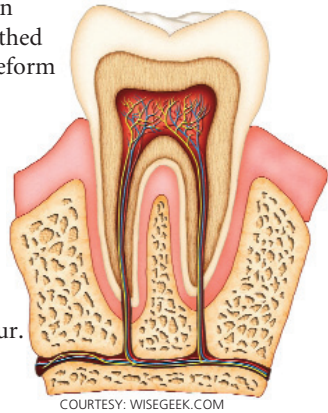
Toxin in the brain

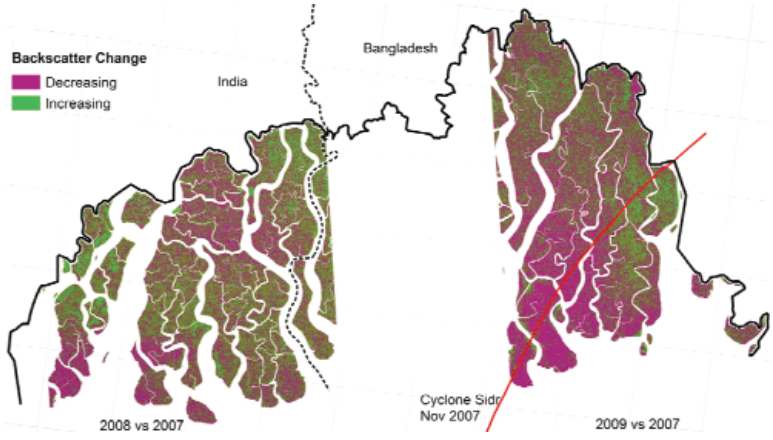
Pesticides' link to Parkinson's disease has been reconfirmed. Benomyl, a fungicide banned in the US 10 years ago, has been found to block a vital enzyme that prevents a naturally occurring toxin, known as DOPAL, from accumulating in the brain. This damages the neurons in the brain, increasing Parkinson's risk. Those who lived or worked within 500 metres of farms where benomyl had once been used have been found to have a 200 per cent higher chance of getting the disease. The study can help understand the mechanisms of Parkinson's onset better. *PNAS, January 8*

MATERIAL SCIENCES

Mussel strength

Three out of every four people across the globe suffer from teeth sensitivity. Dopamine, the natural glue produced by mussels for sticking to surfaces, can help cure the problem. The condition occurs when the hard enamel and underlying softer dentine of a tooth wear away, exposing the nerves inside. It has been observed that cracked dentin and enamel get repaired if damaged teeth are kept bathed in sticky polydopamine and minerals for a week. In contrast, teeth bathed just in minerals reform only enamel. The sticky substance works by keeping minerals in close contact with dentin and enamel long enough for the rebuilding to occur. *ACS Applied Materials & Interfaces, December 26*


COURTESY: WISEGEEK.COM



Recent habitat degradation in the Sundarbans

ENVIRONMENTAL SCIENCES

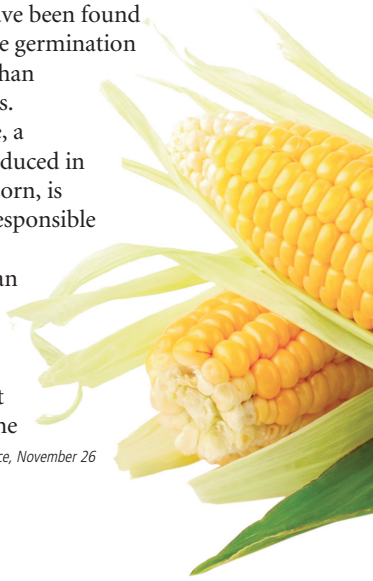
Mangroves losing ground

Sundarbans are disappearing fast. Using radar imagery, scientists have quantified the impacts of cyclone Sidr, human activities and climate change on the world's largest contiguous mangrove forests. They have found that rapid deterioration in the mangrove health is causing as much as 200 metres of the coastal forests to disappear annually at places. The Sundarbans protect coastal areas from tidal waves and cyclones and are among the most carbon-rich forests in the tropics. They are home to nearly 500 species of reptiles, fish, birds and mammals, including the endangered Royal Bengal Tiger. *Remote Sensing, January 11*

AGRICULTURAL SCIENCES

Corn trap

A hybrid variety of corn can help farmers get rid of sunflower broomrape, a weed that causes extensive damage and can reduce yields from sunflower fields to half. The hybrid can act as a trap crop for the weed. It induces germination of the weed's seed but does not allow the plant to develop and survive, thus causing "suicidal germination" in the parasite. Root extracts from corn have been found to cause more germination in the weed than shoot extracts. Strigolactone, a chemical produced in the roots of corn, is most likely responsible for this. This knowledge can help breed corn hybrids that are even better at controlling the weed. *Crop Science, November 26*



TECHNOLOGY

Bright idea



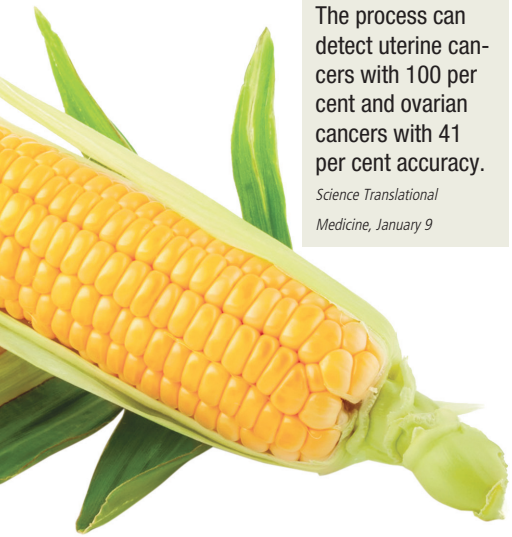
BRUCE MARLIN

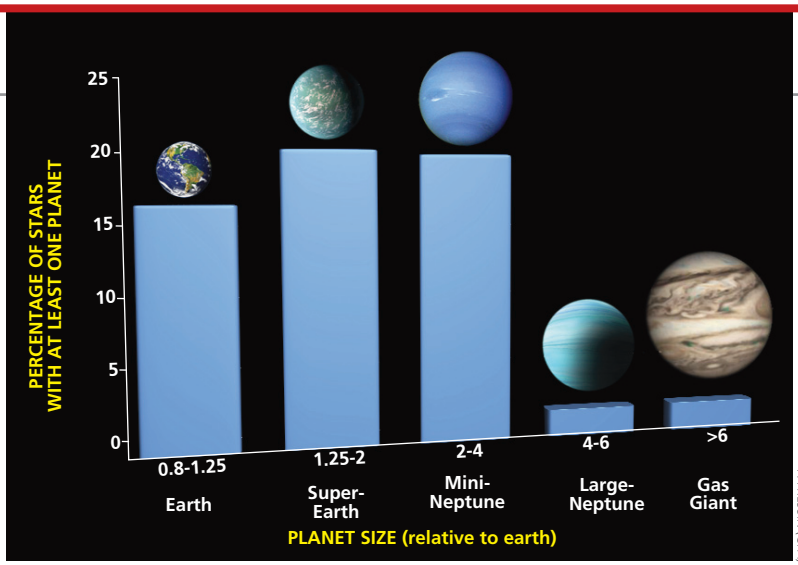
Fireflies have helped make LEDs brighter. Scientists have taken cue from the insects to make the light-emitting diodes up to 55 per cent more efficient. The jagged design of the scales on a firefly's lantern, the organ that flashes to attract mates, maximises the light output by minimising the amount of light that gets reflected inside the insect's body. When a similar five micrometres high saw-tooth pattern was created on the coatings of an LED bulb using a laser, the bulb showed very low internal reflection and was able to emit several times more light than it normally does, using the same amount of energy. *Optics Express, January 14*

HEALTH SCIENCES

One test does it all

Pap smear—the test for cervical cancer—can also help detect ovarian and uterine cancers. The cervical fluid collected for the test contains cells shed from ovaries and the lining of the uterus. Therefore, cancer cells from these organs would also be present in the fluid. Gene sequencing can be used to screen this fluid for genetic changes found only in uterine and ovarian tumours. The process can detect uterine cancers with 100 per cent and ovarian cancers with 41 per cent accuracy. *Science Translational Medicine, January 9*





F. FRESSIN (CFA)

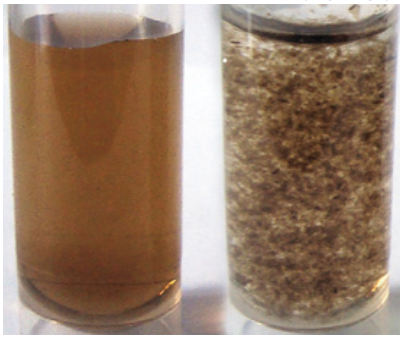
What is the size of the planets in the Milky Way?

