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Dead ahead

Dam mishap kills 29.
Water enters old Tehri town.
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TOURIST SPOT
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Villagers block Ranbaxy

Mangled lake Manchar

Pench: no eco-development

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DownToEarth

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Unsound ground

The recent Tehri dam tragedy resulting in the death of 29 workers has once again brought to the fore the whole question of dam safety



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COVER PHOTO: SURYA SEN



Choke-a-bloc

Apropos the editorial 'Give us today our daily threat' (*Down To Earth*, Vol 13, No 5, July 31, 2004), had I the means, I would have ensured a copy (of the editorial) reached every petrol pump in the city, as well as every taxi and auto rickshaw driver of Kolkata.

However, it would be unwise to repose too much faith in what seems to be an ecological endeavour (Twisha Lahiri's study) involving a study of pollution levels and a comparison of lung function tests. A series of studies carried out over a period of time would have been able to grasp the ill-effects of air pollution better.

The editorial makes no reference to traffic speed. In Kolkata, the average traffic speed is around 8-10 km per hour, one of the slowest in the world. The condition of the roads is easily the worst in the world, possibly second only to Kabul. What does that translate into human health and air pollution? Slow speed leads to congestion and as traffic comes to a standstill the level of emissions from poorly burnt fuels increase. Then again, as most taxi drivers slow down when idling along the streets little do they realize that their diesel jalopies are emitting deadly toxins. The solution possibly lies in driver education.

As you rightly pointed out, ridiculous pollution control norms and improper town planning has made the situation worse. Instead of controlling the number of cars or increasing road spaces or even creating alternate speedways, more flyovers are being added. And yet flyovers do not in any way alleviate the threat of pollution. On the contrary, more flyovers mean more cars and consequently, greater concentration of emission sources which in turn spell soaring pollution levels.

The editorial suggests "...it (Kolkata) must check malevolent explosion (of cars) through vigorous invest-

ment in public transport." Well, yes and no. Yes, because this is the most pragmatic approach. And no because increasing public vehicles can be worse. The emission problems two-stroke engines (cheap two wheelers and auto rickshaws) invite are worse compared to the new Maruti 800. Add to that the problems of slow traffic and poor maintenance of public vehicles, and the situation might actually worsen.

And yet we cannot do away with cars, as they are a growing necessity. In that case, it would be better if there were more environment-friendly cars, maybe electrically driven. It is time we paid heed to Twisha Lahiri's findings.

ARINDAM BASU

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Well being

The editorial 'Water Riddles' (*Down To Earth*, Vol 13, No 4, July 15, 2004) raises some pertinent questions about the dugwells of Kerala and the need for greater attention to sanitation. The sunk costs (literally) in private wells are so huge that it is not an investment any government or related agency can afford to gloss over in a scheme to provide potable water. However, one thing which in my opinion deserves attention is — the practice of boiling water before drinking. This practice — diffused largely through a socio-religious movement — has ensured that, even if the water is contaminated, it is made relatively safe by this process. As a

Witness

Recently, I was in Goa where sanitation is a major issue. In Kisoro, Uganda, where a similar problem prevails, I helped build several dry toilets (compost and dehydration). We also built short sewers for the town centre and treated the sewage in an advanced constructed wetland. But when we began work in 1998, this ecological approach to sanitation was not very well received as it went against the cultural traditions of the inhabitants.

FRANZ HOLLHUBER
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PICK OF THE POSTBAG

Leopard's lament

I am a resident of Borivili (east) where the government has allotted land to our community along with some others. The government has specifically prohibited any form of construction work or 'development' on this land. These legal provisions, however, are being flouted with impunity, and large portions of the land are being encroached upon by slums on the one hand, and high-rises on the other. This has led to a severe shortage of space for us.

No political party has taken up our cause and it is natural because we have no voting rights, and can therefore not form part of any vote-bank. We are doomed to be silent spectators of our own doom. After all, though born in this great country, we are not its citizens, and will never be recognised thus. But fact is that we are an integral part of this land and have been here for generations, even longer than our closest neighbours, the *adivasis*. To those who did not recognise my name, *Panthera pardus* is the scientific name for the leopard.

We were the caretakers of a vast tract of unspoilt forest that nurtured millions of creatures for eons, and even today provides water and oxygen to the choked city of Mumbai. But in the last few decades, this beautiful green lung

result, one becomes aware of bad water standards much later in comparison to other states with similar levels of contamination.

Along with promoting wells, it is also necessary to look out for technologies that will prevent well water from contamination. Perhaps, there are filtering systems or materials that can be used in the outer portion of the rings often sunk into the earth to make a well, once a water source is discovered. Also, if the transformation efficiency between sound water use and good sanitation on the one hand, and beneficial health outputs on the other, are to be high, then hygiene education must be accompanied by conservation awareness.

JOHN KURIEN

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The natural way

This is with reference to the cover story 'Inevitable tragedy' (*Down To Earth*, Vol 13, No 4, July 15, 2004). Village Punukula's experiments in managing

of the city caught the attention of land developers. Land belonging to the forest department was de-reserved and released for human habitation. A systematic mayhem began. Today, we live in a truncated vestige of our original habitat, wondering whether man's onslaught on nature will decimate us in the days to come. We hear angry human voices, demanding more land, more resources for the human population. Sadly, even eminent judges proclaim that human interest transcends all other concerns.

Innocent humans, too, are paying the price for the greed of land grabbers and their political masters. The intervention of the media worsens things, even as mediapersons sensationalise the man-animal conflict, almost invariably showing the animal in poor light. All this may well be a prelude to pushing the forest further behind, ostensibly to protect human lives, but actually for amassing more land.

P PARDUS

As told to

P V

Subramaniam,
Mumbai



crop yields without pesticides made for interesting reading. Artificial chemical fertilisers trigger a vicious cycle. They have a drugging effect on plants, which leads to a loss of natural resistance, which makes them susceptible to pests and diseases, which in turn necessitates further use of expensive chemical fer-

tilisers. Punukula's efforts to replace these artificial pesticides with those of natural origin are a step in the right direction. Use of cow dung, compost, green manure and bacterial cultures are healthier options. In other words, organic farming might be just what farmers in Andhra Pradesh need to rid them of their heavy debts.

D M BALSAVER

Kamshet

Little knowledge of dangerous things

So far as safe dosage of radiation is concerned, there are several conflicting reports. Radioactive emissions can harm the spinal cord, a major nerve centre, though the side effects are neither immediate nor obvious. In recent times, the medical fraternity finds itself faced with a plethora of hitherto unknown diseases, which could possibly be attributed to radioactive emissions. A detailed study on the threat these emissions pose would be welcome.

B GAUTAM

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Showing the way

Thanks to the story '2 little innovations' (*Down To Earth*, Vol 12, No 14, December 15, 2003) one was apprised of R K Palhan's innovative methods for controlling water use in flushing cisterns and LPG use in cooking. Drawing upon Palhan's design for cisterns, those with an even smaller capacity can be developed. The thing to do is simply insert a block of brick into the cistern,

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Tehri at first-hand

A tunnel collapses, fuelling controversy; an old town, seeping out of existence.

T E H R I



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thereby reducing the volume of water within. Where the SONA — the device to save LPG by 30 per cent — is concerned, the final findings of the Indian Oil Corporation and the ministry of petroleum and national gas should be published in the interest of the society. If the SONA is not a patented item, then the design of the same should be given more publicity and modifications should be welcomed.

S K NEOGI

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ERRATUM

Apropos the story 'Worm wonder' (*Down To Earth*, Vol 13, No 1, May 31, 2004), the article mistakenly mentions that Guruntha Oudugoudar sells vermicompost at a cost of Rs 35,000 per tonne. The correct amount is Rs 3,500 per tonne. The error is regretted.

Down To Earth welcomes letters, responses and other contributions from readers. We particularly welcome you to join issues and share your opinion with others. 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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2 sides of an unnatural coin



Last fortnight, I wrote of an impending drought. 15 days on, I stand corrected. Now devastating floods are drowning parts of the recently parched country. So much so that Gujarat chief minister Narendra Modi, who last fortnight sought Rs 2,500 crore as drought relief, has now asked the Centre for flood relief, saying his state should be treated at par with flood-devastated Bihar.

But is this cycle of floods and droughts as natural as it looks? In 1986, the then Prime Minister, Rajiv Gandhi had asked my colleague Anil Agarwal the same question. He had scribbled a note to Anil asking him to explain how, “with environmental degradation, even low rainfall becomes a flash flood and the water rushes into the sea and then is not available as groundwater”. He had wanted Anil to explain this vicious circle, as he had called it, to his parliamentary colleagues.

The question sounded simple enough. But the answers were tough. As we explored it became clear to us that the practice of “living with floods” was as challenging and urgent as that of “living with droughts”.

Let me explain. By the mid-1980s it was clear that the annual flood-prone area – defined as the area affected by overflowing rivers (not areas submerged because of heavy rains) — had increased from 25 million hectares (mha) in 1960 to 40 mha in 1978 and an estimated 58 mha by the mid-1980s. It was also clear that in these years, there was no evidence that the rainfall had increased. To understand why floods are increasing, it is important to go back in time.

The initial years of independent India were a time full of a machismo called ‘the new nation’. Planners had agreed “floods in the country can be

contained and managed”. The first five-year plan emphasised building dams to control floods. The devastating floods of 1954 lead to a China-like syndrome, where government wanted people to take on the task of building huge embankments to tame mighty rivers.

By the late 1950s, enthusiasm for this strategy faded. But a monster had been set loose: a huge, powerful and entrenched industry hell-bent on making embankments. Embankments became the contractor-officials’ dream project; even today, they make or break the fortunes of many a state politician. In Bihar, for instance, by mid-1980s, some 3,400 km of embankments were supposedly constructed. But during this same period, the flood-prone area in the state shot up from 2.5 mha to 6.4 mha. As floods continued, so did flood control. This, when it was well understood that embankments had exacerbated the flood intensity of the region. These structures, which bind the river, also do not allow the valuable and fertile silt to disperse when a river naturally tends to go into spate. The silt accumulates in the riverbed, raising the bed, leading to floods. The water has nowhere to go for all the natural drainage has been destroyed and this, in turn, intensifies the flood. But the vested interests that construct these structures have made sure this strategy for flood control remains intact.

The strategy of the past was the exact reverse: to disperse the flood by channelising excess water across the land — to regenerate soil and groundwater reserves. This system is best described by William Willcocks, a British irrigation expert, sent in the 1920s by the Raj to find solutions to the famine and malaria of Bengal. As he travelled and reconstructed ingenious engineering, Willcocks found that floods were managed through an intricate system of inundation canals, where overflow from swollen rivers would be channelised. These channels would be used to harvest fish, which in turn kept malaria at bay, and irrigated the land as people cut the banks of the artificial streams. In Bengal, these canals were known as “kani nadi” or dead or blind

rivers. But just imagine his wonder, as Willcocks explains that these canals were the only ‘seeing and living’ irrigation works in all of Bengal. Willcocks wrote to his colonial masters that his advice would be to rebuild the system of water management of the region that had been willfully destroyed by them.

But unfortunately, neither the British, nor the whitewashed irrigation bureaucracy of India, ever heeded this advice. Instead, all the streams and wetlands, all flood cushions have been distributed in the name of land reform. Or simply destroyed. Think what this has done to the region. The flood devastates life. And it does not even recharge the groundwater reserves. As farming becomes ever-more dependent on these reserves, they deplete further.

And when you think about it, this cycle is no different from the regions where people had learnt to live, not with the excesses of water, but with its scarcity. Think of the principle of rainwater harvesting in a country, which gets rain for only 100 hours of the 8760 hours in a year. All the rain of the year could come in just one cloudburst. The solution was to capture that rain and to use it to recharge groundwater reserves for the remaining year. The answer ultimately was to use the land for storing and channelising the rain — over the ground, or under. Catching water where it falls and when it falls.

Now let’s return to Modi’s flood-devastated Gujarat. Why has it happened? Is it a natural disaster or a humanmade one, because the rain had nowhere to go? Without tanks or ponds or structures to impede its flow, catch it, or channelise it, rainwater can also destroy.

But this is a chronically water scarce area. Modi’s claim his state is no different from Bihar has to be condemned, for this region has forgotten to cherish each drop of water that turns into a flood. It is for this reason that I would argue that chief ministers like Narendra Modi should not be given flood relief, but instead be penalised for the drought the floods will cause. ■

— Sunita Narain

Tehri on, regardless



Is the recent incident at the dam site an indication of things to come?

DAM officials, contractors and technical experts supporting the dam have been quick to brush aside the tunnel collapse as a mere lapse. But nothing related to the Rs 6,000 crore-plus project has simple answers. In its 26th year of construction, the project has been most controversial. Since 1980, at least four different committees have rejected it from the safety point-of-view and for environmental reasons. International experts' calculations were used to prove the dam was seismically safe; all of them have said their figures were fudged. The project bashes on, regardless (see: p 26).

Much debate has raged about the benefit of the dam, in money terms. When it was conceived, more than three decades back, the dam was to cost Rs 200 crore. The cost has increased thirty-fold since. Such a protracted construction period also meant that rehabilitation could never be done satisfactorily.

The popular movement against the dam was at its peak between 1985-2000. But the dam continued to rise. Several experts tried to reason that such a mammoth project, in the geologically fragile Himalaya, was a big mistake. Nowhere else in the world could such a project be allowed to come up. Especially when there lived a huge population downstream. The government paid sporadic heed and responded by forming more expert groups. More reports, more dissent, but always Tehri was given a go-ahead. The justification was always the same: look how much money has already been spent. Supporters of the dam have always said it was for national development. To date, many rockfaces around the old and New Tehri towns wear the painted message: "Nation before self". Only look at the cost of such posturing: 125 villages to be affected, fully or partially and more than 70,000 people to be displaced. And, to date, we do not know whether the dam structure is really safe or not!

An expert, who has fought long and hard to convince people that the dam design was flawed, once said, "In an atmosphere of so much scientific illiteracy, what eventually wins the day is how many people repeat the same statement, rather than how scientifically examined that statement is. And unfortunately, the number of people on the other side is much larger." Hopefully, the recent incident will reduce those numbers. As one expert said, "If a little rainfall can do this, what when a major earthquake strikes?" We may not know till the time it really does. And then it may be too late. ■

When the G-20 holds



World trade negotiations are bound to be more multilateral

A NEW phenomenon has unfolded in the World Trade Organization. The world trade body no longer remains the exclusive playing-ground of the US and the European Union (EU). The G-20 group comprising Brazil, China, India and others remains the driving force. At the same time, many other developing countries are beginning to feel left out. And that could prove to be a new challenge for these large developing nations.

The framework agreement on agriculture that emerged out of Geneva (see: p 8) was based on a consensus initially reached between Australia, Brazil, India, the EU and the US (called the FIPS, or five interested parties). It was then further discussed and endorsed by 20 countries, FIPS included, and then placed before the others. More powerful G-20 members had already endorsed the treaty, so many smaller ones didn't oppose. Both Brazil and India claimed that they represented the G-20 at FIPS discussions and that they frequently consulted other members. But, did they represent the interests of all developing countries? Could they have done so? Should they be doing so?

Brazil, India and the G-20 do represent developing countries' interests. They may not be able to take on board all of the concerns of the entire developing world. If they tried, it might render them ineffective. Their strength lies in their ability to put pressure on the EU, the US and other developed nations to eliminate their trade-distorting policies, such as subsidisation and high tariffs on sensitive and processed goods, issues of common interest to the developing world. The G-20 has been successful so far; any attempt to belittle their efforts would only weaken their ability to secure even minor gains.

In no way does this mean that the specific concerns of smaller developing countries are not be addressed. Mechanisms to ensure this must be devised. Also, Brazil and India must engage with the other groups more frequently. They cannot and should not bear the mantle of the entire developing world. What would definitely help is if the EU and the US give up their perverse divisive tactics and enable these countries to organise and engage more constructively in the process. But this is wishful thinking; didn't the G-20 emerge in the first place to combat precisely such tactics? And aren't they the only alternative we have? ■

Multilateral fillip

Global trade talks back on track but real work lies ahead

CLIFFORD POLYCARP

IN THE wee hours of August 1, 2004, members of the World Trade Organization (WTO) reached an agreement in Geneva. It is only a framework agreement, but sets out principles to guide further negotiations. Positive in places, much hard work remains if the developing world is to secure meaningful gains.

For various actors involved in the process, the agreement varies in significance. WTO director-general Supachai Panitchpakdi called it a "truly historic" achievement and a "minor triumph for multilateralism". Brazilian foreign minister Celso Amorim found it good for trade and social justice. Even European Union (EU) trade commissioner Pascal Lamy, extremely cynical since Cancun, admitted "the multilateral trading system is alive and kicking." US trade representative Robert Zoellick was more diplomatic: he characterised the deal as a crucial step for world trade.

India, however, was extremely self-laudatory (see box: *India goes hyper-*

bolic). In an official press release, Indian commerce and industry minister Kamal Nath called the agreement a major victory for India for it fully protects her interests. China's assessment, on the other hand, was more realistic; while the deal was "not bad," China's ambassador said, developing countries were "not fully satisfied." Civil society organisations echoed this sentiment. Oxfam, for instance, acknowledged that developing countries had registered small wins but warned there were no cast-iron commitments and no clear timeline for reform.

Agriculture

On agriculture, developed countries have clearly committed to phase out all forms of export subsidies (direct or indirect), by a date yet to be negotiated. Given the EU had vehemently opposed phasing out its export subsidies in



Cancun, this is a positive development. Of course, gains derived from eliminating export subsidies could be nullified by providing domestic subsidies. On this front, the agreement does not do enough. There is a commitment to cut all trade-distorting domestic support by 20 per cent in the first year. This is good, but the language is ambiguous. The base year on which the 20 per cent reduction is to be applied is to be decided;

thus, how real or notional such reduction will be hangs in negotiatory balance. Further, the agreement requires that the sum of all trade-distorting support not exceed 80 per cent "in the first year and throughout the implementation period." The language here implies developed countries would effectively have to make only a one-time cut of 20 per cent for the entire implementation period. It remains to be seen how this issue is interpreted.