ASTROPHYSICS

We are not alone

Milky Way has at least 17 billion Earth-sized planets. Data from NASA's Kepler spacecraft, launched in March 2009, and other planet detection techniques has shown that practically all Sun-like stars have planets. Now, a simulation based on Kepler's observations has shown that 17 per cent of these stars have a planet up to 1.25 times the size of Earth. Since there are 100 billion or so stars in our galaxy, there must be at least 17 billion Earth-size planets orbiting these stars. Kepler detects alien worlds by noting the dip in a star's brightness when a planet crosses it. *Presented at the Meeting of the American Astronomical Society, January 7*

ANNA YU. ROMANCHUK



MATERIAL SCIENCES

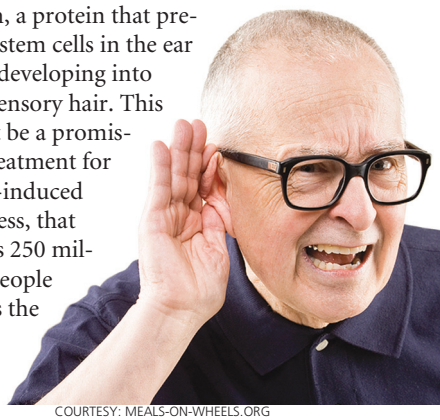
Nuclear mop

Usefulness of graphene, the one-atom-thick sheet of pure carbon, never seems to end. The wonder material has been found to be good at soaking up radioactive waste from water. When particles of graphene oxide are added to water containing nuclear waste, it makes the radioactive material condense into lumps within minutes. These lumps can easily be skimmed from the water and burnt off leaving a cake of radioactive material that can be reused or disposed of. *Physical Chemistry Chemical Physics, December 20*

BIOLOGY

Deaf no more

There is hope for those suffering from permanent deafness. It has been found that a drug can make deaf mice re-grow damaged sound sensing hair cells in the inner ear. These hair are vital for carrying sound vibrations from eardrum to the brain. Birds and fish can regenerate these cells but in mammals the damage was considered to be irreversible. But the new drug works by suppressing the expression of Notch, a protein that prevents stem cells in the ear from developing into new sensory hair. This might be a promising treatment for noise-induced deafness, that affects 250 million people across the globe. *Neuron, January 9*



COURTESY: MEALS-ON-WHEELS.ORG

HEALTH AND MEDICINE: *drug development*

Crude and wholesome

Whole plant of sweet wormwood more effective than its extract in treating malaria

INDU MATHI S

DRUG after drug has failed to control malaria, which kills and incapacitates millions in the developing world each year. A drug, artemisinin, derived from sweet wormwood (*Artemisia annua)*, remains most effective against cerebral malaria, as the malarial parasite becomes resistant to most available treatments. But it is expensive and is frequently in short supply. A study has now shown that the powder of the whole plant is far more effective in treating malaria than artemisinin extract obtained from it. The powder delivers 40 times more drug to the blood than purified artemisinin and can provide a better and cheaper strategy to fight malaria.

The disease killed an estimated 660,000 people in 2010, according to WHO data. With an estimated 24 million cases per year, India has the highest malaria burden in South East Asia. Of all the four species of the malarial parasite, *Plasmodium falciparum* is the deadliest. It is now resistant to all commonly available drugs like chloroquine and quinine. There is recent evidence that it is turning resistant to artemisinin, the last remaining drug, too, in Cambodia, Myanmar, Thailand and Vietnam. And no alternative antimalarial medicines would be available for at least five years to come, warns WHO. It advises the chemical be used in combination with other drugs to avoid resistance.



In this scenario, the study by scientists from the Worcester Polytechnic Institute and the University of Massachusetts in the US, has come as a relief. Published on December 20, 2012 in *PLOS ONE,* the authors state in the study, "We have found that a single dose of whole plant powder (containing 24 mg artemisinin/kg of plant weight) reduces the number of parasites in the blood of mice more effectively than a comparable dose of purified drug."

Sweet wormwood is classified as "generally regarded as safe" herb. Its leaves find extensive use in Chinese medicine and are brewed to make a tea for treating malaria and fever in many countries. "*Artemisia* can be grown readily in most climates. It is a relatively simple process to harvest the leaves, pulverize them, test samples for their potency, measure out doses, and put them in capsules," says Pamela Weathers, co-author of the study.

Stephen Rich, the corresponding author of the study, says in Western medicine, there is a strong tradition of using purified or single-component drugs to treat diseases but in practice purified drugs do not always work. It's same as trying to isolate anti-oxidants from fruits.

"To get the benefits of anti-oxidants in blueberries, one has to eat blueberries. There simply is no effective blueberry extract," says Rich. He attributes this to interactions between active ingredients and complex chemical entities present in blueberries, which make the active ingredients available to the body. "Our whole-plant *Artemisia* treatment is much like the blueberry example. We've proven that the whole plant kills parasites better than purified drug from the same plant," he says.

Weathers attributes the effectiveness of the whole-plant treatment to the presence of other compounds in the plant, like flavonoids, with antimalarial abilities. Artemisinin, along with these compounds, creates a combination therapy that wards off the disease.

Commenting on the study, Thangam Menon, head of the department of microbiology at the University of Madras, says, "Traditional medicine uses crude preparations in cases where the effect is due to a combined action of more than one compound. Such an effect cannot be obtained with a pure preparation of a single compound." ■

Leaves of sweet wormwood have been used to cure fever since ages



YORK UNIVERSITY

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SCIENCE CONGRESS: *research directions*

Catching them young

Every year, the Indian Science Congress Association awards young scientists of the country. *Down To Earth* spoke to some of the winners about their work and how it can shape the country's future



KOUSHIK CHAKRABORTY
Plant Physiologist at Directorate of Groundnut Research, Junagadh

Salt-resistant oilseeds

Major oilseed growing areas in the country, like north-western plains in Punjab, Haryana, Rajastan and Gujarat, have a soil with very high salinity.

My work involves identification of salinity tolerance mechanism in oilseeds and would help breed newer varieties tolerant to salinity. Such stress-tolerant varieties could be introduced in the coastal areas of our country and help increase total oilseed production.

Though India is an agro-based country, having the largest cultivable area in the world, as much as 8 million hectares of its land is affected by salinity and sodicity (a disproportionately high concentration of elemental sodium). And such areas are increasing. High rate of evaporation and transpiration, use of salt-contaminated water for irrigation and characteristics of some of the parent rock material from where the soil has originated mainly contribute to soil salinity in arable land.

Although India ranks second in groundnut and mustard production, it is still not sufficient to meet our daily edible oil requirement. Hence, India has to import edible oil.