Highlights

- First major agreement since the talks collapsed at Cancun in September 2003

- Only a framework agreement that encapsulates agreed principles

- Aims to propel negotiations in five areas — agriculture, market access for non-agricultural products, development issues, trade facilitation and services

On agriculture

- ▶ Developed countries to phase out subsidies provided to its exporters by a date to be negotiated

- ▶ Domestic subsidies to be reduced

- ▶ Developing countries can retain a specified minimum level of domestic support programmes aimed at subsistence and resource-poor farmers

- ▶ All tariffs reduced through a formula that would aim to ensure deeper cuts on higher tariffs

- ▶ More flexible treatment for "special" products of developing countries, and a mechanism to guard against surges in agricultural imports

- ▶ Some products considered sensitive to be treated differently from the general formula for products

- ▶ Developing countries to also benefit from longer implementation periods

- ▶ A sub-committee to address trade-related aspects of problems faced by poorer cotton-dependent economies

On market access for non-agricultural products:

- ▶ A formula to cut higher tariffs for each product by a higher amount. Developed country tariff levels in general are higher than those of developing countries

- ▶ The starting point for any reduction would be the tariff bindings of the previous round of negotiations — the Uruguay Round (For India, its average bound tariff rate during the Uruguay Round is 114 per cent, while its current applied rate is 38 per cent providing it plenty of room to cut its bound rates)

- ▶ Tariffs on products not bound in the Uruguay Round would need to be bound at twice the applicable tariff rates on November 14, 2001

- ▶ Members that had bound less than 35 per cent of their products required to make no reductions as long as they bind all their products in this round at the average bound tariff level of all developing countries

- New deadlines to address special and differential treatment provisions in existing agreements and problems of implementation of commitments of existing agreements

- Negotiations launched on trade facilitation or the easing of customs procedures to expedite the movement, release and clearance of goods, including goods in transit. Controversial issues of investment, competition and transparency in government procurement dropped

- Deadline for completion of the Doha Round of negotiations extended indefinitely from its earlier deadline of January 1, 2005. Work to be carried out until at least the Sixth Ministerial Conference to be held in December 2005 in Hong Kong.

In the agreement, Blue Box subsidies — relatively less trade-distorting domestic subsidies aimed at limiting production — have been capped at five per cent. But there exists a provision that, observers say, might allow the US to expand such subsidies

Another achievement is capping Blue Box subsidies — relatively less trade-distorting domestic subsidies aimed at limiting production — at 5 per cent of a member's average agricultural production. S N Menon, additional secretary, Union ministry of commerce and industry, feels such a step would hack EU subsidies from US \$22 billion to US \$10 billion. But a provision exists that will not require members with an extremely large proportion of trade-distorting support in this category — such as the EU — “to make a wholly disproportionate cut.” Observers believe this provision is also an opportunity for the US to expand its Blue Box subsidies, accommodating subsidies like the one it has announced for farmers in its 2002 Farm Bill. The criteria to include any measure within this category still remain to be negotiated.

Agricultural tariffs are also a matter of concern: in the agreement scenario, a country like India could end up making significant cuts in a “tiered” way, whereas higher tariffs require deeper cuts. Menon clarified this tiered formula of

reducing tariffs was not a worry, for it would be linked to a tiered formula to reduce trade-distorting domestic subsidies of developed nations. As of now, there is no provision to cap maximum tariffs on each product; moreover, members can take certain products they consider sensitive outside the formula, so allowing some developed countries — that have extremely high tariffs on a small number of products — to get away with minimal commitments. A clear defensive victory in this area has been the introduction of “special products” and a “special safeguard mechanism” for developing countries. The former allows poorer nations to select a certain set of products and treat them differently from the formula, possibly even exempting them from tariff cuts; the latter enables them to take measures to guard against any surges in agricultural imports.

Other issues

COTTON: A last-minute deal was struck between the US and four African countries (Benin, Burkina Faso, Chad and

Mali) allowing them to pursue trade-related aspects of their specific concern — a year ago, the four had protested against US cotton subsidies hurting them in the cotton market — expeditiously through a sub-committee.

MARKET ACCESS FOR NON-AGRICULTURAL PRODUCTS: The framework agreement is the draft of the text that came up at Cancun, except for one paragraph included at the insistence of the G-90. This group, largely comprising small and vulnerable developing or least-developed nations, has consistently raised the concern that they would have to cut their tariffs too much too soon under a non-linear formula — contained in the framework — that requires higher tariffs on each product to be reduced by a higher level. The paragraph inserted is a defensive one. It states that the framework contains “initial elements” for future work on the details, implying negotiations on all elements could start from scratch. At the same time, additional negotiations are required to agree on the “specifics of some (initial) elements”. This could mean it is not the elements, but only the “specifics” within “some” elements, that need to be negotiated.

SINGAPORE ISSUES: Of the four issues vehemently opposed by many developing countries at Cancun, negotiations have been launched on only easing custom procedures and costs (referred to as trade facilitation), but there are enough caveats to allow developing countries to move at a comfortable pace. The highly contentious issues of rules for foreign investment and competition have been dropped from the agenda for the duration of the Doha Round, as has the question of developing rules on transparency in government procurement.

SERVICES AND DEVELOPMENT ISSUES: The agreement merely extends deadlines on resolving development issues. On services, it provides a deadline for new improved offers to be tabled by May 2005 and calls for special attention to sectors and the modes of supply of interest to developing countries. ■

India goes hyperbolic

Claim	Comment
Products of special sensitivity exempt from tariff reduction commitments	The draft agreement clearly states these products eligible for “flexible treatment” implying reductions would not be exempted but treated with flexibility. The “criteria (for selection) and treatment of these products” to be specified during ensuing negotiations
By ensuring that additional criteria for selecting measures under Blue Box subsidies is negotiated before it is made operational, India prevented a US move to create a new blue box and transfer some of its trade distorting support to this box	The US provides no Blue box subsidies currently. The provision to cap Blue Box subsidies at 5 per cent actually allows it to increase subsidies under this category
Sensitive products re-defined to limit the number of developed country products in this category	Number of products to be treated as “sensitive” not limited. Members may choose an “appropriate number”, still to be negotiated
Special and differential treatment provisions for developing country agriculture export subsidies extended beyond the Doha Round	The text, however, states that extension would be “for a reasonable period, to be negotiated”.

PHILIPPINES / MEDICAL WASTE

Sound burial

First, they pinch. Then they pollute. Syringes hurt in life as well as in after-life. But things might change. More than six months after a unique demonstration across the country, the Philippine department of health and Health Care Without Harm



HCWH-ASA

(HCWH), an international coalition of health care professionals and community groups, have unveiled to the rest of the world a safer, cleaner and cheaper option. "Immunisation programs are expanding around the world but we need to make sure that we don't solve one health problem by creating new health problems," said Merci Ferrer, HCWH Asia coordinator.

The traditional practice of incineration has harmful consequences; it pollutes the air with dioxins and toxins. This led the Philippine department of health and the HCWH to explore other options. In 1999, the Philippines became the first country to ban burning of medical waste and now they have come up with this new method of treating waste. The Philippine Follow-up Measles Campaign 2004 was to demonstrate the efficacy of the project. Around 18 million children were vaccinated and nearly 19.5 million syringes, amounting to 1,30,000 kg of waste, were amassed.

The department of health issued waste management guidelines prior to the vaccination drive. Some of the options outlined for dealing with the waste were — treatment in an autoclave or microwave, encasement in a concrete septic tank or burial in a waste pit. Needle destroyers were also used in some places. The syringes were collected in 1,62,000 safety boxes.

A cost analysis revealed that simple clay lined burial pits were the cheapest option, followed by, centralised treatment using autoclave and microwave technology. The cost of treating 120 safety boxes in clay-lined pits was just US \$2, as opposed to the US \$137 spent when the same was buried in concrete vaults. The government has now decided to use this method for all future — routine as well as special — immunisation programmes. ■

AFGHANISTAN / AID WORKERS

Drawing the line

After 24 years of independent humanitarian work Belgium-based Médecins Sans Frontières (MSF) will withdraw from Afghanistan. The announcement came in the wake of the Afghan government's failure to conduct a credible investigation, following the killing of five MSF aid workers in an attack on June 2, in the northwestern province of Badghis.

"We have an outstanding call for murder over our heads," said Marine Buissonnière, MSF secretary-general, and went on to explain that the Taliban threat had contributed to the decision.

"Aid workers can't be targeted," she stressed, noting that a Taliban spokesperson had claimed responsibility for the killing, arguing that such organisations supported US interests.

NGOs working in Afghanistan have expressed concern over the pull-out, describing it as a worrying message to the international aid community. Meanwhile, the Afghan government has reaffirmed its commitment to address the security concerns of aid workers. Spokesperson for the Afghan interior ministry, Lutfullah Mashal said that it was government's duty to ensure the security of those who were working to help the Afghan people.

>> What's in a name? Everything, or so claim Mexican chili farmers. Facing competition from cheap foreign peppers, they want to give their products the same international brand protection as French champagne or Parma ham from Italy. The farmers demanded that Mexican varieties be origin-controlled, meaning Jalapeno-type chili peppers grown in countries like China and the United States would have to be called something else.



>> The Gujarat pollution control board (GPCB) plans to have more than 10 pollution monitoring stations in Ahmedabad. This would help it get a clear picture of the increasing pollution level in the city. The Supreme Court ordered an increase in the number of monitoring stations. Presently, the GPCB presently has only 3 stations in the city.

>> An US energy department plant under construction in Hanford, Washington, meant to facilitate removal and treatment of highly radioactive waste from leaking tanks, has a 50 per cent chance of a major accident in its 28-year lifetime. An independent government audit issued three years ago brought the issue to the fore. It, however, owes its recent prominence to the efforts of Robert Alvarez, an adviser to the energy secretary in the Clinton administration.



>> A group of white Zimbabwean farmers are to start farming in Nigeria soon. They are among those whose land was taken by the Zimbabwe government for redistribution to black Zimbabweans. The western state of Kwara, Nigeria, has promised to extend financial aid in return for the development of the state's agricultural sector. Nigeria's farms have been neglected since oil was discovered 40 years ago.

>> Wield the needle, but judiciously. So urged the Indian Medical Association (IMA) to doctors across the country in its recently released policy document. According to it, injections are to be used only when there is no alternative oral medication. The document has also urged practice of safe injections and waste disposal procedures. The IMA will hold five meetings across the country to educate doctors.



BOLIVIA / REFERENDUM

Poor little rich nation

Anation characterised by military coups has chosen the ballot over the bullet in a bid to settle a crucial national issue. On July 18, Bolivian president Sánchez de Lozada's successor, Carlos Mesa, convened and won a five-point referendum deciding the fate of the country's oil and gas reserves. Bolivia has certified gas reserves of 52.3 trillion cubic feet, second only to Venezuela in the continent and almost as much as Kuwait. It is also South America's poorest nation.

Natural gas exploitation and export is an explosive issue in Bolivia. So much so that public anger at proposals to ship the gas out of Chilean ports toppled the



President Carlos Mesa casts his vote

Gonzalo Sánchez de Lozada government in October, 2003. When Bolivia opened its gas sector to foreign investors in 1996, us energy giant Enron helped build a

pipeline to Brazil. Vintage Petroleum, a Tulsa, Oklahoma-based producer of natural gas, invested millions. So did multinational energy giants. But average Bolivians started to question why private companies and not the treasury would benefit from these gas exports. Under the 1996 law, gas underground belongs to the state but becomes private property at the wellhead.

In the referendum, Bolivians came out in support of Mesa's plan to repeal the 1996 law. This is tantamount to expropriation since it declares government ownership of what the 1996 law deemed private property. Energy companies and the us want to see how far Mesa will retreat from free-market policies when he sends a proposed energy law to congress in August. ■

WHO / EPIDEMIC

Spreading the word

With dengue fever spreading in Bangladesh, Bhutan, Indonesia and Sri Lanka, the World Health Organisation (WHO) has issued a warning to all neighbouring countries. Around 658 people have died in Indonesia, 59 in Sri Lanka and three in Bangladesh. There are around 68,000 suspected cases of the disease. Bhutan, which has never reported the disease, alone has around 1,565 suspected cases.

Intermittent rainfall seems to be the reason behind this epidemic. "As dengue fever is extending to new areas, there is a critical role for intensifying control measures for reducing the chances of outbreaks and for better case management to save lives," says Samlee Plianbangchang, regional director for south east Asia, WHO. In Bangladesh, poor awareness about dengue has unleashed panic, while in Sri Lanka, the government is under pressure to set up a special task force to coordinate the campaign against dengue. ■

BRAZIL / FOREST

Future tense

All of the 204 million hectares of the Brazilian Cerrado, a vast tropical savanna, might disappear by 2030. And this disappearing act will be more tragic than magic. According to this startling revelation, in a study by Conservation International (CI), around 57 per cent of the area has already been destroyed. Deforestation continues at a rate of 3 million hectares a year — as much as 2.6 football fields a minute. Reason: agricultural expansion, fire and unplanned development of urban areas. The biome happens to harbour the richest savanna in the world, abundant biodiversity and important watershed resources of Brazil. ■



Brazilian savanna threatened

INDIA / BANGALORE

Control, alt(er) or we shift

If threats could cure, then Karnataka's capital would be a town-planner's delight, instead of the metropolitan mess that it is. Azim Premji, head of Wipro Corporation, has threatened to pull out the company's operations from the city if its infrastructure does not improve. This is not the first time that the IT industry has tried to dictate the city's infrastructure agenda. Two years back, similar complaints from Premji had forced the S M Krishna-led Congress government to set up a task force. However, nothing came of it. The current state government too has so far remained lukewarm to the IT industry's demands.

US / TRADE

Fishy duties

Anti-dumping duties will hit shrimp exports to the us from India and three other countries — Ecuador, Brazil and Thailand. The duties, which range from 5.5 per cent to 67 per cent, were imposed following a complaint filed by the Southern Shrimp Alliance, a trade group representing shrimp producing states in the us in December 2003. Indian exporters, who will face an average duty of 14.2 per cent are not too worried as their close competitor, Vietnam, is facing higher duties, as much as 16 per cent, approximately. ■

SWAZILAND / LIVESTOCK

Hide and seek

In the republic of Swaziland in southern Africa, cattle are regarded as cultural icons. So when the government announced a new cow-branding law in the southern Shiselweni region, the Swazis were but naturally chagrined. The law will go nationwide following an education campaign to introduce farmers to their new responsibilities.

"I know each of my cows by sight. I give them names, and they respond to their names — I have no need to burn their hides. This is an insult to my mas-

culinity," thundered Sipho Dlamini, a smallholder farmer in rural Mliba in central Swaziland.

Minister of Agriculture, Mtiti Fakudze insists, "Branding is needed to reduce the risk of cattle rustling". According to the Royal Swaziland police force, cattle are driven over the border to Mozambique or South Africa by thieves. Even after recovery, identification remains problematic. A well-known reason for the Swazi farmers' resistance to the law is that it would enable police to identify the owners of animals that cause traffic accidents. ■

NEW ZEALAND / FOOD POISONING

Heavy metal

Panic waves swept across the island nation when it was learnt that a consignment of contaminated corn from China had found its way into various food products. The corn, which contained more than 100 times the safe level of lead, was imported in October. It was then milled before being used in products such as baby foods, soups, batters and baking goods. The contamination was discovered when the New Zealand Food Safety Authority (NZFSA) tested the infant formula as part of its Total Diet Survey, carried out once every five years. Authority director of imported and domestic food, Tim Knox said the authority concentrated on inspecting foods it considered high risk. Corn was not among those foods. The NZFSA claims that the health risk for anyone



who has consumed food from the affected batches is extremely low.

But not everyone is satisfied with these explanations. Green MP Sue Kedgley accused the authority of being lax and demanded a public inquiry. Kedgley has also drawn attention to a scientific study published in the *New England Journal of Medicine* according to which any lead exposure, whatsoever, can lead to irreversible intellectual impairment in children. ■

UK / WASTE

Right move

A plant in the Scottish Highlands, will be the first such in the UK to recycle lithium-ion batteries. These batteries are mainly used in mobile phones, camcorders and laptops. Less than 2 per cent of consumer disposable batteries are currently recycled, with the rest being disposed of in landfill sites.

The base, created at Golspie by AEA Technology, was officially opened by Scottish Enterprise Minister, Jim



Wallace. The Golspie plant aims to set a new world standard for battery recycling. Campaign group Friends of the Earth (FOE) in Scotland commended the move, branding batteries "an environmental menace". According to FOE Scotland's head of research Dan Barlow, approximately 680 million batteries are dumped every year. "While this plant will deal with lithium-ion batteries only, its opening certainly represents a major step in the right direction for dealing responsibly with everyday waste," said Barlow. ■

PAYING THE PRICE: To tide over acute water crisis in the Punjab province of Pakistan, members of parliament of the ruling coalition of Punjab have asked the government to buy water from India. They



have also demanded renegotiation of the 1960 Indus Water Treaty with New Delhi over the Sutlej waters. Members of the treasury benches, Riaz Hussain Pirzada, Sardar Farooq Ahmed Khan Leghari and Sardar Saleem Jan Mazari, moved a motion in the national assembly on the issue. According to them, parts of Punjab province faced severe water shortage leading to damaged crops and a drought-like situation. Pirzada said, besides discussing Kashmir and other political issues, the government should negotiate the purchase of water to save the 50 million people in southern Punjab. Former military ruler Ayub Khan had "sold" the Ravi, Beas and Sutlej rivers under the Indus Water Treaty in 1960, which formed the primary water source of the Seraiki belt, he said.

INDIA / PANCHAYAT

Decentralisation snag

The uncertainty over fiscal empowerment of India's *panchayati raj* institutions (PRIs) continues to deepen. At a national consultative seminar, held in Kolkata on July 24-25, the Union ministry of *panchayati raj* affairs (MOPRA) decided to undertake an eight-month long nation-wide survey of the funding pattern, functions and functionaries of these local bodies. This was the first of a series of seven meets to be held by MOPRA to pave the way for amending the Panchayati Raj Act for effective decentralisation of power. The proposed amendments include ensuring direct funding of PRIs from the Union government and making the *gram sabha* the nodal decision-making body.

It was being hoped that the amendments would be placed for voting before the Parliament by the end of this year. But at the Kolkata meet, the 27 participant states failed to arrive at a consensus on the amendments. Therefore, following the survey, a status report would be prepared only by March 2005 to evaluate the structural and legislative changes needed in the Act. ■



HONG KONG / GE SEEDS

State and scandal

Independent laboratory tests carried out in Hong Kong revealed genetically engineered (GE) seeds in packages of papaya seeds being sold by the department of agriculture's research station in the province of Khon Kaen. One of the fields at the research station has been ascertained as the source of the GE seeds. Greenpeace activists sealed off the GE papaya at the research station and demanded government intervention in the matter.

The recent revelation proves the futility of the ban imposed on field trials in 2001. The consequences of growing GE papaya in Thailand are serious. Not only is it the staple food, it is also grown everywhere. The agriculture department has filed property damage charges against Greenpeace South-east Asia, based in Bangkok. The department's chief Chakan Saengraksawong accused the activists of disrupting a 10 year long government research. ■

GREENPEACE

COMMENT RUSTAM VANIA



INFAMOUS FIVE: Eight US states and the city of New York are taking five of US' biggest power companies to court. Reason: they are some of the biggest contributors to global warming in the country. The attorneys general from California, Connecticut, Iowa, New Jersey, New York, Rhode Island, Vermont, Wisconsin, as well as New York City's corporation counsel, have filed a public nuisance lawsuit in the federal court in Manhattan. It is the first lawsuit by state and local government against private companies over global warming emissions. The companies being sued are American Electric Power Co., Southern Co., Xcel Energy, Cinergy, and the federal Tennessee Valley Authority. The action is not trying to obtain monetary damages from the companies, but is calling for a three per cent reduction in carbon dioxide emissions every year for the next ten years. A second legal action is also being brought to bear against the same five companies by the Audobon Society of New Hampshire and the Open Space Institute of New York. The two land groups are being represented by the Natural Resource Defence Council (NRDC). "These cases represent a new frontier in the fight against global warming pollution," said David Doniger, NRDC attorney.

DAMNED: Sri Lanka's premier environmental group, Environmental Foundation Ltd (EFL), has gone to court against the government's move to grant permission for the construction of a hydro-power project on a protected waterfall in one of the country's most verdant highland reserves. It has filed action in the court of appeal seeking to quash the approval given by the Central Environmental Authority for the project on the Bomuruella falls. In its petition, the EFL claims that the waterfall used for the project falls within a very important catchment area and requires the felling of some 1420 trees. This would cause immeasurable damage to the fragile ecology.

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Organic states

Mizoram passes legislation to go fully organic, Sikkim already on the path

NITIN SETHI *Delhi*

THE resolve to rid agriculture of chemical fertilisers and pesticides, expressed by Sikkim an year ago, has been given a shot in the arm by Mizoram. The state made history by becoming the first in the country to legislate for turning its entire agricultural produce organic. It passed the Mizoram Organic Farming Act, 2004 on July 12, 2004. Sikkim is yet to pass a similar legislation.

Mizoram has only done what the Union government has always prescribed in its National Programme for

Organic Production (NPOP), launched four years ago, but never really practiced. When Mizoram governor, A R Kohli, announced the state's intention of going organic three months ago at a seminar in Delhi, critics questioned the ability of any state to completely do away with the usage of pesticides and fertilisers. But they perhaps missed the fact that the two states are among the lowest consumers of pesticides and fertilisers in the country. In fact, this is a trait common to all northeastern states (see table: *Non-toxic northeast*).

Only about 25 per cent of

Mizoram's cultivators, comprising 55 per cent of the total population, use chemicals in their crops. O P Singh, director, ministry of agriculture, Mizoram, says: "A very small quantum of fertilisers is being used, that too primarily for rice and vegetables grown in plains. People don't use fertilisers and pesticides even for the rice grown on hills. Our passion fruit, turmeric, ginger, orange and pineapples are completely organic. So is chilly, sesame and hill potato." Singh also points out that the move towards organic is not sudden in the state. In 2000, the Mizoram government had removed subsidies on fertilisers and pesticides. It also controlled their private sales by making licensing compulsory.

The challenge for Mizoram now would be to get its organic produce certified by accredited international agencies. This is the only way for the produce to command a premium price in the global market. The state has legislated certification and accreditation under the Accreditation Regulations 2001, as per the NPOP.

Some critics have panned Mizoram's legislation, claiming it has too many loopholes. They say it is excessively dependent upon the government, which has to issue notifications and rules from time to time to give it teeth. Besides, it doesn't talk about turning all the areas organic right away, nor does it fix any particular timeframe for the actions to be taken. It has been left to the state's discretion to demarcate designated areas for organic production. But Singh defends the Act: "Though the minister for agriculture, H Rammawi, wanted us to declare the entire state (besides the three autonomous districts of Mara, Lai and Chakma) organic, the department suggested we demarcate areas after checking fertiliser usage patterns as the decision should not cause short-term harm to farmers using fertilisers in some areas." He promises that the state government advisory body would soon do so and also set up a timeframe. ■

Non-toxic northeast

States of the region use little pesticide

States	Amount of pesticides (in tonnes)				Share*
	1985-1986	1986-1987	1987-1988	1994-1995	
Arunachal Pradesh	17	18	25	42	0.05
Assam	810	1,410	531	630	0.78
Himachal Pradesh	690	553	545	290	0.36
Manipur	43	40	38	42	0.05
Meghalaya	40	42	44	19	0.02
Mizoram	6	7	10	13	0.02
Nagaland	9	4	13	—	—
Sikkim	16	18	20	32	0.04
Tripura	190	160	138	100	0.12
All India	62,219	67,272	66,896	80,659	—

*of India's total consumption (in percentage)

Sources: 1. Anon 2003, *Teri Energy Data Directory & Yearbook 2002-2003*, The Energy and Resources Institute, New Delhi, p228; 2. Anon 2003, *Basic Statistics of NER*, Northeastern Council Secretariat, Shillong, p121

Sikkim too

Going organic, slowly

Sikkim's chief minister, Pawan Chamling, declared the decision of his state to go fully organic in early 2003. The move produced mixed reactions, as the government departments concerned were discouraged by the magnitude of the task. But experts felt the work wasn't so difficult as the use of chemical fertilisers in the state was marginal, at just about 10 per cent. Pesticides have already been completely ousted from the state.

"We have already started the process. The horticulture department

has adopted 100 villages in the state to be converted into bio-villages, where organic farming would be introduced," said J R Subba, director (horticulture). In each of these villages, 30 farmers with a land holding of one acre each would be trained in organic farming techniques. The project started in November 2003 and will go on for three years.

"The use of chemical fertilisers will be reduced in a phased manner, and, by 2007, would be completely stopped by withdrawing all subsidies. It would take seven to 10 years to go fully organic," Subba conjectured.

— SARIKAH ATREYA *Gangtok*

Exposed

Fraud by Leh Berry's officials

TASHI MORUP / *Leh*

A MAJOR scam has been exposed in a venture aimed at accelerating the economic growth of farmers of the Ladakh region. The case involves two former top officials of the Ladakh Food Limited (LFL), which manufactures the popular Leh



RUHANI KAUR / CSE

Growth track marred by corruption

Berry brand of seabuckthorn nectar. The father-son duo of D K Mittal and Varun Kumar Mittal, LFL's former chairman and managing director, respectively, have been charged with misappropriating funds to the tune of Rs 3 crore in a suit that has come up in the district court. They have also been accused of presenting a fictitious list of shareholders to get loans, grants and equities for personal gains.

The police registered a case of forgery against the duo on the basis of accusation made by Ghulam Abbass Abidi, executive councillor in charge of health in the Ladakh Autonomous Hill Development Council (LAHDC). Abidi's name was in the fabricated list of 396 shareholders that includes names of 300 farmers too. "I never saw Mittal, leave aside having any dealings with him," Abidi avers.

LFL's board of directors, chaired by the managing director, Small Farmers Agri-Business Consortium (SFAC) of the ministry of agriculture, removed the Mittals from their posts on noticing the fraud. The duo, however, allegedly continued working illegally. But LFL's new

management, with Anand Prakash as its managing director, has charged the promoters acting through Mittals with embezzling funds meant for farmers. The board of directors has written a letter to member of parliament, Thupstan Chhewang, in this regard. It says the Mittals siphoned away profits, equities and grants from SFAC, National Agricultural Cooperative Marketing Federation of India Limited and the ministry of food processing industry and loans from Exim Bank and ICICI Bank to the tune of Rs 3 crore.

It was SFAC that decided to set up the fruit processing plant at Phyang in Leh to tap the economic potential of the wild seabuckthorn fruit. LFL, a public limited company established in 2002, was short-listed as a promoter and the plant was established under a Joint Venture Agreement. Chhewang, the then chairman of LAHDC, was appointed the ex-officio chairman of LFL's board of directors. Meanwhile, it is alleged that the formation of LFL has led to overexploitation of the seabuckthorn plant. Besides, farmers receive a very small portion of the profits made. It has also caused heavy losses to the Indus Tsestalulu Society, a group of local women who first started producing seabuckthorn juice under the label of Tsestalulu juice (local name for the berry), sold locally. ■

Mercury toys

Kellogg to withdraw them

FACED with fervent censure in the US, Kellogg Company has decided to withdraw its Spiderman toys "Spidey Signals" fitted with mercury batteries, which were distributed in its sugared cereal boxes. The toy was a promotion for the movie Spiderman II. The company also announced its resolve to never use mercury batteries in its future promotions. Kellogg would offer postage-paid envelopes to consumers who wish to send back the toys they have already received.

The decision fol-

Loaded with lead

Indian toy jewellery pulled out from US market

In the largest recall of its kind in US history, four toy jewellery importers recently announced a voluntary withdrawal of 150 million pieces of toy jewellery from the country's market. The decision was taken after the US Consumer Product Safety Commission (CPSC) found many of these items containing dangerous levels of lead. The rings, necklaces and bracelets, made in India, were sold in vending machines outside grocery stores and malls since January 2002. The four importers control more than 90 per cent of the US market.

CPSC approached the importers after test results on 10 pieces of jewellery showed lead content, according to Ken Giles, CPSC spokesperson. Although only around half of these toys would be dangerous, the decision aims at removing the confusion about what is safe and what isn't. Lead poisoning in children causes behavioural problems, growth retardation, hearing and learning disabilities and affects their nervous system.

lowed an agreement with New York attorney general Eliot Spitzer. Spitzer said the pact would apply nationwide. As per the agreement, Kellogg would stop selling or distributing mercury-powered promotions by September 30. But the catch is, by then the campaign would have served its purpose.

Mercury-powered toys are dangerous as the metal is highly toxic. Kellogg's spokesperson Celeste Clark claimed that though Spidey Signals met federal safety norms and did not impact food quality or safety, the action was being taken to "go beyond what is required by law to address an issue important to our consumers and the environment".

Earlier, the company had to stop shipments to Connecticut and New Hampshire and recall cereal boxes from retailers as mercury-powered toys are banned in these states. But this couldn't be done for New York, as it didn't have any such law. Environmental organisations have called for a federal law banning mercury batteries in toys and other items sold for children. ■



Groundwater control

Centre urges states to enact laws, take other steps

THE Union government recently asked the states, in no uncertain terms, to get their act together in 'groundwater management' and do it fast. The ministries of agriculture and water resources jointly summoned top bureaucrats from all states and union territories to formulate an action plan on "how to use water more efficiently". Groundwater was the most critical issue on the table at the two-day conference, the first of its kind, held in New Delhi. Everything related to it was discussed at the meet: methodology to estimate the levels of water table; artificial and natural recharge methods; pricing the resource for bulk users; and most importantly, enactment of legislation on groundwater by the states.

Much of the deliberations revolved around the irrigation sector, which consumes more than 85 per cent of the country's 'utilisable' water resources, according to government figures. The chief secretaries, principal secretaries and command area authorities discussed efficiency levels of irrigation systems; rationalisation of water charges for irrigation; flood management; large-scale reservoir siltation; and groundwater exploitation.

Experts suggest adopting a tough stand towards the states due to their dismal track record. "Most states fail to come up with the required information on time for our estimation records," complains a Central Groundwater Authority (CGWA) official. At the meet, the defaulters promised to complete their work by December 2004. No such deadlines were, however, set for enacting state groundwater laws, a long overdue commitment. The process had begun way back in 1969 but till now only four states — Goa, Andhra Pradesh, Tamil Nadu and Kerala — and the union territory of Lakshwadeep have enacted the law. These laws are vital, especially since the government is now proactively talking about pricing groundwater for bulk consumers. ■



LINGARAJ PANDA

Ecological jam at Lord Jagannath's doorstep

Gods feel the pinch too

Puri *rath yatra*, Jagannath temple plagued by scarcity of wood

SATYASUNDAR BARIK

AN ECOLOGICAL crisis resulting in scarcity of wood has placed the sacred Jagannath *rath yatra* (chariot journey) of Puri in jeopardy. Wood is an integral component of the rituals associated with the *yatra*. But lately, the divisional forest officers responsible for making the required quantity of wood available have expressed reluctance in doing so.

People from across the country flock to this coastal town of Orissa every summer to witness the *yatra*. Twelve rare varieties of trees are used for constructing the three huge chariots and the images of the three deities — Jagannath, Balaram and Subhadra — they house. Around 1,130 big logs are required for the construction of the chariots alone. After the festival, the chariots are dismantled and the wood is used in the temple's kitchens.

"We need not worry about the logs. Shortage of wood has never impeded the car festival. We have explored only one district of Orissa (Nayagarh). There are 15 other districts which could supply the wood for another 100 years," claims Ramchandra Das Mahapatra, member of the Chariot Construction Committee. But forest experts say Mahapatra's optimism is misplaced, as forests in other districts are neither dense nor very well protected.

Wood is also used for preparing food in the temple. The casuarina tree is

the chosen variety but it is disappearing fast. "To prepare 56 varieties of food for nearly 30,000 people, we use 8.5 tonnes of wood in the kitchen everyday. During the *rath yatra*, the daily consumption of wood increases to 25 tonnes," says Managobinda Samantray, president of Suar Mahasuar Nijog, a body of over 1,000 priest-cum-cooks. But Samantray rues that procuring this wood has become very difficult now. The Nijog recently suggested the creation of forests to meet the wood requirement. But this does not appear practicable, especially as a similar government project has already failed. The Rs 650 million Jagannath Bana Prakalpa was launched in 2000. The forest department planted trees in a 2,800-hectare area along the Mahanadi River but hardly any trees are seen now.

Tapán Padhi of Regional Centre for Development and Cooperation, a Bhubaneswar-based non-governmental organisation working in the forest sector, suggests entrusting forest protection communities with the meeting the temple's wood requirements.

The ecological crisis in Puri has other manifestations too. Ikan Bisoi of Kumbhakar Nijog, an association of traditional potters, says: "You cannot find suitable soil for earthen pots and the wood for burning the clay has also become expensive." Nearly 45 per cent of potters are said to have abandoned their profession. ■



Bittersweet

EC sugar reform proposal doesn't please anyone

THE European Commission (EC), the EU executive arm, has attempted to reform the 35-year-old system of European countries for managing their domestic sugar. This is the first time such a step has been taken. On July 14, 2004, the EC proposed cuts in the price at which it intervenes to support producers and in the sugar quotas eligible for this support. But in partly compensating for revenue losses, it is effectively reducing support by only 13.3 per cent and not by one-third, as it claims. Not surprisingly, civil society organisations are outraged. The sugar industry, on its part, claims that not only would its profits dip by nearly 30 per cent, 83,000 people would also lose their jobs.

The EU has been severely criticised in recent times for distorting international trade and harming developing country exports. The EC proposal aims to address this problem. Franz Fischler, EU agriculture commissioner, said: "Consumers will see much more market

Off the level

Is the government's handling of northeast floods off-track?

THE fury of floods reached Assam's power centre when Guwahati's prominent markets got flooded and experts noticed a crack in the city's only crossover bridge over Brahmaputra river. The breach was repaired in record time. But the crisis in the rest of the state hasn't been assuaged to the same extent.

Even as the state government reported on July 26, 2004 that water levels of the major rivers had begun receding, the overall flood situation remained grim. Road communication to all flood-affected areas stayed severed. While the death toll in the state reached 136, the number of people dead or missing in the floods was 535 in India, 285 in Bangladesh, 86 in Nepal and three in Bhutan, according to an AFP tally based on official figures as on July 26. More than 1.17 crore people have been affected in Assam and more than 15.87 lakh of these are still staying in the 1,557 relief camps. Besides, inundated areas in the northeast have reported cases of malaria and diarrhoea.

The despair in the situation was further intensified as Assam's water resources department declared before the press that the state's 4,459 km-long embankment system was vulnerable, having completed its lifespan two decades ago. These embankments had

been constructed by the government between 1950 and 1970 as a short-term flood control measure. A master plan prepared by the Brahmaputra Board in 1981 to permanently solve the problem suggested the construction of high-rise multi-purpose dams in upper catchments of the Brahmaputra basin. These dams are now under construction but are very controversial with regard to their environmental impacts.

It was a breach in a dam in Bhutan that flooded Assam and other Indian states more than 20 days before the government's estimates. The dam is a part of the 60 megawatt Kurichhu hydro-electric project in Bhutan's Mongar district. The project is funded by India and also sells surplus power to it.