We urgently need to increase both the production and productivity of oilseed crops.



PARIJAT ROY
National Geophysical Research Institute, Hyderabad

Tracers to study Earth

My research work is mainly focused on understanding the earth's processes, using geochemistry as a tool. Platinum group elements are powerful geochemical tracers to understand these processes, therefore, demand for these precious metals is high. Research in this field is limited in India as these elements are not mined in the country. I hope our research, coupled with modern analytical technologies, would help us explore hidden resources of these precious metals to fulfil their demand.



AKALESH KUMAR VERMA
North Eastern Hill University, Shillong

Anti-cancer drug from beetles

My work is on the ethno-zoological practices of the traditional healers of Karbi Anglong district in Assam, India. I have isolated a potent anti-cancer drug, cantharidin, from two different blister beetle species, *Mylabris cichorii* and *Epicauta hirticornis*. The decision of including *M cichorii* and *E hirticornis* in our study was based on the information collected from the traditional healers. They use it to treat many diseases, including suspected cancer cases.

We have developed a simple and first-of-its-kind method for isolation of cantharidin from these beetles. For our study, we crystallised the compound and performed its structural analysis. We have deposited the crystallographic data with the Cambridge Crystallographic Data Center, an online database of the crystal information of drugs.

Based on the findings from the present study, cantharidin could effectively inhibit cell growth due to Dalton's ascites lymphoma cell proliferation in several ways. However, the effect of cantharidin on human cancers needs to be examined further to ascertain if it could be used alone or in combination with other drugs. There is also a need for studies on the specific drug delivery system for cantharidin so as to reduce its toxic effects, if any, on the host.



DIVYA SHARMA
Indian Agricultural Research Institute, New Delhi

Degradation of persistent toxins

I have worked on the microbial degradation of a persistent compound in the soil. To achieve enhanced degradation of the compound we used a biosurfactant-producing microorganism in consortia and have found that the organism worked well.



AMIT MISHRA
Faculty member at Indian Institute of Technology, Jodhpur

ures for neurological disorders

Synthesis and folding of proteins is the main quality control process that governs long-term health of a cell. Accumulation of misfolded proteins inside or outside of cells represents a clinical hallmark in neurodegenerative diseases such as Parkinson's, Alzheimer's and Huntington's disease.

For efficient quality control, cells always try to refold proteins prior to their degradation. How a cell recognises an abnormality in cellular proteins for their selective clearance from the crowded cellular environment remains poorly understood.

We have studied the detailed molecular mechanism of how certain proteins involved in quality control mechanism play a significant role in causing these diseases. Our work may help develop markers for these diseases and provide new lines of treatment for neurodegenerative disorders.



ARVINDER SINGH
Indian Institute of Technology, Kharagpur

Energy storage material

India would become the third largest energy consumer in the world by 2030. With an increasing energy need and fast depleting fossil fuel reserves, India would have to switch towards renewable energy sources like solar, wind, bio and geothermal.

The solution seems easy but large scale implementation is hampered by the intrinsic intermittent nature and high cost of renewable energy-based technologies. Consequently, any future energy landscape would have energy storage systems as an intrinsic component. Such storage technologies will help in load leveling while ensuring continuity in energy supply.

I am currently focusing on one such energy storage technology known as "supercapacitor". My aim is to develop highly efficient, reproducible and low-cost electrode materials for supercapacitors. These low cost and locally fabricated supercapacitors would become cheaper alternatives to already existing energy storage devices that form an integral part of the renewable energy-based technologies.



MALLAMMA V REDDY
Bangalore University, Bengaluru

Computer-based translation

According to the Eighth Schedule of the Constitution of India, the country has 22 officially recognised languages as of May 2008. The Indian census of 1961 recognised 1,652 different languages in the country (including languages not native to the subcontinent). The 1991 census recognises 1,576 classified "mother tongues' in India. In the age of Internet, this multiplicity of languages makes it necessary to have sophisticated Machine Translation Systems.

My work is based on the human or natural language processing, particularly for machine translation. This could help a person communicate easily in any part of the country without knowing the native language. The project can also help researchers efficiently and accurately understand information and studies available in languages different from theirs.

Natural Language Processing (NLP) is a field of computer science, artificial intelligence and linguistics concerned with interactions between computer and human or natural languages. Specifically, it is the process of a computer extracting meaningful information from human language input and/or producing human language output. The major task in NLP is machine translation, the process of automatically translating text from one human language to another.



ABHILASH
National Metallurgical Laboratory, Jamshedpur

Uranium extraction technology

Our work is focused on providing an alternative economically feasible and environment-friendly process for extracting uranium from low-grade ores. India plans to significantly increase the contribution of nuclear energy in electricity generation from a meagre 4 per cent at present by 2020. This would require more fuel, but that would mostly be imported as per the US-India Civil Nuclear Agreement. India is well endowed with uranium resources; it is of low grade (<0.024 per cent uranium content) but can be tactfully exploited. Current methods of extraction cannot extract the metal from such low tenor ore.

Based on our 10 years' experience in biohydrometallurgy and past five years' experience on uranium bioleaching, we have developed a process that uses such low tenor ore in a bioreactor to improve the rate of leaching. In this process, a combination of bacteria and bio-generated ferric ions fastens the slow bioleaching rate. This can enhance the uranium extraction yield to 90 per cent in 10 hours for such unusable raw materials. The work needs immense scale up trials on reactors and heaps (we have successfully conducted trials in 2 tonne columns), for commercial use. The work has the capability to put India on the path of self sustainability in the nuclear power sector.

ZOOLOGY: *fisheries*

Fisheye view

Complex interplay of several factors decides fisheries' fate



NBORUN

IT MAKES sense to fish when their numbers are high. Fishing targets are based on abundance of fish stocks and are the mainstay of most management plans in the US and a growing number of other countries. It is thought that if a stock reaches a certain abundance the potential harvest would be maximised.

But fish stocks fluctuate both in abundance (indicating high numbers) and productivity (the stock's ability to increase in population). While productivity can increase or decrease due to changes in abundance caused by fishing, there are also examples where changes in productivity are entirely unrelated to abundance. Researchers from the US and Argentina used a database of trends in harvest and abundance of 230 fish stocks to find the proportion of fish stocks in which productivity is primarily related to abundance.

The results show that potential harvest of fish is closely linked to abundance only in 18 per cent of the stocks assessed. For the other 82 per cent stocks, potential harvest was primarily controlled by irregular shifts in environmental conditions or was random and not controlled by either abundance or environmental factors.

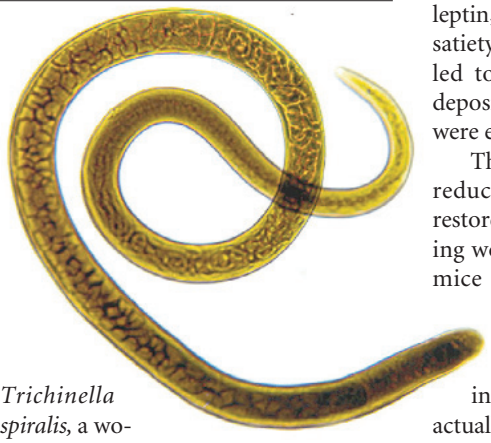
"We can think of fisheries like natural savings accounts, where we're trying to harvest the interest—what fisheries scientists call the 'surplus production'—without causing a long-term decline in the principal or abundance of mature adult fish. Scientists have generally operated under the assumption that the 'interest' is determined by the abundance of mature adults," says the study co-author Olaf Jensen of Rutgers University. "Our research shows that this is rarely the case. Instead of operating like a simple savings accounts, fisheries are more like volatile stocks where the rate of return is determined by a variety of complex factors outside the control of managers," Jensen said.