Successive floods have repeatedly shown that watersheds and flood plains of the seven northeast states, Nepal, Bihar, Bhutan and Bangladesh are intertwined. Thus, as Assam suffered the price of the breach in Bhutan, Bangladesh and Garo Hills in Meghalaya also bore the brunt, in turn. Tripura too got cut off from the rest of the country on July 24 due to floodwaters of Bangladesh rushing onto the shared flood plains.

Meanwhile, prime minister Manmohan Singh constituted a Task Force to look into the problem during his maiden visit to the area after assuming office. He also released the usual relief funds. It remains to be seen whether the Task Force again recommends construction of dams or has the political mandate to view the region as an integrated hydrological system. ■

WAITING FOR THE BUS

As has happened in other cities, adoption of compressed natural gas (CNG) for public transport in Ahmedabad is stuck in a bureaucratic tangle. The Ahmedabad Municipal Corporation (AMC) is to introduce 100 new CNG buses and convert 300 existing buses to CNG by December 31, 2004. This is part of an action plan of the Gujarat Pollution Control Board (GPCB) submitted to the Environmental Pollution (Prevention and Control) Authority formed by the Supreme Court.

AMC insiders say the proposal for buying new state transport buses has been pending for four months. Bureaucrats and corporators disagree on the company from which these be purchased and the emission standards they should meet. "There are elements resisting the move to buy the latest Euro III compliant buses with lower emission levels," AMC sources revealed. The AMC standing committee considered the proposal in the second week of July 2004. It was dubbed "vague and unclear"

orientation and developing countries much less trade distortions.” But civil society groups like Oxfam and WWF International disagree. They claim the proposal has nothing to do with poverty alleviation or environmental concerns. “After decades of waiting for reform, this is a half-hearted effort,” alleged Elizabeth Guttentstein, head of the WWF Agriculture Program, in a joint press release by the two organisations. They demanded an immediate elimination of all forms of direct and indirect export subsidies, end to sugar dumping in the international market and increase in imports from the poorest countries at remunerative prices.

Countries like Ireland and the Nordic nations have also challenged the proposal, saying it would kill their domestic sugar industry. The Italian Farming Federation has called the proposal “unacceptable”. It claims that the reference price for intervention has been reduced “excessively” and the decrease in sugar beet prices is “too large”. Wirtschaftliche Vereinigung Zucker, a German trade group, said the proposal has endangered the future of European beet and sugar production.

Some non-EU countries, such as those from African, Caribbean and Pacific nations group and India would

TAKE NOTE

In an interim ruling on August 4, 2004, the World Trade Organisation's Dispute Settlement Body has reportedly held the EU sugar subsidies illegal. The complainants, Australia, Brazil and Thailand, had argued that the EU exceeded the levels it was supposed to subsidise. The final version of the ruling will be circulated to the parties in September.

also lose from the proposal. They enjoy preferential access to the EU market under bilateral arrangements and receive a refund of the difference between the EU domestic price and the international price. With the domestic reference price dropping, the amounts they would receive as refunds would also decline. The EC has proposed initiating a dialogue with these countries before the end of 2004 to identify measures to deal with the setback. ■

Firing the fuel

Delhi acts tough on diesel vehicles, levies pollution tax

DELHI has become the first city in the country to levy a pollution cess. State finance minister, A K Walia, announced an additional levy of two per cent on polluting diesel cars and multi-utility vehicles while presenting his budget on July 22, 2004. He said the step is aimed at making people shift to cleaner fuels for personal transportation needs. This cess will be imposed in addition to the ad-valorem tax rate, based on the price of vehicles, which has also been introduced in the state for the first time.

The government is also examining the possibility of imposing an additional entry tax on diesel vehicles registered outside Delhi to discourage their entry in the city. But it faltered on one point. Under mounting pressure from the diesel lobby, it rolled back its sales tax hike on the fuel by eight per cent. But the cited reason was a fear of drought and additional burden on farmers, who use diesel.

The automobile industry is piqued about the imposition of the pollution cess. “The step is retrograde and should not be introduced,” demands the Society of Indian Automobile Manufacturers. “The charge on diesel vehicles is discriminatory and not based on science. It discriminates between vehicles that meet existing emission norms and comply with all existing government regulations,” it argues. The industry's annoyance is understandable: the city has recorded a 106 per cent annual incremental increase in diesel car sales since 1999.

But the New Delhi-based Centre for Science and Environment (CSE) said the industry's claims are misleading. Diesel vehicles emit more nitrogen oxides and particulates compared to those running on petrol. But the Euro II emission standards currently in force in the city are discriminatory as they legally allow these vehicles to pollute more, it pointed out. Commending the new move, CSE said the state's budget had addressed the public health imperatives of the situation for the first time. Countries like the US, Japan, Germany and Sweden had also acknowledged the toxic effects of poor quality diesel. Scientific organisations and regulatory agencies, such as the International Agency for Research on Cancer, World Health Organisation and the California Air Resources Board, have branded diesel particulate matter as a probable human carcinogen.



All for farmers? A roll back beneficiary

Meanwhile, vehicle dealers in the city are worried about the imposition of the ad-valorem tax rate too. They argue that it will increase the cost of vehicles in Delhi and instigate customers to buy them in Haryana, where the road tax is based on the weight of the vehicle. ■

Ahmedabad's CNG plans bureaucratised

and sent back because it did not specify the bus manufacturer and was tabled without inviting tenders, says Jayantilal Parmar, the committee's chairperson, who wants national bids for the purchase of buses.

“Why should we invite national bids when there are only two suppliers [TATA and Ashok] of CNG buses,” asks T G Jalavadia, deputy commissioner in charge of transport. AMC had sent its transport committee members to Mumbai and Delhi to study the performance of CNG buses. Two months later, they are yet to submit any report. In the meantime, two CNG dispensing outlets were to be ready before the onset of the monsoon. Not one has come up till now. But GPCB member secretary Sanjiv Tyagi isn't without hope: “The work is underway and the deadline will be met.” After government buses convert to CNG, it is the turn of 50,000 auto-rickshaws and private buses.

MAHESH L Ahmedabad

Still under fire

Will the CBI report oppose tribals in the Muthunga case?

AN IMMINENT report by the Central Bureau of Investigation (CBI) might compound the woes of Kerala's tribals who suffered the police firing from close range in their struggle for forestland. The agency is about to give a clean chit to the police operation to drive the tribals away from the Muthunga Wildlife Sanctuary last February, the local media claimed. The tribals had occupied the forest to insist on adherence to a 2001 pact with the government that promised them land. A policeman and a tribal were killed in the incident.

While the report will be filed in the High court only by the end of August 2004, the tribals already apprehend its contents. "We had asked for the CBI

enquiry. But the way in which it was conducted does not give us hope. It was just an attempt to protect the police and forest officers," alleges C K Janu, leader of the Adivasa Gothra Maha Sabha (AGMS), which spearheaded the tribal land rights movement in Kerala. The CBI has not confirmed the report's leakage.

"The CBI attacked our people during the enquiry to frighten them," Shriram adds. He claims that four tribals, Radhakrishnan, Venugopal, Babu and Mani, were taken to a forest bungalow in Begur, Tirenelli, six months ago and beaten severely by CBI functionaries. The tribals also say the police had tortured many of them after the firing incident.

Meanwhile, K J Joseph, the then director general of police, believes the report would vindicate the police stand. "The police action was warranted as it did not remain a law and order problem but had turned into a hostage crisis with a forest official and a police official in their custody." ■

Sea sand crisis

Sri Lanka's government flayed for mining coastal sand dunes

ENVIRONMENTALISTS in Sri Lanka are up in arms against mining of sand dunes in Puttalam, the coastal town in the country's northwest. At stake are the fragile water table, vegetation, freshwater sources and people's safety from harsh winds, they say. Their appeal for stop-

Lesson from the past: river sand mining had to be banned



THE SUNDAY TIMES

ping sea sand mining comes amid a clamour of demands from the construction industry for lifting restrictions on sand mining in riverbeds.

The government imposed these restrictions last year and the Supreme Court banned mechanised sand mining in rivers earlier this year. These led to a 700 per cent rise in the cost of sand. Aiming to use sand deposits on the west coast as an alternative, the government allowed permit holders for river sand mining to remove this sand. But the Centre for Environmental Justice (CEJ), a non-governmental organisation, has requested Sri Lanka's environment and natural resources minister, A H M Fowzie, to stop mining in the sand dunes of Kalpitiya peninsula and the sea belt from Udappuwa to Palavi, both in Puttalam district, according to CEJ executive director, Hemantha Withanage.

Withanage warns if this is not done, the consequences could be dangerous. Tampering with the region's ecosystem by mining sand dunes would remove the natural wind barriers. The CEJ has also pointed out that most locations from where sand is mined are adjacent to agricultural lands and this would harm vegetation. It could also cause seepage of saline water into freshwater, harming the region's fragile water table, and expose people to harsh winds. ■

IN SHORT

► **LETHAL TEFLON:** The US Environment Protection Agency (EPA) has charged the DuPont company with hiding the adverse health and environmental effects of Teflon, used in its non-stick cookware and carpet protection product. In doing so, the company violated the federal Toxic Substances Control Act from June 1981 to March 2001, it says. Traces of perfluorooctanoic acid, the main chemical in Teflon, were found in water supplies near DuPont's West Virginia plant and also in the blood of a pregnant employee. The chemical has been linked with birth defects in the offspring of the company's former employees.

► **ON NUCLEAR PATH:** After more than five years, the Chinese government has approved the construction of two new nuclear power plants. The step is aimed at tackling electricity shortages, the state media said. The new plants would install two 100-megawatt nuclear reactors each. China is aiming at a four-fold increase in its nuclear power generating capacity by 2020.

► **AGRI TUSSLE:** Agribusiness giant Monsanto Company has filed two new lawsuits against its Swiss rival Syngenta AG. According to one suit, Syngenta infringed patents held by Monsanto's DeKalb Genetics Corp. Monsanto has urged the court to prevent Syngenta from developing, using and selling Roundup Ready corn seed, including its GA21 Roundup Ready variety. In the other case, Monsanto has called for the withdrawal of a license that allows Syngenta to sell soybeans made resistant to Monsanto's Roundup herbicide.

► **MELTING BEAUTY:** Experts have warned that climate change could melt the Pastoruri, one of the most beautiful peaks of the Andes in Peru, and many glaciers of the country in the coming years. The glacier that covers the Pastoruri has shrunk at the rate of 19 metres per year since 1980. Peru's national environment council, CONAM, has said this is just one of the 18 glacier-capped mountains of the country facing the wrath of global warming.

► **SEEDLESS ATTEMPT:** The Maharashtra government suffered a blow in its attempt at drought relief in Vidarbha and Marthwada regions. Its much hyped Rs 5-crore cloud seeding project, 'Prakalp Varsha', generated only around 20 millilitre rainfall in these areas. The government had last year allocated Rs 18 crore for such operations.

Marvel unearthed

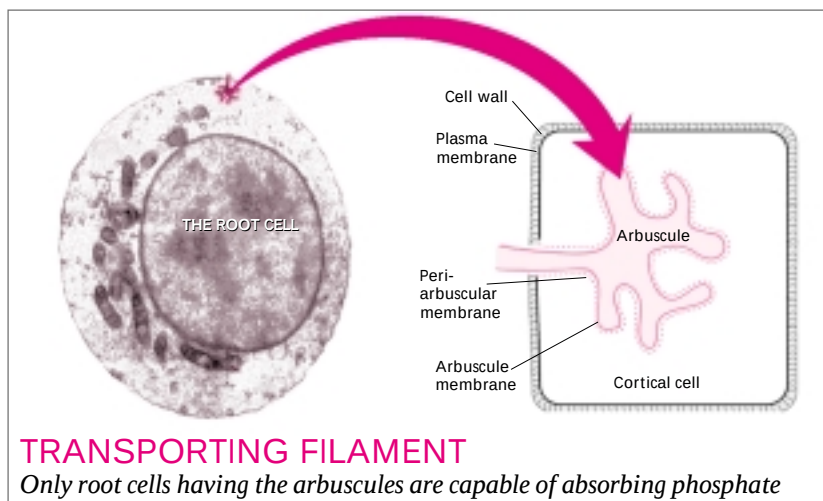
Newly found plant gene could help increase the natural phosphorus uptake of crops

T V JAYAN

SCIENCE seems to have inched closer to answering a question that has nagged agriculturists for almost 100 years — how to make an essential plant nutrient present in the soil available to crops in adequate quantity. A team of US scientists has recently uncovered a plant gene that is involved in transferring phosphate, the nutrient, from soil-dwelling fungi to the plant cells. Understanding the functioning of the gene would open up the possibility of manipulating the fungi as well as the plant genetic system to deliver additional quantities of the nutrient to the crops.

Among the three key plant nutrients — nitrogen, phosphorus and potassium — phosphorus is the most difficult for the crops to absorb from the soil. Microbes present in the soil convert phosphates into an immobile, organic form. As a result, most of the nutrient gets locked up in the soil, forcing farmers to apply phosphatic fertilisers to improve crop yields. But even rock phosphates — the source of phosphatic fertilisers — are non-renewable resources and it is feared their stock will deplete over the next century.

Therefore, the only ray of hope for agriculturists is the fungi-gene symbiosis. The fungi, *Arbuscular mycorrhiza*, colonise the plant root. They have thread-like filaments that run deep inside the soil. These filaments are able to suck phosphate in small quantity from the soil, which is then transferred to the plant roots. Though extremely important from agricultural point of view, very little is known about this interaction between the fungi and the roots. Consequently, scientists have not been able to evolve ways to exploit the



colossal phosphorous wealth of the soil.

The discovery of the gene may provide a way out. The find was disclosed at the annual meeting of American Society of Plant Biologists held in Florida on July 28, 2004. The gene was found by Maria Harrison and her colleagues from the Boyce Thompson Institute for Plant Research at the US-based Cornell University. The team worked on the legume plant *Medicago truncatula* — a species commonly used in the laboratory to study various flora processes.

Genes and means

It found that the fungi initially grow in the spaces between the cells of the plant roots, but slowly they permeate into the cells, where they form branched, thread-like filaments called the arbuscules. Although physically present inside the cell, the arbuscules remain separated from the cytoplasm (main constituent of the cell) by a layer called the peri-arbuscular membrane. But this membrane is in contact with the plasma membrane — the protective layer of the cell.

During their investigations, the scientists stumbled upon a gene, *MTPT4*, which is present only in those root cells that contain arbuscules. Detailed studies ascertained that *MTPT4* is an integral component of the peri-arbuscular membrane. The gene helps transfer the phosphate released by fungi through the peri-arbuscular membrane into the cell. "The gene is a fundamental part of the phosphorus transfer. Without it, the process would not be possible," Harrison informed the meet.

She said considerable work lies ahead before scientists learn to exploit the discovery. But when it happens, the pay-off to growers and the environs could be substantial: more efficient plant growth with less use of phosphorus-based fertiliser, and a subsequent reduction in the phosphate runoff in surface water. "Phosphorus in our lakes and rivers often nourishes undesirable algae growth. Agriculture is a major source of phosphate pollution. Therefore, any effort of biologists aimed at improving the phosphate uptake of plants will make agriculture more sustainable and less harmful for the environment," said Harrison.

The scientists would now undertake studies to scrutinise whether there are other genes that are involved in the phosphate transport. ■

Any effort aimed at improving the phosphate uptake of crops would make agriculture more sustainable and less harmful for the environs

ENVIRONMENTAL SCIENCES

False hopes sunk?

The Amazon emits high levels of greenhouse gases

COUNTRIES wanting to escape their obligation of combating climate change have always projected the Amazon rainforests of Latin America as the key absorbers (sinks) of polluting greenhouse gases. But this notion may be disingenuous, indicate scientific discussions held during a recent international meet. During the mega-event a controversy raged about how much greenhouse gases the mighty Amazon emit. Ironically, scientists were unable to reach a consensus even after three days of dialogue.

The aim of the conference was to

that the greenhouse gas emissions of the Amazon in 2003 were more than 400 million tonnes — a figure nearly 60 per cent higher than the previous estimates. Logging and burning were mainly responsible for the crisis — the Amazon lost about 2.4 million hectares of its forests in 2003 alone. Fearnside asserted that the earlier projections had failed to take into account a big culprit — vast tracts of forests submerged under water due to hydropower projects. The rotting vegetation now emits very high levels of methane. As per Fearnside, Amazon's four dams together emit more methane than Sao Paulo, Brazil's largest city.

But Fearnside's prognosis was challenged by many scientists, including Carlos Nobre of Brazil's National Institute of Space Research. As per Nobre, the basin's emissions were not more than 250 million tonnes in 2003. His research also indicates that the continuing devastation of the area will convert the biodiversity hotspot into a vast, grassy savanna in 50 to 100 years. "In the worst case, the forest may lose some 60 per cent of its area. In the intermediate case, 20 per cent of the area will disappear," informed Nobre. "Even without deforestation, global warming could cause a 'savannisation' of 20-30 per cent of the rainforests," he added.

Such findings have important political ramifications, especially for Brazil, as it is expected to publish an inventory of its emissions this year as required by the Kyoto Protocol. If Fearnside's figures are anywhere close to reality, the country has a problem at hand — it means that the Amazon, most of which fall in Brazil's territory, will be seen as emitting more noxious gases than absorbing them. High emission levels even mean trouble for others — the forests cannot be used for carbon trading, as desired by the industrialised world, particularly the US. ■



Burnt out: Amazon is indeed not a carbon sink

discuss the latest findings of projects being executed under the Large Scale Biosphere Atmosphere Experiment in Amazonia (LBA) — the world's most comprehensive study on deforestation. The research, which began in 1998 and is expected to continue through 2006, seeks to examine the interactions between the rainforests and regional as well as global weather patterns. It involves more than 1,000 scientists and specialists from over 100 research institutes that are based in Latin America, the US and Europe. The exercise is made up of 120 projects, 61 of which are already complete.

Participating in the conference convened in Brasilia from July 27-29, 2004, Philip Fearnside of Brazil's National Institute for Amazonian Research said that the findings of a project showed



HEALTH & MEDICINE

Check it!

Medical products leach out toxic chemicals

NUMEROUS people, including newborns, are being exposed to a toxin via medical products, indicates a recent report. Di (2-ethylhexyl) phthalate (DEHP), the toxin, is found in products made of polyvinyl chloride (PVC). DEHP is added to PVC so that it gets softened to manufacture products like blood bags, urine bags and tubes.

The report, *Preventing Harm from Phthalates, Avoiding PVC in Hospitals*, has been released by Health Care Without Harm, a coalition of 437 organisations. At least 48 products used in European hospitals were tested. Almost 39 products contained DEHP, which accounted for 17 to 41 per cent of the total weight of the product. Since DEHP is not chemically bound to PVC, it leaches from PVC products depending on a variety of factors, including storage and usage temperatures. Particularly troubling is the 'potential' exposure for premature babies. "These babies receive one or more blood transfusions per week...DEHP has been detected at levels as high as 174 milligrammes per litre (mg/l) of packed red blood cells and 889 mg/l of plasma."

Animal experiments indicate that exposure to DEHP leads to abnormal sexual development as well as skeletal, cardiovascular, eye and neural tube defects. Whereas the European Union has banned the use of DEHP in cosmetics, personal care products and certain toys, its use in medical products is rampant. In India too there is no regulation on the use of phthalates and PVC. ■

PHYSICAL SCIENCES

Making history

Famous astrophysicist finally accepts science of black holes

IT'S GOING to be termed as the most famous about-turn in the history of science. Stephen Hawking, who is regarded as the modern-day Albert Einstein, has recently accepted that black holes do not destroy everything they consume. Instead, they eventually emit out matter and energy in a mangled form, he informed the 17th international conference on General Relativity and Gravitation held at Ireland on July 21, 2004. Hawking's turn-about, the reasons for which are still unknown, settles a 30-year-old paradox involving the massive vortexes.

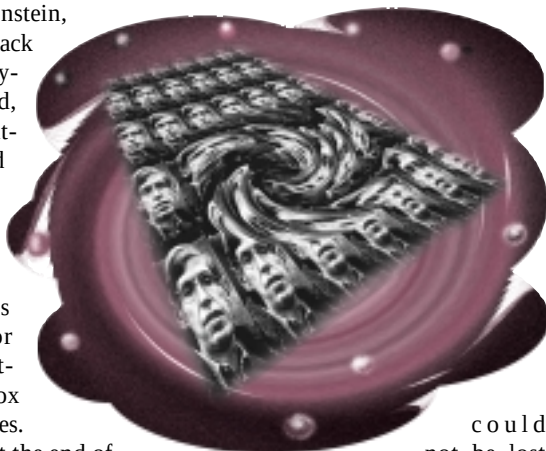
Black holes are formed at the end of the stars' life. The gravitational force of these black holes is so strong that even light cannot escape from them. In the 1970s, Hawking stated that these mysterious objects also have a temperature, which means they give off thermal radiation. Because of this radiation, all the mass of a hole ultimately gets converted into energy, leading to its destruction. With a black hole disappearing, the information enveloped inside it is also lost, hypothesised Hawking.

This theory however created a flutter in the scientific world, as it contradicted the laws of quantum physics, which state that information can never be completely wiped out. The wheelchair-bound mathematics professor of UK's Cambridge University has now accepted this. "As a black hole disintegrates, it sends its transformed content back into the infinite universal horizons from whence they came," Hawking told a packed hall using a speech synthesiser connected to a computer.

Hawking also dismissed another of his premise he had used for explaining the 'missing information' — presence of a different 'baby' universe. "I am sorry to disappoint science fiction fans, but if information is preserved, there is no possibility of using black holes to travel

to other universes. If you jump into a black hole, your mass energy will be returned to our universe, but in a mangled form which contains the information about what you were like, but in an unrecognisable state."

The turn-about of the mastermind indeed is a victory for science as well as John Preskill — in 1997, Hawking had betted with Caltech's astrophysicist Preskill, who insisted that information



could not be lost in a black hole. At the conference, Hawking presented Preskill with a reference book 'Total Baseball, The Ultimate Baseball Encyclopedia', after having it flown from the US. ■

HEALTH & MEDICINE

Sweet vaccine

Cuban scientists gear up to fight meningitis

DECADES of trade embargo by the US did not chip away the biomedical edge of Cuba. This fact was crystal clear recently when the country's scientists announced that they have developed a synthetic vaccine for meningitis — a disease that kills more than 600,000 children annually in developing countries.

The Cuban vaccine is being hailed as far superior to the ones available in the market currently. Interestingly, its research paper appeared in the July 2004 issue of the prestigious American journal *Science* barely a month after the US permitted its periodicals to publish papers from scientists belonging to countries that face the trade embargo.

LIFE SCIENCES

BETTER THAN THE BEST

Disease-resistant rice varieties that even have a good yield

Hyderabad's Centre for Cellular and Molecular Biology (CCMB) and the Directorate of Rice Research (DRR) have developed samba masuri and triguna rice lines (varieties) that are resistant to the bacterial leaf blight (BLB) disease. BLB is one of the biggest snags for rice growers in India, as it reduces yields by more than 15-20 per cent. No pesticide is available at present to combat the disease.

Two centres in India — Ludhiana-based Punjab Agricultural University and Cuttack's Central Rice Research Institute — have already developed rice varieties that are resistant to BLB. But the CCMB-DRR group has gone a step further — their varieties are not only BLB-resistant, but even have a good yield.

In limited greenhouse and field trials, the new lines were found to possess yield and morphological characteristics similar to that of the parental lines. Further trials are planned for the forthcoming growing season.

— NEHA DUA

The vaccine has been prepared by chemists led by Vicente Várez Bencomo of the University of Havana. It is based on sugars (carbohydrates) made by the chemical processing industry. When injected into the arm, it stimulates the body's immune system to hunt and subsequently kill the disease-causing bacterium. During clinical trials involving more than 2,000 Cuban children, it elicited a strong immune response in 99.7 per cent of the cases. This makes it as effective as the vaccine now being used in North America, whose cost is almost double. Moreover, it is said to have no adverse side-effects. Since January 2004, it has been used for immunising 300,000 Cuban youngsters.

As per Bencomo, the vaccine can be readily mass-manufactured. The scientists have already produced up to 100 grammes of the synthetic sugar component, which is enough to make millions of doses. It is so potent that one gramme can produce 100,000 doses of vaccine. ■

HEALTH & MEDICINE

World is at risk

With scientists undertaking controversial flu virus experiments

SCIENTISTS may open the Pandora's box if they are given the go-ahead to create a new form of the flu virus. This is the grim message of an article published recently in the acclaimed journal *Science* (Vol 305, No 5684, July 30, 2004). The article ponders over the repercussions of experiments soon to be undertaken to combine the genetic material of the fatal Asian bird flu virus with that of its equally lethal human counterpart.

The controversial research is being undertaken as scientists and public health workers worldwide are concerned that the bird flu virus could coalesce with its human form, creating an 'immortal' variety. If this happens, the world would face a pandemic that could kill millions. As per some experts, particularly those from the World Health Organization (WHO), the only way to avert the crisis is to combine both the

viruses in the laboratory, and then comprehensively study the new organism.

Many are planning such an investigation. In fact, in 2000, the US Centres for Disease Control and Prevention (CDC) had started experiments to create the crossover, but these were suspended when CDC's flu researchers were overwhelmed by SARS. The agency plans to resume the work shortly. Others countries too are exploring the option. Virologist Albert Osterhaus of the Erasmus University in the Netherlands is eager to experiment on a range of bird flu strains. Researchers from UK's Health Protection Agency and the National Institute for Biological Standards and Control are also discussing the idea.

As per the article, these pursuits may spell ruin. "There is a high risk of the virus escaping the laboratory. Moreover, the published results of these

experiments might help those who want to unleash a pandemic on purpose," Mark Wheelis, a researcher at the US-based University of California, was quoted as saying. But WHO's principal flu scientist Klaus Stohr downplays these concerns: "You cannot create a monster. But it's a monster that nature could produce. Therefore, it is necessary to conduct the experiments."

Critics beg to differ. "Though most countries have a system to review the safety and ethical aspect of run-of-the-mill scientific studies, none have formal panels to weigh studies that could put the entire world at risk or be of potential help to bioterrorists," they assert. As per flu researcher Karl Nicholson of the University of Leicester, the UK, there should be a more formal, global consensus on the necessity of studies and who should conduct them. But even in this regard, WHO's attitude seems to be lax. "Studies have been discussed widely with scientists in WHO's global flu lab network. The existing safeguards are sufficient enough," asserts Stohr. Time will only tell whether he is right or not. If not, then the world will be in a fix. ■

ENVIRONMENTAL SCIENCES

Old is gold

Traditional knowledge still aids poultry farmers of India

A RECENT research is yet another proof of the fact that traditional knowledge is of immense help in areas where science has failed to infiltrate. During the study, traditional poultry farming practices of Karnataka and Kerala were assessed. The findings show that the traditional procedures immensely benefit areas bereft of veterinary services. Moreover, traditional knowledge empowers farmers to manage their flock in a cost-effective manner.

In both the states, poultry farmers have been evolving several traditional practices through the trial and error method, keen observation and evaluation of the existing system. One of their key practices is moulding, which aims to improve the quality of the flock and precluding disease outbreaks by preventing egg production for a while. Moulding is

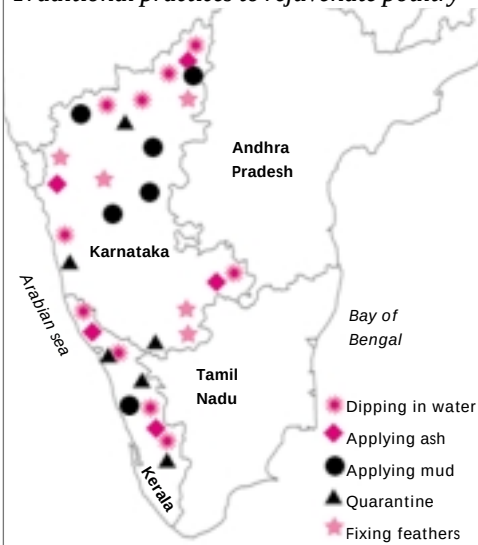
often described as a 'physiological pause', whereby birds are given time and energy to rejuvenate. It is induced through the following means:

- Catching the birds by their legs and dipping them in water for at least 10-15 times
- Applying ash in the reverse direction of a bird's feathers for a few hours
- Applying a thick layer of mud all over a bird's body for a few hours
- Keeping a bird in a dark place for three to four weeks
- Fixing a bird's feathers on to its back

Researchers from the ANGR Agricultural University of Andhra Pradesh assessed the effectiveness of these methods. They found all of them to be effective. The flock of farmers using these practices were as healthy as those of individuals who had access to the veterinary services. The practices even proved to be a cheaper option of maintaining a healthy flock rather than taking the advice of the vet. Moreover,

ALL ARE EFFECTIVE

Traditional practices to rejuvenate poultry



the practices did not cause any stress to the birds. The researchers conclude by stating that traditional knowledge is useful, albeit with some regulation to ascertain safety. According to them, the practices should be well documented to benefit the future generations. ■



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Elephants bathe. The wind
whispers. Paddy fields prance.
Bullock carts jingle. Ducks glide.
Boats sail. Life flows.
And suddenly, you're a poet.

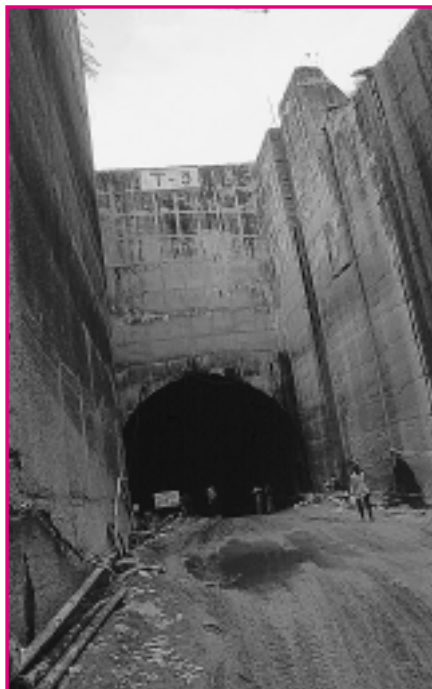


Kumarakom, the heart of backwater country.

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God's Own Country

A DARK TUNNEL



Twenty-nine workers were killed in a landslide at the Tehri dam. The contractor building the dam has blamed the “weak mountains” for the incident. Many experts agree that the mountains of the region are fragile. The dam will have a huge reservoir that would only increase the risk of a breach, which could trigger a calamity. Further, the controversial dam is being built in an earthquake-prone region.

Was the incident a tragedy foreseen?

KUSHAL P S YADAV reports from Tehri.

Photographs by SURYA SEN

Disaster struck the Tehri dam site in Uttarakhand at 10:15 pm on August 2. A huge landslide inside the vertical shaft of a tunnel claimed the lives of 29 workers and left about 12 injured. According to Puneet Kansal, district magistrate, Tehri, one person is still reported missing. Of the injured, three were critical and were admitted to the Himalayan Hospital at Jollygrant near Dehradun.

The victims were working at various levels of the 240-metre shaft and in the two horizontal tunnels that it connects. The horizontal tunnel at the top is called the Intermediate level outlet (ILO). The ILO and the vertical shaft are meant to drain excess water from the dam reservoir once it is filled, to the tunnel, T3, at the bottom of the shaft. Draining excess water is important because this dam is an earth and rockfill dam which can be damaged if water passes over it. But such a dam can withstand seismic vibrations to an extent. Since Tehri is in an earthquake-prone region, so the authorities had settled on an earth and rockfill dam and not on a concrete dam.

At the time of the incident, concreting work was going on in T3 to strengthen the tunnel. In the ILO, workers were involved in digging and excavating activities (see: *Buried alive*).

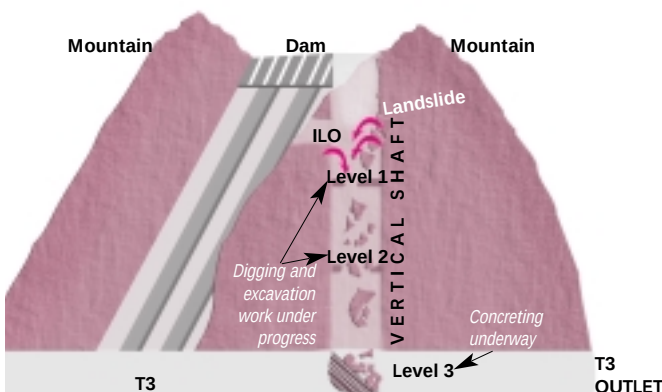
Officials of the Tehri Hydro Development Corporation (THDC), which is supervising the work on the Tehri dam project, refused to comment on the exact cause of the tragic incident. But J P Gaur, head of Jai Prakash Industries, the

contractors responsible for constructing the dam structure, said, “The dam is strong but inherently the mountains are weak.” The comment begs the question: was such a tragedy foreseen? And if so, what steps had been taken to protect the lives of the workers from the “inherent” risk?

According to P C Nawani, head of the Geological Survey of India (GSI), the landslide could be a result of incessant rains and the consequent seepage of water into the rocks. Nawani, who visited the site two days after the tragedy, told journalists

Buried alive

Who is to blame for the death of the workers?





“I’ll never go back into those tunnels”

The account of 28-year-old Ganesh, a native of Bihar, who was injured in the incident

It was about 10 pm. I was working in the Intermediate level outlet. Suddenly I felt the earth shake and heard a loud sound. Then a huge cascade of rocks and boulders came upon me. First I could not feel anything but then the pain came. I realised that an iron rod had pierced my right shoulder and there was a huge plate on my chest. It is probably the plate that saved my life because it shielded my body from the falling rocks and debris. I lay there for about 2-3 hours in the darkness. Then I heard some noise and saw a rescue team come in a cable car from above. But since they had not brought any cutters they could not extricate me from the debris. They said they would return. I requested that one person stay with me since it would give me some confidence and hope but I guess they were too scared to stay inside and all of them left.

They came back about two hours later. They cut the iron rod and extracted me from the debris. But a portion of the iron rod remained in my shoulder. I was taken to the hospital in Tehri and given first aid. They removed the iron rod and then I was shifted here (The Himalayan Hospital, Jollygrant).

It is clearly the company’s (J P Industries) fault. How can they allow this to happen? Even earlier, small accidents have been taking place and many workers have lost their lives in these tunnels. Now I am too scared to go back. In my entire life I have never taken a single pill or an injection and now look what has happened to me. I am never going back to those tunnels. I will take whatever compensation they will give me and go back to my village in Bihar to do some other work.

that the work on the area from which the landslide occurred should have been finished before the rains, which begin in June. Other experts who visited the dam site also said rain and the weak mountains led to the incident. Some officials have pointed out that the portion of the hill from which the landslide took place should have been properly lined with microsilica to strengthen it. J P Industries officials say that they had ordered a consignment of microsilica, which is imported, but its delivery was delayed “due to some reasons.”

But who will bear the responsibility for the incident? Says R D Prabhakar, executive director, THDC, “It is everyone’s responsibility. We are the supervisors, it is their (J P Industries) responsibility also.” Gaur announced that the weak mountains would be fortified. However, no one is clear as to how all the mountains surrounding this huge reservoir can be strengthened. Once completed, the 260.5 metre high dam will store 3500 million cubic metres of water in a reservoir that will extend 45 kilometres upstream in the Bhagirathi valley and 25 kilometres upstream in the Bhilangana valley.