In many cases natural causes are the reason stocks are in low abundance, rather than overfishing, although fishing will cause even lower abundance in such cases. "Improved methods for early detection of such shifts may permit fishery managers to reduce harvest in time to avoid collapse," write the authors in the study published online on January 14 in *Proceedings of the National Academy of Sciences.* ■

HEALTH SCIENCES: *parasite control*

Worm wipeout

Controlling diet can help children get rid of intestinal worms



Trichinella spiralis, a worm that first inhabits the small intestine but later moves to skeletal muscles and causes inflammation in both the places.

MOST children suffer from worm infections in their intestines sometime or the other. Such infections cause low appetite and weight loss, making their parents overfeed them. If studies on mice are any indicator, it would be better to starve the kids a little to get rid of the worms than overfeed them.

One problem linked to worm infection is that the mechanisms behind weight loss are not understood. How feeding affects the whole process is also not clear. A study tries to answer this. The researchers infected mice with

The researchers found that in response to both intestinal and muscular phases of infection, the mice's immune system was making the body release a leptin, a hormone that causes a feeling of satiety. This made the mice eat less and led to a reduction in weight and fat deposits. Due to weight loss, the worms were expelled from the mice's body.

The researchers then tried to find if reduction in fat was beneficial. They restored the leptin levels of the mice during worm infection and found that the mice could not make the correct immune response to the parasite in this case. This resulted in a delayed worm expulsion suggesting that the reduction in fat deposits actually helps the mice expel the parasite from the intestine.

"Our study provides novel insights into how the immune system interacts with feeding pathways during intestinal inflammation," say the researchers in the study published on January 17 in *PLOS Pathogens.* ■

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Lighting up hearts

A hospital for cardiac patients in Ahmedabad is sunlit to cheer up patients. It saves energy, too

ANUPAM CHAKRAVARTTY

Hospitals are difficult to design. There are far too many health safety concerns that must not be ignored and very high hygiene standards to be adhered to. Architects, therefore, rarely choose to construct hospitals as eco-sensitive buildings, says senior architect Ashok B Lall. The Care Institute of Medical Sciences (CIMS) building at Ahmedabad has achieved this feat of integrating eco-sensitive elements of design into the building without compromising on the hospital's standards. The 150-bed hospital was inaugurated in July 2010. It has three floors, a basement, eight operation theatres and two catheterisation laboratories.

Architect Surya Kakani built the 10,000 sq m CIMS where patients could feel at home and get ample movement and breathing space. He brought natural light inside the hospital's grimmest areas—the ICU and the operation theatre. The building has a thick and tough outer shell yet soft insides, says Kakani.

Sunlit insides

Drawing inspiration from traditional courtyards, each of the four blocks in the building stand independently and are connected with courtyards. "Open spaces were either used to plant locally available tree species or turned into courtyards. This allows entry of natural light and cuts down electricity consumption," says Kakani.

Natural light has a calming affect and the green environment lifts spirits up, says a patient in the hospital's ICU. "In operation theatres it is difficult to keep track of time. Entry of natural light is very helpful here," says anesthetist Ketul Patel. "Eighty per cent of the patients in this super-specialty hospital have cardiac problems. They need natural light, seamless services with less congested environment for fast recovery," says cardiologist Milan Chag. "All these have been well thought out," he says.

To give more movement space in the hospital, services such as cables, gas pipes and plumbing occupy once common duct. Minimising service area space reduces false ceiling area and thus cost. It also gives 3.6 m clear height of the rooms, and, therefore, better air quality to patients.

The wardrooms have been plastered with washable smooth lime to reduce the risk from volatile organic

An open courtyard outside the hospital's OPD reduces need for artificial lights



PHOTOGRAPHS: ANUPAM CHAKRAVARTTY / CSE

compounds in paints. They can cause allergies and affect kidneys and the nervous system.

Taking off the load

Four years ago, a group of doctors, mostly established cardiologists, approached Kakani to construct an eco-sensitive building. He chose to use the largely forgotten load-bearing technique rather than the much-too-prevalent RCC (reinforced cement concrete) structure. RCC structures have steel bars for tensile strength and concrete for compressive strength in the beams and columns of buildings. The walls cover the building like a curtain. Load-bearing structures use building blocks such as bricks or stones. The walls are the primary means of transferring the building's load to the ground.

Such structures cut down energy consumption and provide better insulation because of minimum use of steel, which has high embodied energy. Embodied energy is the total energy used in making a construction material. The walls are made primarily of flyash bricks. Flyash used to make bricks come from refuse of large thermal power plants. A total of 0.3 million bricks were used to construct the hospital. Load-bearing structures make the building earthquake-resistant up to four storeys. Ahmedabad has witnessed severe earthquakes in the past.

An intelligent balance of right materials and suitable design strategies go a long way in making a building energy-efficient. Glass is highly used in modern buildings because of its mass appeal for naturally lighting up buildings. However, most of the glass used has only contributed to rising electricity bills (see 'Reflections on glass', *Down To Earth*, December 15, 2012). "Glass retains heat inside the building which leads to reliance on air-conditioners. Glass has high embodied energy," says Kakani.

Making a load-bearing stucture also increased work opportunities for skilled labour. "Masons are dwindling in number because most of the real estate construction is moving towards pre-fabricated techniques and machinery," Kakani says.

Taking a cue from the local practice, flooring of the terrace is done by broken glazed tile leftovers from bathroom constructions. These heat-reflective tiles insulate and waterproof the terrace.



The hospital's load-bearing structure transfers the building's load to the ground

'80 per cent of the patients have cardiac problems. They need natural light for faster recovery'

And when it rains, efforts have been made to recharge the water. Also, the hospital's sewage treatment plant, which has 75,000 litres per day capacity, allows reuse of water in the toilet flush, cooling tower and for gardening. Water requirement has been reduced by planting local plant species which have adapted themselves to the environment and require less water.

Thinking green

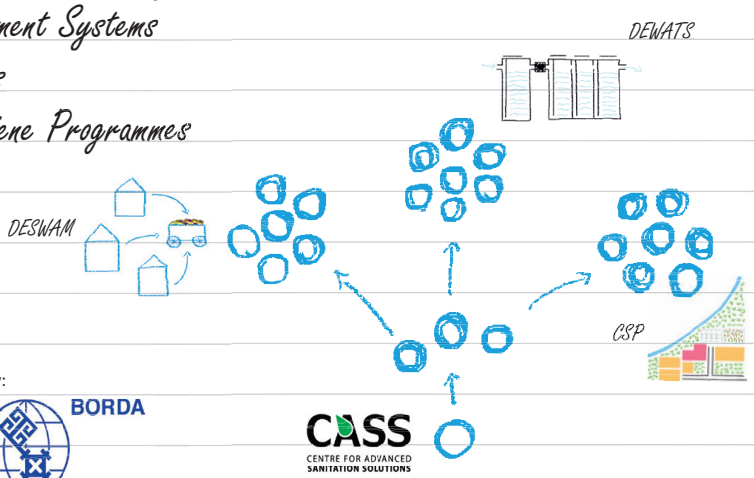
When making a building take a holistic approach, says Kakani. Do not spend a lot of money to create energy-efficient spaces. "It will go a long way in achieving economy of resources, which is a more fundamental way of thinking green," says Kakani. He was able to reduce the building cost to ₹1,800 per square foot (1 sq foot=0.09 sq m). This includes cost of civil work, interiors, electricals, HVAC (heating, ventilation and air-conditioning), plumbing, fire-fighting, site development, and even municipal and professional fee. In Ahmedabad and neighbouring areas, the cost for a similar building is ₹2,500 to ₹3,000 per square foot.