Various reasons are being given for the mishap. One of them is that the work in the shaft was being done at a level lower than that of the water already in the reservoir. Most of the workers were engaged at levels between 618 and 670 metre elevations above sea level, while the water in the reservoir stood at about 648 metres. Some people say the pressure of the reservoir water coupled with seepage could have led to the landslide.





WELCOME

"In the future no such big dams should come up in Uttarakhand"



An interview with N D Tiwari,
chief minister, Uttarakhand

What do you think is the cause of this accident?

The Union power minister has announced the setting up of a technical committee under the chairmanship of M S Reddy. We have ordered a non-technical enquiry to be done by a mag-

istrate. I will let you know exactly what has been the problem once the reports come.

Will the questions on the safety of the dam be raised again?

In the future we have decided that no such big dams should come up in Uttarakhand. Already many dams being constructed today are tunnel-based (which do not require impoundment of water and thus a creation of reservoir) and not dam-based (where a reservoir is created). So the lessons that we have learnt from Tehri is that instead of constructing huge dams, where you also have a problem of displaced people and lot of technical problems, we will construct the tunnel-based dams. Srinagar dam was earlier supposed to be dam-based but it has now been changed to a tunnel-based dam.

But is it not too late as far as Tehri dam is concerned?

Because of this (incident), we have issued a warning that all the technical experts involved in constructing tunnels should come here and see what have been the shortcomings and learn from them so that they are not repeated in other places.

Will the technical committee, besides investigating this accident, also look into the safety aspects of the dam?

Tiwari referred the question to R D Prabhakar, executive director, THDC. Prabhakar said:

The safety aspects have already been settled. So now the committee will specifically look into this incident.

Tiwari's comments on Prabhakar's reply:

(Be careful) These press people will catch hold of you tomorrow.

Meanwhile, the police have registered a case against J P Industries. "We registered a case under the section 304 (a) against the company (J P Industries). Basically this section covers offences involving carelessness endangering human lives. As far as the case is concerned the investigations will be on," says V Murugesan, superintendent of police, Tehri.

Union power minister P M Sayeed visited the dam site on August 4 and announced the setting up of a three-member technical committee to investigate the matter. M S Reddy, former secretary, Union ministry of water resources, will head the committee. "The recommendations are will be fully implemented," says Sayeed (see interview: *Status quo*). Chief minister of Uttarakhand, N D Tiwari, also visited the site on the same day and ordered a non-technical magisterial enquiry into the matter (see interview: *"In the future no such big dams should come up in Uttarakhand"*).

The committee set up by the power minister will hand over its report in due course. But whatever this committee finds on the causes of the tunnel disaster, it is clear that this incident has once again raised questions about the safety of the dam located in the young, fragile and highly seismic Himalaya.

But the inhabitants see this incident as a curse for the submergence of the old Tehri town. The town is located at the confluence of rivers Bhagirathi and Bhilangana, just a few hundred metres upstream of the Tehri dam. On July 29, the water level in the reservoir went up by about 7 metres to 655 metres. This caused submergence of various parts of the old Tehri town. But some people were still present in their homes when the water entered the town and had to flee to save their lives (see: *Deluge*). The water level has now receded to the earlier 648 metre mark and in the ghost town of old Tehri, these people were seen by *Down To Earth* hunting for the little they could retrieve.

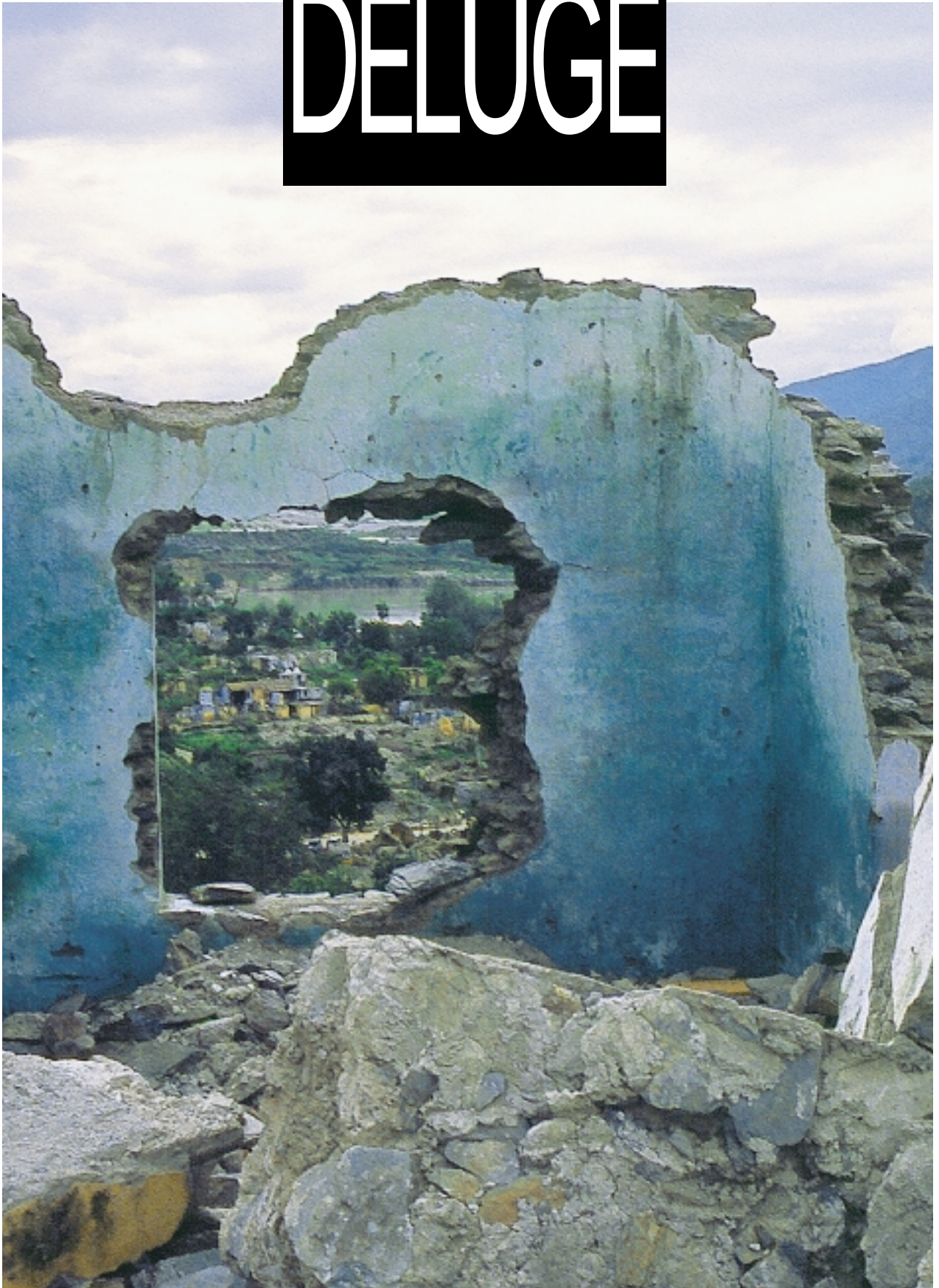
STOP PRESS

LANDSLIDE AT PARBATI PROJECT: Twenty workers were trapped inside a tunnel at the Parbati hydroelectric power project in Himachal Pradesh following a landslide on August 7. The landslide, caused by a cloudburst and flash floods, blocked the entrance to the 1.5 kilometre (km) long tunnel. Most of the workers had been rescued while efforts were on to extricate the remaining ones.

The National Hydroelectric Power Corporation is implementing the Parbati power project located in the Manikaran area, about 60 km from Kullu town.

Soon after the cloudburst, the flood waters rose forcing about 500 people living in the labour colony to take refuge in safer areas. The flash floods also washed away the approach road to the tunnel and a temporary road had to be constructed to carry out the rescue operations.

DELUGE



Time stood still as water entered the old Tehri town. The Victorian era clock tower stood a mute witness as the water turned the town into ruins. About 20 families had been living here. They managed to save their lives but lost everything else



July 29 was a black day for those residents of the old Tehri town who had decided to remain back. At around 2 pm, the water in the lake surrounding the almost empty town rose and entered their homes. The 20 or so families left had to run for their lives, grabbing whatever they could. Girjesh Chandra Ghildiyal was having lunch. “We never expected this to happen. I grabbed a few eatables and ran with my wife,” says Ghildiyal. “All I could think of saving were a few clothes for my children,” says Saraswati Devi, his wife. Residents blame the Tehri Hydro Development Corporation (THDC), which they say had closed the T1 tunnel in March. This together with the monsoon rains raised the level of water in the reservoir upto 655 metres on the fateful day. The closing of T1 violated last year’s Supreme Court order, they allege. The apex court had ordered that no tunnels be closed, or reservoir filled any further, till rehabilitation was completed.

The district authorities contend that 96 per cent rehabilitation has been done and no one lives in the old Tehri town. But in the last Lok Sabha elections, 11 polling booths had been set up in old Tehri. Strangely, on July 20, the administration had issued 44 notices to people in old Tehri, asking them to immediately evacuate. When water entered their homes, the residents rushed to the Shankeshwar Mahadev temple, located at a higher altitude. “Water levels reached the foot of the temple,” says Sunil Rana, another resident.



A few of them returned to dig out whatever remained. But there wasn't much hope. Broken walls still bear a testimony to the once living town. With no place left to live, people are unsure about their future





Little to recover

On August 5, when the water level recedes, some families return to whatever remained of their homes. Ghildiyal rummages through mounds of debris while his daughter looks frantically for her school certificates. But whatever little they recover, they cannot transport it all out of the town.

"We are not able to hire a tempo to transport even the few things we have recovered. For the tempos, the first priority is the contractors who are demolishing the houses in the town," says Ghildiyal. So the handwritten manuscripts get precedence over the old schoolbooks. A wooden almirah is left behind for a traditional leopard-skin trunk, more than a 100 years old.

Saraswati Devi has tears in her eyes. "We have yet to be compensated. Where do we go and live," she asks. The family is now staying in the tin sheds at the New Tehri town. Despite her misfortune, she doesn't forget to offer us tea. Ghildiyal lost most of his belongings. His son is shooing away the monkeys. "Numerous monkeys have taken over the whole town," says Ghildiyal.

Not too far away, Sunil Rana sits on a pile of rubble that was his house and asks the workers to dig gently else they damage whatever is left. He has filed a case in court to get a shop in New Tehri. Since he did not hold an entitlement to the shop in old Tehri, he did not get a shop under the rehabilitation scheme. "We held occupancy for last 100 years but the original landowner got the shop in New Tehri," says Rana. He





A house for a house

About 10 kilometres from old Tehri, as one travels upstream along the Bhagirathi, is Malidewal village, which has more than 300 families. This will be the first large village to be submerged when the reservoir starts to fill up. The villagers have been given land in Pashulok area in the Terai region. "Only 45 families have started constructing houses in Pashulok," says Virendra Nautiyal, a resident. There are countless tales of corruption. Different people got different rates for their lands. "We are getting a paltry Rs 40,000 to construct houses in Pashulok. We cannot construct even a single room with that amount in the plains," says Rukma Devi. In Malidewal, constructing a house is cheap. Slate and mud comes for free. So does wood. The villagers only need to buy a little cement. "All we want is that they give us the same kinds of houses that we have here, and we do not want any money as house construction assistance. A house for a house," demands Magi Devi.

But will the villagers find an environment as secure as the one they have been displaced from? "No one has ever locked a house in this village. In Pashulok, even the beams from foundations of houses being constructed are stolen," says Nautiyal. We will prefer to drown here than going down and living in plains, say many women in unison. This, they say, is swarglok (heaven), and that, indeed, Pashulok.



recovers a few wooden planks and a clock that has stopped. The clock's hands show 3:30 pm. Water entered the town at 2:00 pm. What is beneath the rubble? "All I had. All my forefathers' belongings, two televisions, compact disc player, music system, few CDs, clothes, and furniture," says Rana.

The bustling Tehri market — which served the entire Tehri Garhwal district — is in ruins. Part of the road that ran through the market remains. A few metres down the road from Rana's house, all the male members of the Daudiyal family are doing exactly the same. Then the road disappears into the water and with it half of the Tehri market.

The Ghildiyal family will come back the next day. What was lost was precious. "My forefathers had preserved numerous handwritten manuscripts. They were priceless," rues Ghildiyal. It was all planned, says his wife. "A conspiracy by the authorities to force the remaining families to leave. If this is our fate, imagine what will happen to the villagers. They will not even get a chance to escape." There are 125 villages which will be fully or partially affected. Their rehabilitation story is murkier (see box: *A house for a house*). Many of these villages have been resettled on agricultural land in the Terai region.





POWER POINT

Experts have given conflicting reports on the Tehri dam

The Tehri dam project has always been embroiled in controversies. The initial protests against the dam started in the late 1960s when surveys were conducted at the dam site. An organised movement took shape after the Planning Commission gave its nod to the dam in 1972. In the 1980s and the 1990s, numerous committees were formed and several experts spoke both for and against the dam. The case went before the Supreme Court which passed a 2:1 verdict in September 2003. The dissenting judgement ordered further studies to establish the safety of the dam.

The main opposition to the dam was on account of it being built in a highly seismic zone. Another factor against it was the geological fragility of the young Himalayan range. So even if the main dam structure was strong, the surrounding mountains were not. Therefore, in the event of an earthquake or due to creation of a big reservoir, a major disaster could occur. Experts pointed out that in the event of the dam being breached, the reservoir built at such a height will be emptied in 22 minutes: within 63 minutes, Rishikesh will be under 260 meters of water. Soon after, Haridwar will be totally submerged. Bijnor, Meerut, Hapur and Bulandshahar will be under water within 12 hours.

On weak ground

The Tehri dam is located in one of the world's most active earthquake zones. Less than 15 kilometres below the dam site lies

a fault, the geological boundary between the Indian and the Eurasian continental plates, that is capable of unleashing catastrophic earthquakes. Many seismologists have raised concerns about the structure of the Tehri dam being breached in the event of a major quake. The local protests in the late 1970s focussed on this aspect of the dam. In February 1980, an Environmental Appraisal Committee appointed by the Union government refused environmental clearance to the dam. "Taking into consideration the geological and social impacts accompanying the project, the cost and benefits expected, and after a careful examination of the information and data available, the Committee has come to the unanimous conclusion that the Tehri project, as proposed, should not be taken up as it does not merit environmental clearance," the committee concluded.

In the face of protests, on March 18, 1980, the then Prime Minister Indira Gandhi wrote a note to the Department of Science and Technology to review the project. "It seems that larger areas of very fertile land are being submerged without any commensurate gains. It is true that these decisions have been taken over a period of time but there is great local distress and a feeling that the contractors and other such groups will be the main gainers," she wrote. However, the work on the dam continued, albeit a bit slowly. By 1986, the diversion tunnels had started

Damming the Bhagirathi



Source: Veerlapati Govardhan 1993, *Environmental Impact Assessment of Tehri Dam*, Ashish Publishing House, p8, quoted in *State of India's Environment, The Citizens' Fifth Report*, CSE publication



The old Tehri town is heading for a watery grave

operating. The voices against the dam also continued rising with more experts coming out in the open against the deficiencies in the dam.

In 1986, a government appointed expert group, headed by Sunil Roy, rejected the dam project. But nobody paid any attention. The Tehri Hydro Development Corporation (THDC) was formed in 1988 to oversee the project. Again, in 1989, the D R Bhumbla committee of the Union ministry of environment and forests reviewed the project. After considering various aspects such as siltation, seismicity and dam safety, it rejected the project in 1990. The project authorities told the committee members that the dam structure was designed to withstand an earthquake of magnitude 7 on the Richter scale. The committee however concluded that this was not adequate as an earthquake of 8.5 magnitude was very much likely in that region.

Dissenting note

A committee of secretaries referred the Bhumbla committee report to yet another expert group. The new expert group included representatives from the University of Roorkee, the Central Water Commission, the National Geophysical Research Institute (NGRI) and V K Gaur, an eminent seismologist and former director of NGRI. Gaur had raised concerns about the design parameters of the dam in 1986 and said that an earthquake more severe than the structure had been designed for could occur at the site. This committee accepted the recommendations made by the earlier committee, that an earthquake of 8.5 was more likely. Surprisingly, it did not make any revisions in the structure of the dam. Gaur was forced to give a dissenting note.

Later, Gaur wrote to P V Narasimha Rao, the then Prime Minister: "The dynamic response of the dam to a real earthquake accelerogram was tested without appropriately scaling the duration of strong ground shaking to about 30 seconds, which would be more representative of the Tehri situation. The test clearly showed that the deformation of the dam continued to increase right upto 12 seconds when the test was terminated, and would have perhaps maintained this trend for longer if the test had been allowed to run for the full 30 seconds. It is, therefore,



difficult to imagine as to how the dam structure would have suffered continued strong shaking for a further duration of 18 seconds. Thus, it can be seen how the conclusions offered by the consultants, by the very deficiency of critical discussion of these assumptions and shortcomings have misleadingly assumed the status of a scientific truth."

Huge protests from the local people forced the government to set up yet another committee to look into the safety aspect of the Tehri dam in 1996. This committee was headed by Gaur. This group, in 1998, recommended that the government should conduct further studies — a 3-D non-linear analysis of the dam and also a simulated dam-break

analysis — to ensure that in the event of flash floods, the damaging impact was minimal. The Gaur committee, therefore, did not clear the current design of the dam but wanted more analysis to ensure safety.

Instead of implementing the recommendations, the government referred them to the National Committee on Seismic Design Parameters (NCSDP), which comprises of the Survey of India, GSI, NGRI, seismology directorate of the Indian Meteorological Department (IMD) and the Department of Earthquake Engineering of University of Roorkee.