In his other projects, too, Kakani has managed to reduce cost in different ways. He used rubble from the earthquake that hit Gujarat in 2001 to construct a school building in Rajkot. Most of the rubble was dumped outside the city.

Kakani's home, too, is a model example of green living. When he renovated his house, among the first things he initiated was removal of air-conditioners. With a wind-catcher installed on top of his two-and-a-half-storeys house, Kakani created vents that bring cool air down to the rooms in summer nights. "This does not work when it rains, but it rains only for a brief period. I do not feel the need for air-conditioners," he says.

Designing an eco-sensitive building is all about using locally available materials, local architectural techniques and local skill, says Kakani. ■

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Smart farming

Two IITians explore ways to make farming profitable for Bihar farmers

ALOK GUPTA *Vaishali*

In a shabby godown-turned-office in Vaishali district, Shashank Kumar, an alumnus of prestigious Indian Institute of Technology (IIT), pensively browses through the Internet on his laptop. He is surrounded by a goup of farmers who wait expectantly to know the chances of rain. Kumar finally gives up. He walks out of the office and looks at the partly cloudy sky. "It might rain," he says, mumbling that weather update in Bihar is awful. His friend, Manish Kumar, another IIT alumnus, is back from a hectic tour of villages in Banka district. Long hours of walking under the sun has made him ill. Yet he joins the discussion on what the group of farmers should grow this season keeping up with the market trend.

Shashank, a statistician, and Manish, a textile engineer, resigned from their plum corporate jobs in 2010 and have since been working with farmers of Vaishali, Muzaffarpur, Banka and Hajipur to turn farming into a profitable venture. "For us, it was a call of land," say the duo who hail from the same village.

So the profit of their organisation, Farms n Farmers, must be impressive. Mere mention of profit gives them bouts of laughter. "Our balance sheet is negative but things are looking up," say the entrepreneurs who are in the process of finding out what ails the farming sector in the state. "When we started, we thought a direct market to farmers' produce in cities and elimination of middlemen would bring them more money. Our concept was far removed from reality," says Shashank. "We realised the problem lies in the gap between demand and the produce." Farmers in the hinterlands of Bihar prefer sowing labour-intensive paddy and wheat. They do not grow for the market and have little idea about high-value crops. Then there are obvious problems like small landholdings and reluctance towards new farming techniques.

Amid the gloom, Shashank and Manish decided to persuade young farmers. The idea worked. Young farmers agreed to experiment, though on a small portion of their fields. The duo also told the farmers about storage facilities and packaging and processing techniques so that they can earn higher prices for their produce.


PARAS NATH

Shashank and Manish discuss market trends with farmers at their office

Varun Singh is one such farmer from the IITians' village who grew baby corn on one-tenth of his farmland last year. "Initially, I had to face the wrath of my father," he says. But the earning from baby corn was impressive. This year Varun's father has allowed him to grow capsicum, another vegetable in demand in cities, along with baby corn.

His neighbour Ravi Bhusan was startled when he was told about mixed farming. The IITians after a thorough study of his field and market trends asked Bhusan to grow potato along with wheat. He reluctantly followed the advice. A bit of profit in the first year itself surprised him. "My profit would have been much more if I had grown a few more crops," says Bhusan, who is now improvising methods of mixed farming.

Farmers in the hinterlands of Bihar don't grow for market and have little idea about high-value crops

Farm n Farmers segregates the harvested crops into categories of ready to sell, crops that need to be processed and crops that require storage facility. "Farmers usually sell their produce in the local market where they do not get a good price. We find a niche market for each crop and sell it at a better price," Shasank says. Crops like baby corn are sold processed and canned, and fetch an impressive price, he adds.

Though at a nascent stage, their venture has come to the notice of National Bank for Agriculture and Rural Development, which has offered them access to its farmers' clubs. This has enabled them to interact with large groups of farmers and understand the problems better. "There is a severe resource and information crunch in Bihar. Weather updates are difficult to get despite 95 per cent of farmers depending on rain," says Manish. In the next few years, they plan to set up a call centre to advise farmers on crop diseases and right planting schedules. To begin with, they have prepared a database of farmers and send them remiders through SMS about when to buy seeds or irrigation methods. ■

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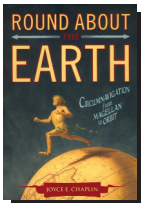
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Trials at sea

HRISHIKESH MATTOO

Last January when Dutch teenager Laura Dekker became the youngest person to sail around the globe, her voyage caught media attention. But the focus of the world press was more on Dekker's battle with reluctant Dutch authorities than on her sea tribulations. The 16-year-old did suffer her share of mishaps and experienced adventures including close encounters with sharks, but these were assumed to be stock-in-trade for any seafaring adventurer. Today, when it is possible to book an around-the-world air ticket with a basic smart phone and when children are acquainted with GPS devices, Dekker's feat seems more quaint than exceptional.



REUTERS

Laura Dekker of the Netherlands is the youngest person to sail solo around the world

Things were vastly different five centuries ago when Ferdinand Magellan's circumnavigation killed him and most of his crew. Contrary to the received wisdom, Magellan was not the first to sail around the globe. He perished in a duel with a Filipino chieftain and it was left to his deputy Juan Sebastian de Elcano to lead the ragtag flotilla back to Spain. Harvard historian Joyce Chaplin takes us back to that voyage and several others. She tries to understand what made young men rough out an enormously uneven battle with seas. For Magellan and his successors over at least three centuries, conquest was the paramount motive. Magellen's expedition aimed to reach the Spice Islands—now part of Indonesia's Malaku Islands—via a radically backward route: sailing west, not east. The journey promised to make Magellan and his crew either very rich or dead. The Spice Islands was the world's only source of cloves, mace and nutmeg, and in the early 1500s sailors who survived the journey could sell them in Europe at an enormous profit.

Over the next three centuries seafaring became intertwined with colonial and imperial ambitions. Chaplin observes that early circumnavigators "had no respect for the territories of non-Europeans", and thought of foreign lands as resupply points or potential colonies. In the 19th century, the Russian and Japanese empires sponsored circumnavigations to demonstrate their status as great powers. In 1907, US president Theodore Roosevelt dispatched the Great White Fleet around the globe with the intention of showcasing US naval power.

The many instances of ruthless asset stripping, casual slaughter and cultural arrogance were allied to the new transcontinental connection-making, copious opportunities and eager accumulation of knowledge that this period of protracted Western hegemony sometimes afforded its beneficiaries. By the late 19th century the seas had become safer. When British ship *HMS Challenger* went on circumnavigation in 1872 it carried masses of scientific equipment but only two cannons that were mainly used for signalling. The voyagers returned in perfect safety with the "largest oceanic database yet generated".

Chaplin is at her best while describing the sailors' tribulations. Very few sailors would return home. Scurvy was the biggest scourge. History credits British explorer James Cook as the pioneer in the battle against the seafarer's greatest bugbear. But it was actually his countryman John Byron who devised ways of keeping provisions fresh. Cook who followed his directions a few years later, returned from his voyage with all but six of his 232-member crew unharmed.

If the early voyagers were driven by the desire of conquest, curiosity became the major reason for people taking to the seas from the late 19th century onwards. Chaplin chronicles virtually unknown travellers such as Ida Pfeiffer, a wealthy widow whose 1846-48 tour between flourishing outposts of imperialism included ship, rail and a mule caravan.