While the Survey of India, GSI and the NGRI failed to offer any comments, the IMD agreed that a 3-D non-linear analysis of Tehri dam should be conducted to gauge its performance against the maximum credible earthquake and also to prepare a simulated dam-break analysis to minimise the damage due to a dam burst scenario. The only dissenter against the Gaur committee's recommendations was the University of Roorkee which thought that carrying out both the recommendations was unnecessary.

Status quo

Interview with Union power minister P M Sayeed

Doesn't this incident reopen the whole question on the safety aspects of the dam?

This dam project was approved only after detailed discussions and scientific studies. They came to a conclusion that the dam should be constructed. I am not a scientist, you understand.

Many committees have been giving contradicting reports and many of them have been against the dam

Many committees might have given contradicting reports. I am not a scientist. For this dam and the whole project a detailed discussion was done and then the result was that they started it in 1970s. And now it is coming to an end.

Many committees have been giving counter views against the dam...

May be, may be. I am not in a position to say because I am not a technical person.

So now do we relook at the whole issue of safety?

As far as scientific aspect of dam safety is concerned, no.

The government decided to stick with the dissenting verdict of the University of Roorkee and thus the recommendations of the Gaur committee were never carried out. It was widely reported at that time that the University of Roorkee's interest in the project stemmed out of its major role as consultants to THDC, and therefore, its view was partisan. Finally a committee was set up by the National Democratic Alliance government. The committee was headed by the then union science and technology minister, Murli Manohar Joshi. The terms of Joshi committee went beyond examining the safety aspects as the members were asked to confer on the damage to the self-purification qualities of the Ganga if the dam was allowed to impede its flow. But even this committee gave a go-ahead to the dam.

In the meantime, the matter was also pending in the apex court on a petition filed, in 1992, by the environmentalist N D Jayal. The majority view of the judgement, in September 2003, contended that the government had put into place all the necessary conditions and safeguards for the project. However, the judges directed that the project authorities should ensure that

Lots of stories relating to messy rehabilitation float around Tehri and the surrounding villages. There are examples of people who have taken compensation multiple times, people who were not entitled and still got hefty compensation coupled with houses and shops in New Tehri. Endless tales of corruption do the rounds. But at the other end are those genuine claimants who did not get anything and are still running from pillar to post. The situation is worse in the villages. For them it is not just relocation but an entirely new socio-cultural environment.

People of Malidewal, the first large village that will be submerged, have sown rice again this year. They say that they have nowhere to go and will prefer to drown here. The dam is almost complete and within a few months the final tunnel may be closed and the filling of the reservoir behind the Tehri dam will begin. ■

CHRONOLOGY OF CONTROVERSY

- 1949** Tehri dam conceived
- 1961** Tehri chosen as a tentative site for the dam
- 1972** Planning Commission gives its nod to the dam
- 1978** Actual construction of the dam begins under police protection; Protests gather momentum
- 1980** Environmental Appraisal Committee appointed by the government, refuses environmental clearance
- 1986** Diversion tunnels start operating; Protestors storm the site and stall construction work
- 1990** Environmental Appraisal Committee, the D R Bhumbala committee, rejects the dam again
- 1991** Earthquake measuring 6.6 on Richter scale rocks Uttarkashi. Renewed concerns about the seismic safety of the dam.
- 1992** Sunderlal Bahuguna goes on a fast unto death. Work on the dam temporarily stopped. Gain in 1995
- 1996** Government sets up the V K Gaur committee to look into seismic safety
- 1997** Hanumantha Rao committee on rehabilitation submits its report. Recommends major changes in rehabilitation policy
- 1998** Gaur committee submits its report. Asks for detailed analysis
- 1999** Chamoli earthquake, measuring 6.8, brings large scale destruction. Anti-dam activists up in arms about safety
- 1999** Committee of secretaries of the Union government clears dam
- JANUARY 2001** Bhuj earthquake again raises concerns
- MARCH 2001** Vishwa Hindu Parishad joins the anti-dam movement just as the tunnels are to be closed
- APRIL 2001** Government forms another committee under the S&T minister Murli Manohar Joshi
- DECEMBER 2001** M M Joshi committee yet to give its final report. Regardless, gates of two diversion tunnels are closed and water level rises. No protests this time. Final work on the dam gets underway
- NOVEMBER 2002** M M Joshi committee submits its report. Says the dam is safe to withstand an earthquake of high magnitude
- SEPTEMBER 2003** In a divided verdict, the Supreme Court clears the legal hurdles for dam construction
- MARCH 2004** Tunnel T2 closed. Water level rises to 648 metres submerging many parts of old Tehri town
- JULY 29, 2004** Water level rises to 655 metres submerging the remaining parts of the Tehri town. Residents flee for their lives
- AUGUST 2004** Internal landslide at the dam site. 29 workers dead



Rehabilitation remains a contentious issue

all the rehabilitation is completed before the closure of the diversion tunnels and consequent filling up of the reservoir. The dissenting judgement reinforced the Gaur committee recommendations to assess dam safety.

What about life span?

The dam authorities and successive governments have repeatedly said that the life span of the dam would be 100 years. But many disagree. "Siltation will take place much faster than expected. Life of the dam will be only around 30-40 years, not 100 years, as claimed by the THDC," says K S Valdiya, former director of the Wadia Institute of Himalayan Geology and a member of the M M Joshi committee. "The ghost may not be there but the fear of the ghost makes your life miserable," Valdiya sums up, referring to the earthquake and the possibility of dam collapse.

In the meanwhile, the anti-dam movement spearheaded by Sunder Lal Bahuguna fizzled out. Rehabilitation issues were somehow lost in all the noise against the project itself. And the protracted construction period meant that rehabilitation could never be carried out satisfactorily.



R K SRINIVASAN / CSE

150 MLD of sewage flowing in Parvati Puthan every day

time. KWA has the same old seven sewage blocks in the city. Each block pumps untreated water into Parvati Puthan, which then flows in an 8-km open channel through the city. All the way down to Kovalam and the sea. Its ironical that although Thiruvananthapuram in 1928 became one of the first cities in India to have piped water, it is yet to have a sewage treatment plant. The sewage in Parvati Puthan has become a major health hazard. According to John Kurien, a fellow at the Centre for Development Studies in Thiruvananthapuram and an expert on fisheries and oceans, a large part of the coast south of the city is highly polluted. The sea at Kovalam is polluted till 500 metres, and skin diseases are common among people who swim there.

Moreover, Viji Titus, executive engineer at KWA's sewage department, says 40 per cent of Thiruvananthapuram is connected to the sewage system. This doesn't match figures given in the State Planning Board's *Economic Review 2003*. According to this document, 83.36 per cent of the city's urban population gets piped water, but only 23 per cent of the households have access to a common sewage collection system. The remaining households have septic tanks or soak pits, which contaminate open wells.

Yet the city's focus since the 1930s has been to get more and water through expensive supply schemes. The KWA currently runs the Rs 4.24 crore Aruvikkara scheme and the Rs 10.48 crore Peppara Dam scheme, both of which use water from the Karamana river (see map: *muck track*). Next on the pipeline is a Rs 215.12 crore project at the Karamana for which the Japan Banking International Cooperation will lend Rs 199.47 crore.

The latest project will bring in 85 million litres of water to Thiruvananthapuram every day. It will generate 65 million litres of sewage every day. Where will this muck go? Thiruvananthapuram needs a whole new sewage system, which treats sewage flowing into the river. Yet it chooses to remain obsessed with water supply schemes. ■

Water supply is all

What about the sewage that makes Kovalam beach stink?

R K SRINIVASAN *Thiruvananthapuram*

In October 2003, the managers of Kovalam beach near Thiruvananthapuram, Kerala, conceived a plan to create a zero-waste, eco-friendly beach. They targeted the waste tourists dump on the sands; that hasn't cleaned the beach up. The real problem lies — or rather, flows from — elsewhere: the mass of smelly and black sewage Kovalam receives from the Parvati Puthan river; almost all of Thiruvananthapuram's muck. But ask authorities in the state capital how they are managing their water, and they will point supply-side: the fact that Parvati Puthan has turned into a sewage drain completely escapes their managerial gaze.

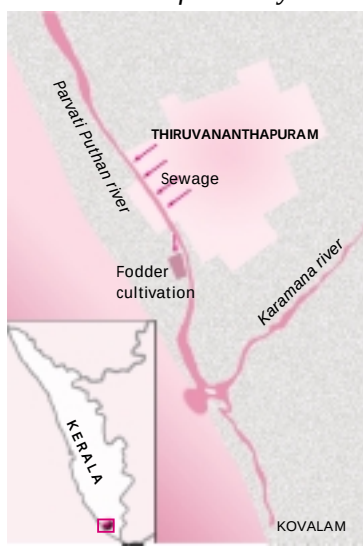
To know how Parvati Puthan was turned into a sewage drain, we have to go back to 1938 and to Thiruvananthapuram. The state capital that year set up a treatment system called the Comprehensive Sewage Scheme, designed to use Parvati Puthan as a sewage-conveying channel. An important component of the system was a stretch of open land to which the sewage was diverted, to be then used to cultivate fodder. In 1938, Thiruvananthapuram's population was about one lakh and the sewage outflow 16 MLD (million litres per day), so the cultivation patch was able to absorb the muck.

But Thiruvananthapuram's population is now approximately 789,000 and Parvati Puthan carries over 150 MLD of untreated sewage every day. Yet the fodder cultivation patch — it no longer exists outside city limits; the airport has come up near it — is still the Kerala Water Authority's (KWA) only answer to sewage treatment. KWA, which manages the city's water supply and sewage, claims it takes care of all the city's sewage.

Indeed, nothing's changed over

Muck track

Parvati Puthan flows dirty



मेरी एक मुस्कान में छिपी हैं
ढाई लाख खुशियाँ!



आपको पता है कैसे?

मैं जाना चाहती थी स्कूल, पर मेरी दोनों बड़ी बहनों का नाम कभी स्कूल में लिखा ही नहीं मेरे अम्मा-बापू ने। मुझे भी यही लगता था कि घर रह जाऊंगी।

लेकिन फिर अचानक ही माहौल बना बच्चों को स्कूल भेजने का ... खास तौर लड़कियों के नाम स्कूल में लिखाने का। अम्मा-बापू ने भी बदले माहौल में अपना मन बदला और बापू खुद मेरी उंगली पकड़ कर मुझे स्कूल ले गये और मेरा नाम लिखा दिया पहली कक्षा में।

तो ये खुरी है स्कूल में अपना नाम लिखाने की। स्कूल जाने की। नये दोस्त नयी सहेलियाँ बनाने की और ... अपने गांव से बाहर की दुनिया जानने की।

और हां, ये खुरी सिर्फ मेरी नहीं मेरे जैसे कहीं ६५ लाख बच्चों की है जिनकी जिंदगी की राह ही बदल गयी सिर्फ सात दिन में। स्कूल में नाम लिखाने के साथ ही।

जी हां, सात दिन ही तो चला था शिक्षा जागरूकता सप्ताह।

मध्यप्रदेश में
शिक्षा जागरूकता सप्ताह

बच्चों की जिंदगी को रौशन करने के 7 दिन





SHAJA

Lake Manchar is dead

Pakistan's largest freshwater lake is drowned by effluents

SHAHID HUSAIN *Karachi*

In mid-May this year, Hyderabad in Pakistan's Sindh province was hit by a severe diarrhoea epidemic. The pestilence, which lasted for two months, claimed 38 lives — mostly children. An unpublished World Health Organisation report cites contamination of Hyderabad's water's supply by untreated waters of the Manchar Lake, as one of the causes. The lake's waters reached the city via the Indus River, which was in spate. "As a result," says the report, "its heavy salt content could not be adequately diluted." A fact-finding report of the Pakistan's Human Rights Commission also blamed the lake's waters for the calamity, signifying a terrible irony: Manchar, which once gave livelihood to fishing and agricultural communities and life to several migratory birds had turned toxic.

Located 18 kilometres west of Sehwan in Dadu district of Sindh and 300 kilometres north of Karachi, Manchar is a vast natural depression surrounded by Khirthar Range hills in the West, the Lakki hills in the East and a flood embankment in the Northeast. It is Pakistan's biggest freshwater lake; some even say it is Asia's biggest lake, though that is debatable. But today it would be more apt to describe Manchar as a grim cesspool of agricultural effluents, including pesticides.



How did that happen?

The lake's misfortune can be traced back to 1982, when Pakistani authorities remodelled the Main Nara Valley Drain: built in 1932 by British colonialists to control floods in the Hammal Lake in southern Sindh and to protect the low-lying areas of the province, the water body was now turned into a drain to carry industrial runoff and agricultural effluents into the Arabian Sea. But then how did that affect the Manchar? The remodelled drain — now called the Right Bank Outfall Drain — did not

work and was redirected to Manchar. The authorities assumed that freshwater from the Indus and from the torrents that gush down the Kirthar hills during the rainy season — the two sources of the lake — would dilute the effluents. That was a big mistake. For, Manchar's two sources don't provide it enough water to clean effluents. Flows from the Indus are drying up because of barrages and dams in its upstream. Moreover, the thinning down of Himalayan glaciers means that rainfall in Sindh is extremely erratic; so the Manchar does not receive much water from the torrents either. Environmentalists Naseer Memon and Zubaida Birwani note that, "The mean annual rainfall in Dadu is 4.43 inches (112.5 millimetres) while annual evaporation is about 80 inches (2,000 millimetres). Therefore, very little runoff is generated in catchments of hill torrents. The lake gets recharged only when there is heavy rainfall, which usually happens once in three years."

A community vanishes

This has meant that Manchar can provide scarce support to communities who have lived by it for centuries — perhaps even ages. Amongst them are fisherfolk called the Mohanas. Architect and town planner Arif Hasan — who also writes on environmental issues — says, "Folklore has it that the Mohanas

are descendants of people of the Indus Valley Civilisation. Some suggest that the word Mohenjodaro is a corruption of Mohana-jo-daro — the tomb of Mohanas.” They are a fast dwindling community today. According to Ghulam Mustafa Mirani, vice-chairperson, Pakistan Fisherfolk Forum, “There were once 60,000 Mohanas at the lake. Their population has dropped to 25,000 today because of droughts over the last five year and increasing effluents in the lake.” (See graph: *Rising poison*)

The community’s source of livelihood has suffered a lot. As per a report of the Sustainable Development Policy Institute (SDPI) — an independent think-tank based in Islamabad — the fish catch in the Manchar has fallen from 3,000 tonnes to less than 100 tonnes in 2003. “Before 1999, I could catch about 20-25 kilogrammes (kg) of fish every day. Today, it has come down to 5-6 kg,” laments Analdal, a member of the Mohana community. Rues another Mohana, Haji Karim, “We used to eat fish and roots of aquatic plants. It was like a free meal. We only brought wheat and rice. Manchar was like a cup; it has now turned into an empty saucer.”

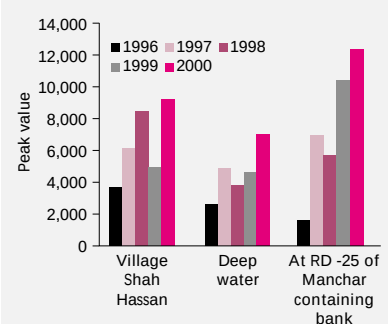
The effluent-ridden lake water is no longer fit for drinking. So, the Mohanas have to purchase drinking water from a supply facility at the embankment. Each bucketful costs 5 Pakistani Rs. And there is crisis when water cannot be pumped out during power breakdowns.

The sinking lake has also put paid to the livelihoods of hundreds of agriculturists who diverted its waters through small canals, *phats*, and then used the lake-bed for farming. According to Memon, “This method relied on filling the lake during monsoons and then drawing out water to uncover cultivable land on which wheat was grown.” He notes that, “The lake was filled to about 113 feet by September end and was reduced to 106 feet in October. In the process, about 26,000 acres of land was uncovered for farming.” But today, Manchar doesn’t have enough water and the lake-bed farmers have no work.

And that is not the end of their woes: the lake’s toxic waters have played havoc on the health of their livestock. According to Behram Chachar, team leader veterinary project, Indus Resource Centre (a non-governmental

Rising poison

Total dissolved solids increasing



Source: WAPDA, SCARP Monitoring Organisation report

organisation that promotes informal education in Sindh), “Viral diseases, such as rinder pest and foot and mouth, and bacterial diseases such as haemorrhage septicemia and black quarter have become common among livestock. The animals in the area are also plagued by tympana/bloat and acidosis.”

An unwelcoming place

The lake’s once-rich marine and aquatic life has also suffered. Mirani lists about 10 fish species that can still be found in Manchar but says that their diversity and numbers were much higher, even a few years back. In the past, the lake waters were kept at 112-reduced level (RL, the lake’s water height with respect to mean sea-level). The surplus was diverted to the Indus; “fish seeds” swam into the lake against the flow of the Indus-bound waters. The process was a boon for the Mohanas, for these little creatures would grow up to weigh a tasty 2.5 kilogrammes. That’s a thing of the past now. For, even with good rains last year Manchar’s water level reached only 108.2 RL.

In the past, the lake was the winter home to numerous migratory birds species. Since it was the first wetland on their route, Manchar during winters was redolent with a host of migratory bird species. In fact, according to the environmentalist Shujaudin Qureshi, “About 20,000-30,000 birds still visit the lake every year.” However, Qureshi also adds that pollution has caused a drastic fall in their numbers. Mirani also notes that migratory birds do visit the lake, but fly off after an overnight stay.

It is clear: Manchar is dying and its water can now kill. ■



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Popular medicine

Farmers say 'no' to Ranbaxy expansion plans

VIKAS PARASHAR Paonta Sahib

Pharmaceutical giant Ranbaxy Laboratories Ltd's Rs 107 crore expansion plan in Himachal Pradesh's Sirmour district has become a bitter pill the company's being made to swallow. Farmers' suspicions, indeed outright distrust, have placed the company's initiative to expand the capacity of an existing plant at Ganguwala, Paonta Sahib, under a cloud. And on July 28, 2004, district deputy commissioner M L Sharma stopped the construction of a formulation plant at village Bata Mandi after an inspection at the site revealed town and country planning department rules had been flouted.