While much of her book is about sea-travel, Chaplin is at her poignant best while bringing out the hiatus between the geopolitical ambitions of national space programmes and the sentiments of space travellers. Soviet cosmonaut Yuri Gagarin, awestruck by the fragility of Earth among celestial giants, is said to have remarked, "It's indescribably beautiful", a sentiment way away from the militaristic motive of the mission that took him to space. ■

Hrishikesh Mattoo is an independent researcher in Bengaluru

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Free the air of mercury

Newly launched Minamata Convention weak on mercury released by thermal power plants



CHANDRA BHUSHAN

In 2003, we at the Centre for Science and Environment undertook the task of creating an inventory of mercury use in India. We decided on this endeavour after conducting the environmental rating of the chlor-alkali industry: an industry that produces basic chemicals like caustic soda and chlorine. This industry was at that time using large amounts of mercury in its production process. We were horrified to learn during the rating that more than 90 per cent of the mercury used literally vanished into thin air. No mercury is actually consumed in the production process, so the mercury used has to be discharged with effluents, waste and air emissions or has to be present in the products. But even after we had taken stock of all such mercury, a large proportion of the silvery element used in the production process remained unaccounted for. Industry too had no idea where this mercury was going.

Experts advised us to conduct laboratory tests.

We tested the soil, water, effluents and sludge within and outside the chlor-alkali plants that used the mercury cell process. We found mercury everywhere at more or less same levels—inside the mercury cell plants, a few kilometres from these plants and hundreds of kilometres away in factories using products manufactured in these mercury cell plants. We concluded that mercury not only contaminates the environment right next to the place where it is used; it also evaporates and travels far and wide. It is, therefore, an invisible pollutant and threatens public health far away from the place of actual use.

We recommended phasing out the mercury cell process and thankfully a decade later all the mercury cell plants have been phased out. However, today more mercury is being released in the country than in 2003.

Our inventory-creating exercise in 2003 threw up two key findings: that India was the largest importer and user of mercury in the world, and that it didn't know where it was using a large part of this mercury.

We sifted through reams of import-export data from the Directorate General of Foreign Trade, but could not locate the major users of mercury, other than the chlor-alkali industry, electrical companies and a few medical instrument manufactures. In all cases mercury used in the production process vanished into thin air. We also concluded in our inventory findings that mercury emissions from coal-based thermal power plants are substantial and may be of the same order as that of the mercury used in industrial processes and products. We prepared a regulatory agenda, which has not yet been implemented.

A decade later, we again tested mercury, but this time looked for it in human bodies. We were approached by the people in Uttar Pradesh's Sonbhadra district to investigate their health and pollution problems. Sonbhadra is the energy capital of India



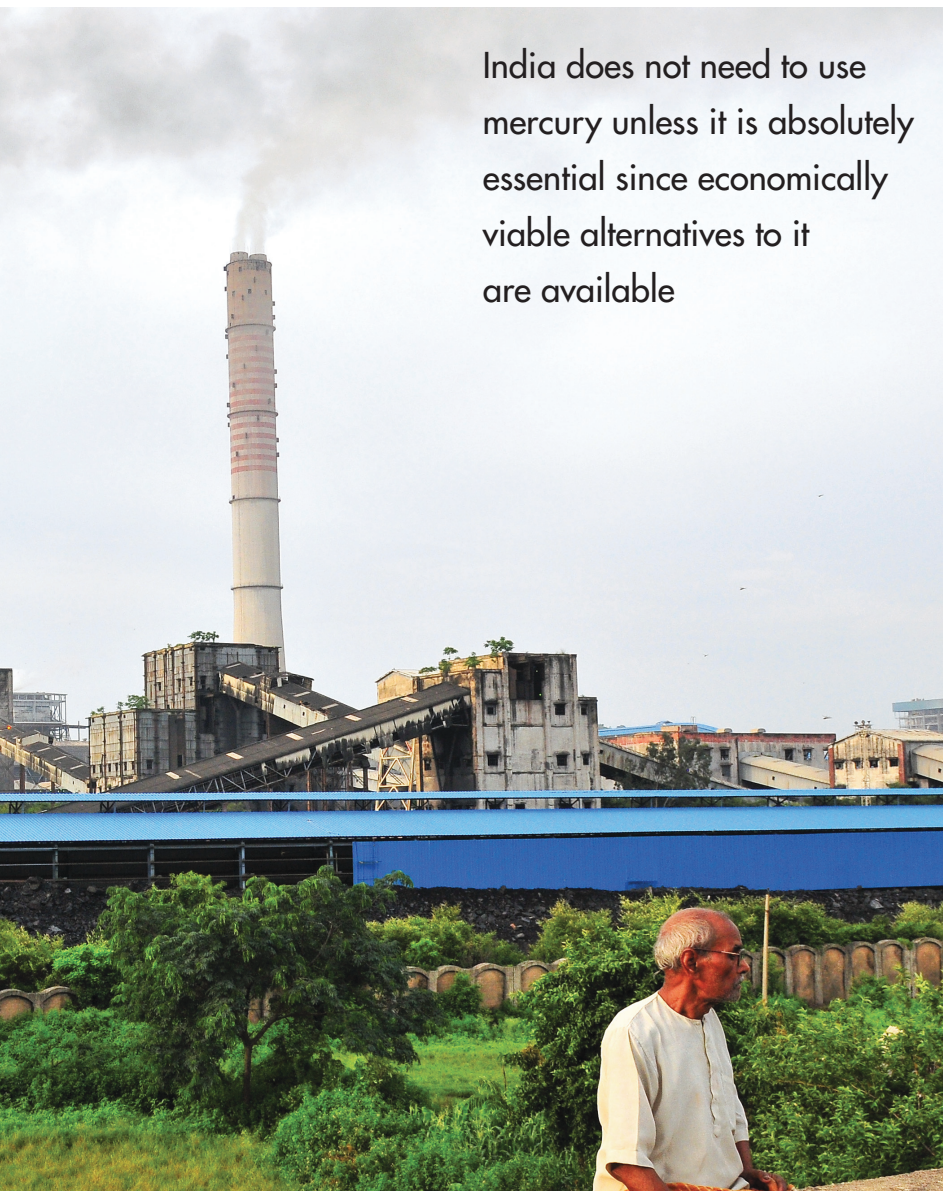
MEETA AHLAWAT / CSE

with coal-based thermal power plants of close to 10,000 MW capacity. People around these plants suffer terrible health problems: high incidence of skin discolouration, shivering, reduced vision, burning sensation in the limbs and impaired speech. Preliminary investigation indicated these were caused by mercury.

We tested the blood, hair and nails of people for mercury. We also tested water, fish, cereal and soil. We found mercury everywhere. It was present in 84 per cent blood samples at an average level six times the safety norm. We found mercury in hair and nails, indicating continuous high level exposure to it. We found mercury in their drinking water as well as in fish from the Rihand Sagar dam.

The biggest shock for us was that the government and the key company—National Thermal Power Corporation (NTPC) Ltd—knew about mercury poisoning in Sonbhadra way back in 1998. That year NTPC had asked Lucknow-based Indian Institute of Toxicology Research (IITR) to conduct an epidemiological study. The institute found high levels of mercury in humans, water and food items. But the study was never made public and people continued to suffer. In fact, we were recently informed by IITR that the Union Ministry of Environment and Forests had commissioned more studies on mercury pollution in thermal power plant hot spots, but did not release these studies.

Our decade-long work on mercury has convinced us that India does not need to use mercury till it is absolutely essential. Today there is no rationality for its use because economically viable alternatives to mercury are available. Besides, the health costs are just too high to justify the use and release of this toxic metal.



In this context, the Minamata Convention to reduce the emissions and release of mercury into the air, water and land, must be seen as the beginning of a process to eliminate the use and abuse of mercury. On January 18, 2013, 140 countries agreed to launch the convention. Under the agreement, a range of products, including batteries, electrical appliances, CFL bulbs, soaps and cosmetics, will be phased out by 2020.

However, exception has been made for a few medical products and some items related to religious faith. The convention prohibits the primary mining of mercury. However, it has failed to deliver on reducing mercury from industries and the mining sector. This is largely because European NGOs have used mercury as a front to further their climate change agenda and target coal-based power plants in India and China. This has made countries like India defensive and consequently the language on reducing mercury emissions from power plants in the convention is weak.

Signing the convention will not be sufficient. Going by the experience in the climate change arena, one needs an effective compliance and finance and technology mechanisms to achieve the objectives.

India, on its part, will have to put its own house in order. It does not know how much mercury it uses and where and how much it releases in the environment. It does not know the effect it has on people's health. And when it does come to know, it wants to hide it. India hardly monitors or regulates mercury in products and has not yet set mercury emissions standard for coal-based thermal power plants despite discussing it for the last 10 years. It is time India took steps to protect the present and future generations. Mercury is too dangerous to be allowed to move freely.

Though India has agreed to the Minamata Convention, let's hope it also learns from the experience of Minamata and stops repeating the mistakes. ■

Chandra Bhushan is deputy director general at the Centre for Science and Environment in Delhi

Long road to justice

The new land acquisition bill promises much but has little to ensure delivery



SHRIPAD DHARMADHIKARY

With most political parties having set their sights on the 2014 national elections, the Congress-led UPA government is surely hoping for a repeat of the 2009 miracle. A good part of the credit for the 2009 victory has been given to progressive legislation like the employment guarantee Act. It is no surprise then that the Congress is looking at more such pieces of legislation before the country goes to the polls. One such legislation on the anvil is a new land acquisition bill which, it is said, will bring justice to the land owner and the displaced—and votes to the Congress. But given the current form of the bill, it is unlikely to do either.

The new bill was introduced in Parliament in September 2011 by the rural development ministry and has negotiated a tortuous path through a Parliamentary Standing Committee, the ministry, the cabinet and a group of ministers. On December 17, 2012, the ministry introduced a notice of amendments, with more than 150 changes, to the original bill. The bill is now slated to come up in the budget session.

Undoubtedly, the bill, now called The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act of 2012, has several significant and progressive features. An important change is that for the first time resettlement and rehabilitation issues have been intertwined with land acquisition. Till now, the law only dealt with land acquisition; and the only legal entitlement for the land loser was cash. Under the bill, the right to resettlement and rehabilitation is automatically triggered the moment the acquisition process starts. The resettlement and rehabilitation provisions in the bill become applicable even if any private entity purchases land after direct negotiations—this holds for purchases above a certain extent.

The bill's most important provision is the requirement of consent of 70 per cent or 80 per cent of the to-be-affected people before the state can acquire land for a public-private partnership or a private enterprise, respectively. This is a significant step in fulfilling a long standing demand of people's movements. Such movements—from struggles against the dam on the Narmada to the more recent ones in Singur, West Bengal, and against the POSCO steel factory in Odisha—have demanded that decision-making process of a project must give meaningful say to local communities.

Another significant provision of the bill is social impact assessment (SIA) as the first step once the government intends to acquire land for public purpose. Significantly, SIA will have to include an "assessment whether the proposed acquisition serves public purpose". The proposed legislation also requires constitution of an expert committee to review SIA. If this committee finds that "the project does not serve any public purpose" or "the social costs and adverse social impacts of the project outweigh the potential benefits", it shall recommend the project be "abandoned forthwith and no further steps to acquire the land... initiated". The government can reject this recommendation, but it has to give reasons in writing.

In spite of these and several other positive provisions, there is little chance the bill will ensure justice to the affected. This is because the bill has many lacunae. For example, why should the condition of consent of the affected people hold only for private projects? Will a government-owned dam or thermal power plant have any less impact on the people? Moreover, given today's policy





SACHI / CSE

of privatisation and divestment of publicly owned companies, what would happen if a government project acquires land without consent but this project is subsequently sold to private owners?

It is true that the expert committee has the right to see whether the proposed land acquisition and the project are serving public purpose. But the definition of public purpose given in the bill is so broad that almost any project can be shown as public purpose. For example, any electricity generation project is considered a public purpose project. According to a study by the Prayas Energy Group in Pune, the power generation capacity of thermal (coal- and gas-based) power projects in the environment clearance cycle is close to 700,000 MW. This capacity is three times the thermal capacity that will need to be added in the next 25 years as per the long-term projections of the Planning Commission. How can we say that each of these projects will serve a public purpose? But the bill does include all power generation projects as those meant for public purpose. And since the committee will have no room to assess the public purpose of any project outside the scope defined by the Act, this power of the committee is as good as non-existent.

The resettlement and rehabilitation provisions of the bill are too weak. It certainly has a provision for increased cash compensation, but overall the provisions are inadequate to even restore the house, habitation and livelihood of the displaced.

Moreover, many elements of resettlement are to be provided only in cash. The bill only provides for compensating people belonging to the Scheduled Tribes and the Scheduled Castes with land up to one hectare. Others will be compensated with land only if their holdings are acquired for irrigation projects. Here, the provision is for a minimum of 0.4 hectare, but there is no condition to ensure that this minimum limit does not become the *de facto* maximum limit.

In fact, many provisions of resettlement are based on minimalist principles, that is, they create the smallest possible legal entitlement. For instance, houses to be provided are as per norms of Indira Awas Yojana, and employment is to be offered "at a rate not lower than the minimum wages provided for in any other law for the time being in force". What is the point in saying this, when there is another law that ensures minimum wage? This raises the suspicion that the displaced will get jobs that pay the minimum possible. Several other resettlement provisions are rendered ineffective by pre-fixing them with words such as "as far as possible" and "efforts will be made". This includes important issues such as granting fishing rights in reservoirs to oustees and providing irrigation for land given to the displaced.

The bill mandates acquiring the consent of the affected before the state acquires land for PPP or a private enterprise, but leaves out public projects

Last but not the least, the provisions of the bill will not to be applicable to all land acquisition in the country. For example, land for coal mining—a significant part of the land that are to be acquired in the near future—will continue to be acquired under the Coal Bearing Areas Act.

Looking at these and other parts of the bill it is clear that it will not be able to deliver justice to those losing land or being displaced. One cannot but ask, is it the weakness of the government, or is it the power of the vested interests that is responsible for this situation? Whatever may be the case, the message to the displaced is clear: "*Aage aur ladai hai* (There is a long struggle ahead)." ■

Shripad Dharmadhikary is an activist and researcher on water, energy and developmental issues. He works with Manthan Adhyayan Kendra in Barwani, Madhya Pradesh, and can be reached at manthan.shripad@gmail.com

ADVERTISEMENT>> COKE • The US

What gas

Believe it or not, Coca-Cola has launched an anti-obesity ad on US TV. The two-minute ad aired for the first time on January 16 depicts healthy-looking people, many carrying Coke bottles, and peddles the high-sugar product as something that can be consumed responsibly. In the background, a female narrator says Coca-Cola offers smaller portions, is working to make better-tasting, low-calorie sweeteners and has voluntarily made lower-calorie drinks available at schools. "There is an important conversation going on about obesity out there, and we want to be a part of the conversation," Stuart Kronauge, general manager of sparkling beverages for Coca-Cola North America, told the Associated Press.



Critics are not buying the argument. Mike Jacobson of the Center for Science in the Public Interest, said if the company was serious about tackling obesity it would stop fighting a tax on its drinks. Food writer Susan Milligan says, "In a sense, the ads are similar to those run by liquor companies—drink us, but don't go overboard. But it misses the point: if you want to make more responsible food choices, don't drink sugared sodas at all." ■

SNIPPETS NEWS

>> Chinese security researchers have discovered a botnet running on the smartphones of more than a million users in the country. The devices had been infected by a Trojan-based attack first discovered in 2011, Xinhua reported. The botnet can allow the phones to be hijacked remotely.

>> Striking farm workers in De Doorns in South Africa attacked three journalists from the public broadcaster, South African Broadcasting Corporation, who were covering their strike. This incident adds to the number of journalists attacked in De Doorns since the strike, which started in August 2012.

MALL>> BREASTFEEDING • Costa Rica

Mothers have their say

On January 12, about 100 women nursed their babies in public in the Costa Rican capital, San Jose, to protest the decision by a shopping centre to prohibit a woman from breastfeeding in its main part. The women staged their protest in the food court area of the Lincoln Plaza shopping centre in eastern San Jose.

A week earlier, Patricia Barrantes was asked by a security guard to stop nursing her daughter in public and move to a special lactation room.

After the protest, Barrantes told reporters that the mall's representatives apologised and thanked the women for supporting her. The representatives said making use of the lactation room at the centre is optional and breastfeeding babies in public was never prohibited. The security officer had made a mistake, they said. ■



XINHUA/KENT GUILBERT

Dubbed "mamaton" (nurse-in), the protest was organised on social media networks

NEW YORK TIMES>> ENVIRONMENT • The US

Environment beats retreat

On January 16, the nine journalists who make up *The New York Times*' environment desk learned that they will be reassigned. The newspaper is shutting down its environment desk.

Dean Baquet, the paper's managing editor for news operations, said when the desk was created in 2009, the environment beat was largely seen as "singular and isolated. But today, environmental stories are partly business, economic, national or local... ," he said.



ALEXANDER TORRENEGRA

The UK's *Guardian* described the change as disheartening. "Environment stories... require a solid background in the subject matter, a reasonable understanding of the science and issues at play, and the ability to explain complex subjects in a way that will make sense to readers.... That's why having a team of reporters and an editor committed to that beat is essential." ■

PHOTO>> PROTESTS • Belarus

Nailed by a photo

A court in the western city of Hrodna has convicted three human rights activists, Uladzimer Khilmanovich, Viktar Sazonau and Raman Yurhel, for participating in an unauthorised demonstration on International Human Rights Day (December 10).

But the men were not arrested at the time of the demonstration, but after a photo of them protesting was published online. In the photo, they are holding a portrait of Ales Byalyatski, a human rights leader who was sentenced to four and a half years in prison in 2011. Byalyatski's supporters say the charges are politically motivated. ■

The three human rights activists were fined US $173 each



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TELEVISION>> ELECTIONS • Kenya

Pause for polls



Kenya's high court has ordered that the date for switch off of the analogue TV signal be delayed, preferably until after the March poll. The court believes an immediate move to digital would be unfair to those keen to follow the polls on TV.

The Communications Commission of Kenya wanted to switch the country to digital TV in December. But consumer group COFEK argued that Kenyans had not been given enough time to prepare. The set-top boxes needed to receive digital transmissions are expensive for most people, it argued. Kiprono Kittony of Kenya's Media Owners Association, said the switch-off would affect four million people and urged government to reconsider its decision. ■

ART>> BUTTERFLY • Mexico/USA

The Monarch's ways

An art exhibit that opened in the second week of January tries to make a connection between the long southbound migrations of Monarch butterflies to their winter home in Mexico and the Mexican immigrants who travel to the US to find work, and thereby survive.

The exhibit, sponsored by the Pintoras Mexicanas (Mexican Painters) collective is on display at the Casa Michoacan in Chicago's mainly Latino Pilsen neighbourhood and consists of 75 interpretations of Monarch butterflies. "Immigration is a crucial aspect of Mexico's socio-economics," said Alma Dominguez, the founder of Pintoras Mexicanas said. Dominguez said her group includes 260 painters living in Mexico, the US, Canada, Italy, Germany and France.



Nuria Metzli created this image for Chicago exhibition

EFE

Chicago is the first stop for the travelling exhibition that will next move to Mexico City and Mexico's Michoacan state. ■

RIGHT TO DISSENT / LATHA JISHNU

MARK LYNAS AND THE DEMEANING OF SCIENCE

He's fuzzy on facts and low on science, but the campaigner gets big media support

Within days of his address to the Oxford farming conference on January 3 where he claimed he had been wrong in opposing GM crops, environmental activist Mark Lynas's speech had gone viral, attracting an avalanche of comments, the brickbats perhaps outweighing the fulsome praise. *Down To Earth,* too, was alerted to the speech but I, for one, was foxed by the headline-grabbing *mea culpa.* One knew vaguely that Lynas was a climate campaigner who had changed his views to accommodate the concept of planetary boundaries—if humanity operated within the boundary framework on 10 parameters we could continue to exist as we've done in the past 10,000 years—and had written *The God Species* to explain his new thesis. According to the thesis, climate change is "more than anything else, a financing issue". So why were a lot of people getting hysterical about the Lynas speech on having seen the light on GM crops?

Two sets of people are fulminating over the claims made by the activist. One lot is the anti-GM activists who, justifiably, are questioning his claim that he "helped to start the anti-GM movement back in the mid 1990s". If he did so then not many knew this. One of his claims, made in an interview to *The Indian Express*, which has outraged activists here is that he coordinated the anti-GM campaign with Indian NGOs, "in the process taking the fear of GM crops to India". But what is odd is that the anti-GM Saul converted to the GM-is-the-solution Paul at least two to three years ago, and hence the excitement of the media worldwide is a little curious to say the least.

Even more surprising is the reaction of Indian newspapers; most of them have grabbed at Lynas's Oxford speech with a delight—or is it desperation?—that is hard to fathom. Ironically, it is the very same dailies that took pains to highlight Prime Minister's recent remark at the Indian Science Congress: "Complex issues, be they GM food or nuclear energy or exploration of outer space, cannot be settled by faith, emotion and fear but by structured debate, analysis and enlightenment. A scientific approach and understanding of these issues are therefore as vital as our core scientific capabilities."

What does Lynas have to say that is scientifically valid? This is where the other set of people who have been upset by his contrition come in. These are scientists, and highly reputed ones, who have been withering in their criticism of his understanding of science. This is important because Lynas says the reason he is no longer hostile to GM crops is because he "discovered science". This column does not have the space to detail the frailties of Lynas on the science of GM. Scientists like Doug Gurian-Sherman, a doctorate in plant pathology and senior scientist with the Union of Concerned Scientists, and John Vandermeer, professor at the department of ecology and evolutionary biology in University of Michigan, have ripped apart Lynas's sweeping and naive claims and what appear to be deliberately inaccurate portrayal of the GM technology.

Here are some of the more egregious examples: according to Lynas, the world needs GM because other methods are inadequate to meet the planet's food requirements. Here's what Gurian-Sherman has to say: GM may contribute, but conventional breeding continues to outpace GM and is likely to do so in the future. Besides, agroecology is much better at addressing many of these issues because of pressure on finite resources and the resilience required. The other myth Lynas fosters is that GM has been instrumental in reducing pesticide use. A recent study by Charles Benbrook shows the biggest promoter of GM crops, the US, is using much higher amounts of pesticide on account of GM herbicide-resistant weeds, mismanagement, and the monoculture system of GM technology. As anyone keeping tabs on GM knows, resistance to Bt by rootworm in the US is increasing and will lead to higher insecticide use. In other parts of the world, too, insect-resistance is mounting: by the stem borer in South Africa and bollworm in China. All of these are issues that Lynas does not deign to address.

Ultimately, Lynas and what he says should not matter to us: not to the scientists, to the activists or to the media. But what's worrying is the reluctance of the Indian scientific establishment to acknowledge the downside of GM technology. Worse still is the determined refusal of the mainstream media, specially the business dailies, to make an effort to understand the issues surrounding the issue. The scientific illiteracy of journalists is well known. Should they then be relying on the likes of Lynas to push their agendas? ■



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