Sharma took the step in response to a July 21, 2004, Simla High Court order on a petition filed by Bata Mandi farmers. A bench consisting of chief justice V K Gupta and judge M R Verma required the deputy commissioner to inquire if

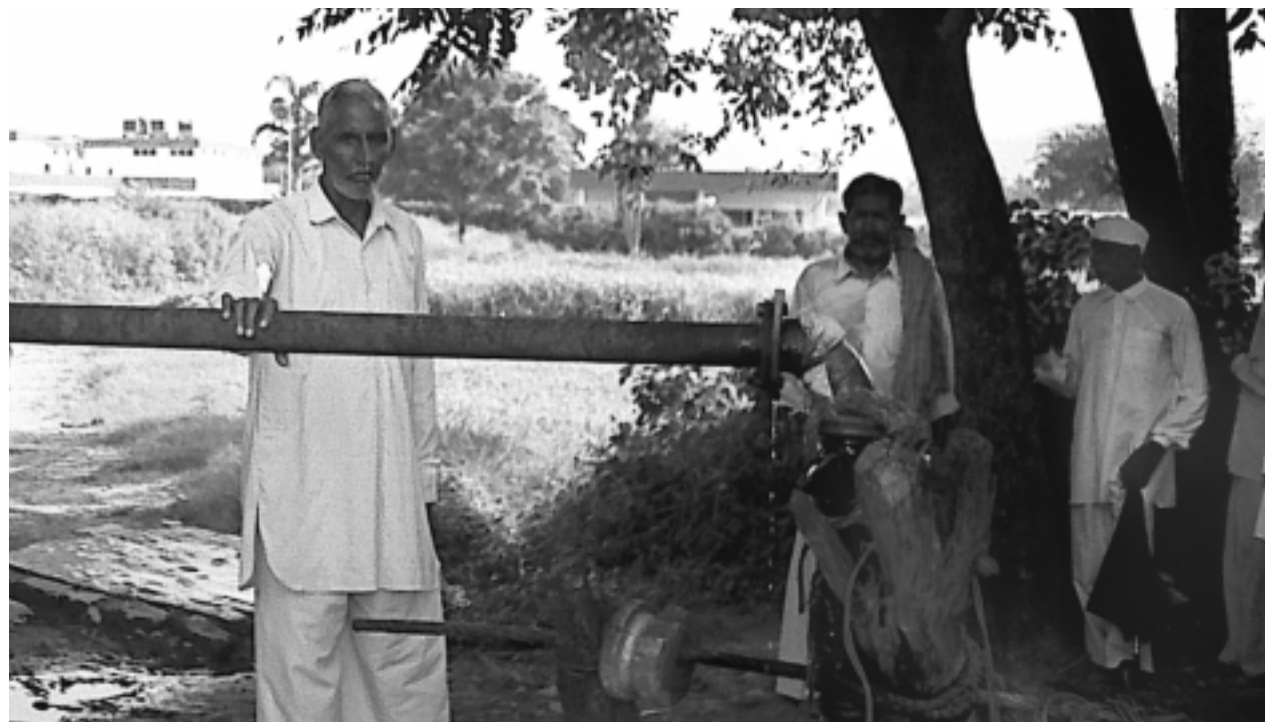
the construction contravened rules: "After satisfying himself that the said construction activity is being carried out in contravention of any such law, rules or regulation on the subject, he shall ensure that such construction activity is stopped forthwith and with immediate effect," the order said. "The maps of the construction site were yet to be approved by the competent authority," explains Sharma. "So we stopped construction immediately, as ordered by the honorable court."

Timely expansion

At the Ganguwala plant, Ranbaxy has been manufacturing Lovastatin and Pravastatin — these inhibit the activity of an enzyme known as 3-hydroxy-3-methylglutaryl coenzyme. Since this enzyme regulates cholesterol production, blocking it results in less cholesterol being produced by the body — for more than a decade now. This year, it

wished to increase production capacity there to 15 times more than the current 8 tonnes, and set up a new formulation plant at Bata Mandi, costing respectively Rs 87 crore and Rs 20 crore. Such expansion was, as Ramesh Parekh, the director of the plant at Paonta Complex, explains, "Keeping in mind the coming competition in the statin drugs market after January 2005 because of India's commitment to WTO (World Trade Organisation) to adopt the product patent policy." Statins — so-called because each drug in this category has a name that ends in 'statin' — are slated to emerge from the shadow of patents; any company with a greater ability to produce it would immediately become more competitive in the global market. So the expansion is good thinking, from the company's perspective. But ask Paonta Sahib and Bata Mandi farmers, and they shake their heads in absolute unison.

Living literally in the shadow of Ranbaxy's Ganguwala plant, Gopichand, of village Kedarpur, says the plant's use of water has caused the water table to plummet



VIKAS PARASHAR / CSE

Ranbaxy laboratories at Ganguwala, M/s Satya Shree Chemicals at Bhungarni, M/s Gill Chemicals at Haripur Tohana and Himalayan International Ltd. at Shubhkhera are some of the units located in various directions around Paonta Sahib town. All such units have come up with the permission of State Government though in a highly irrational and illogical manner vis-a-vis a unified land-use policy. In a majority of these cases the local population have raised hue and cry at the level of environmental hazard being generated by them. Therefore it is suggested that:—

(a) No further expansion in terms of area or capacity should be permitted in respect of these units.

Page 22 of the development plan for Paonta Sahib — made by the town and country planning department, government of Himachal Pradesh — clearly renders Ranbaxy's initiative illegal

They fear: less water

According to Mahesh C Juneja, senior manager at the Ganguwala plant, about 70,000 litres of water per day is required to run the plant. He says the company has permission to extract this much water, from the Himachal Pradesh Pollution Control Board. But people in surrounding villages claim the plant guzzles more than 100,000 litres every day. In any case, the water table all around has fallen. Consider village Kedarpur. The main crop cultivated here is rice, a water-intensive crop. Says Gopi Chand, a 50-year-old farmer, “Four to five years ago, one could get water at a depth of 15-17 metres. Now I have bored to a depth of 35 metres, and even am getting only 1.5 inch of water with a bore of 7 inches.” He laments: “I have invested more than Rs 10,000 on the rice crop in twenty *bighas* of my land. I am not anticipating anything this season. All my efforts and money have gone in vain.” Other Kedarpur villagers, and people in Ganguwala and Bhatanwali villages, echo Gopi Chand's words; their primary apprehension is: the 800,000 litres per day of water the expanded plant would require, and what *that* would do to a diminishing water table. Precisely such a fear is one reason the Bata Mandi farmers filed their petition against the construction of the formulation plant.

They also fear: more waste

Says C M Madhur, chief secretary of Resident Welfare and Environment Protection Society, Paonata Sahib, “According to papers Ranbaxy submitted before [a July 28] public hearing, if the proposed expansion takes place, the solid waste and liquid effluent will respectively increase from 150-200 kilograms per day to 6000-6500 kg per

day, and 50,000 litres per day to 700,000 litres per day.” This is no ordinary effluent. Madhur warns: “It comes out of the fermentation process (used to manufacture statins). It will have lots of biological ingredients which cannot be trapped by a simple sewage treatment plant and are very harmful for the area, as the plant is surrounded by prime agricultural land.” Parekh pooh-poohs such apprehensions. “We will be using soybean oil and milk as raw material for the fermentation process. So it is not as typical or hazardous as it is being projected by some people. This process of manufacturing will be as simple as making curd from milk.” But K K Tripathi, adviser/scientist, department of biotechnology, Union ministry of science and technology, differs. “No fermentation process is as simple as making curd from milk,” he says. “If they are using soybean oil and milk as raw materials then it is bio-transformation, a basic fermentation. Even so, the effluent from the manufacturing process will contain dangerous bio-agents.” But Parekh remains confident: “As far as treatment of effluent is concerned, all the guidelines decided by the state pollution control board will be taken care of.” This doesn't convince villagers. They believe all the waste management techniques being explained by Ranbaxy are but a fiction to get clearances for the expansion. “They discharged all the effluent in the Yamuna and dumped the solid waste in the open area near the riverbed. But when the talks about expansion started, just two-three days before the

public hearing, people from Ranbaxy came and took some of solid waste from dumping sites in trucks and burnt the rest to destroy the evidences”, says Yashpal, president of Bhatanwali *panchayat*, pointing to one of the sites used to dump the solid waste.

Moreover

Farmers in the vicinity of the Ganguwala plant also say they were not provided with a copy of the environmental impact assessment (EIA) at a June 28 public hearing the company arranged as part of the clearing process for expansion (any project above Rs 50 crore requires a public hearing, to obtain a no objection certificate). When *Down To Earth* contacted C Joshi, environment engineer at Paonta Sahib, to see the EIA report, he refused to show it, despite having a copy with him. This correspondent subsequently contacted the deputy commissioner, who ordered the report to be handed over. But when this correspondent visited the office again, the engineer had proceeded on leave.

**Down To Earth
tried to obtain
a copy of the
EIA report,
but the official
had gone
on leave**

Moreover, both plans — the one for expansion and the new one at Bata Mandi — flout regulations. The development plan for Paonta Sahib, prepared by the town and country planning department of the government of Himachal Pradesh, categorically suggests that no further expansion in terms of area or capacity should be permitted in respect of the unit. The upcoming unit at Bata Mandi, for which construction is already on, is violating state pollution control board rules: in its siting criteria, it is specifically mentioned that prime agricultural land shall not be covered by industrial units.

As of now, the file for the Ganguwala plant has been forwarded to the state pollution control board for clearances. The Bata Mandi farmers are clearly more proactive; that's because some farmers there were literate. This is not the case of the Ganguwala farmers. They face a future in the shape of a question: what if the state and Union governments give the go-ahead? ■

At an atom's level

Nanotechnology has immense potential, but it is also a little-known area with many dangers

T V JAYAN

How would you find the prospect of little machines crawling inside your innards to cure some terrible disease? Intrigued? Repulsed? Welcome to the happening world of nanotechnology, where scientists work on atoms and molecules to fashion intrusive devices like the one described above. In less than 20 years after the American scientist Eric Drexler described a powerful manufacturing system where robots the size of bacteria join individual molecules to form products — or are programmed to replicate themselves — nanotechnology has progressed enough to blur the divide between fantasy and reality. A report jointly published by the UK's Royal Society and Royal Academy of Engineering in July 2004 notes that the number of patents granted in nanotechnology has increased nearly four fold between 1995 and 2002 — from 531 to 1,976. Estimates indicate that the current global investment in nanotechnologies is about US \$6 billion — more than US \$2 billion of that comes from private sources.

But what exactly is nanotechnology? It is a set of techniques where scientists and engineers manipulate matter at the level of atoms and molecules to build devices and systems. Unlike “biotech-

nology” where the word itself lets you know that *bios* (life) is manipulated by human art (*techne*), nanotechnology indicates only the scale of the art. A nanometre (nm) equals one billionth of a metre. Its dimensions are about 50 times smaller than a typical virus and a strand of human hair is about 80,000 nm. The materials of this technology are chemical elements of the Periodic Table — stuff that makes up everything on this universe, including the DNA.

What lures scientists to research matter at a nano-scale? At this level, matter is chemically more reactive and its optical, electrical and magnetic behaviours change. And then, matter can even permeate human skin and deceive the ablest immune system to deliver drugs; medicines can in fact be delivered directly to diseased cells. Ability to make precise manipulations at the nanoscale also opens up a world of other potential applications. Computers can get smaller and faster and sensors can monitor everything — from crops to cows to crooks to chemical warfare agents to customers.

But be warned

The possibilities of nanotechnology are indeed immense. Hold on, critics also tell us of its potential dangers. For instance one of its avatars, nanobiotechnology merges three advanced frontiers

of science — nanotechnology, information technology and biotechnology — and according to the Canada-based activist organisation ETC Group, “Controlling Bits, Atoms, Neurons and Genes adds up to a little Bang theory enabling a godlike mastery over all knowledge, matter, mind and life.”

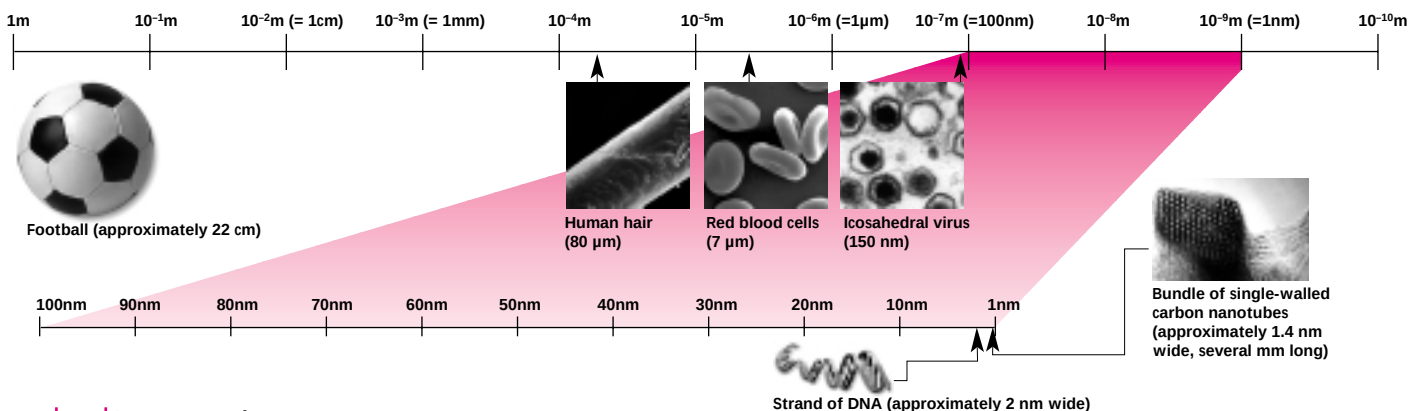
And such possibilities are rife in some of the areas in which new nanobiotechnology firms are working: incorporation of non-living, nano-scale materials in living organisms (such as drug delivery systems or sensors to monitor blood chemistry); creation of new synthetic materials that have biological components (such as proteins incorporated into plastics). But why should we worry? Aren't pacemakers and artificial joints also examples of introducing non-living mechanics into the human body? Yes they are, but let us not forget this new technique operates at the nano-scale. Such materials can penetrate our immune system and even cross the blood brain barrier. A foreign nanoparticle has no problem of biocompatibility because at the nano scale, there is no clear distinction between the biological and non-biological. Prospects of nano-technology — nanobiotechnology in particular — are indeed both scary and exciting.

And such contradictory prospects are even truer when products of the

How small is it?

A nanometre is one billionth of a metre

Note: cm: centimetre; mm: millimetre; μm : micrometre; nm: nano metre



Developing nano ambitions

Though European Union, Japan and the US account for most of nanotech research funding so far, several developing countries too nurture ambitions in the nano-world. Some of them are:

TAIWAN: Announced a six-year, US \$667 million programme to promote nanotech applications in September 2002. Its nanotechnology industry is projected to be worth US \$8.69 billion in 2008.

SOUTH KOREA: Has commitments to invest US \$2 billion in nanotechnology between 2001 and 2010. It intends to commercialise nano-products from 2005 onwards.

CHINA: Only modest funding so far, but no figures are available. Has made impressive strides in research on nanotubes.

INDIA: Still at nascent phase. Set up a nanotechnology mission in 2003 with a modest investment of Rs 100 crore (nearly US \$21 million). The Indian Institute of Science, Bangalore, Indian Institutes of Technology and the Tata Institute of Fundamental Research, Mumbai are some prominent institutes working in this area. A few pharmaceutical firms have also shown interest in nanotechnology.

SOUTH AFRICA: Unveiled a 'Nanotechnology Initiative' in March 2002, but has no comprehensive state funding programme. Primary focus is on development and use of nanomaterials and nanoparticles for the mining industry.

BRAZIL: Invested modest US \$1 million in promoting nanotech in 2002. But has 200 PhDs who are broadly networked into four areas: nanoelectronics, nanostructured materials, molecular nanotechnology and nanobiology.

technology are living organisms themselves. Inside the human body they might continue to do what nature intended — procreate. And this may cure illness but also play havoc upon our immune system.

A growing field

Right now, supporters of the technology are overwhelmed with its potential. They say that the *E coli* bacteria can take on oil spills and the nanobiopolymer car door can use embedded proteins to repair itself after a collision. And there is no shortage funds for such research. Since 1999 about 52 per cent of the US \$900 million venture capital funding for nanotechnology has gone to nanobiotechnology startups. Today there are several projects to develop newly made nanobio organisms. For instance, Craig Venter — known for his work on the Human Genome project — and his Institute for Biological Energy Alternatives in Rockville, Madison, USA have been awarded US \$12 million by the US Department of Energy to create new life forms engineered to produce energy or clean up greenhouse gases.

Other biotechnologists are building new life from stripped-down microbes, nanotechnologists are building biological machines from the bottom-up. The implications are breathtaking: not just new species and new biodiversity, but life forms that are human-directed and self-replicating. Consider this: scientists at the Nanometer Consortium at Lund University in Sweden, on the other hand, have produced tiny forests of nano trees. These "trees", though inanimate, can be "taught" to replicate

plant photosynthesis and extract energy from sunlight, says Knut Deppart, a Lund University professor involved in the study.

Among other examples, US researcher Robert Freitas is developing an artificial red blood cell that can deliver 236 times more oxygen to tissues with natural blood cells. The artificial cells,



Nanotechnology can deliver medicines to specific cells. But can play havoc with our immunity as well

called a "respirocyte", measures one micron (1000 nm) and has a nanocomputer on board, which can be reprogrammed remotely via external acoustic signals. Freitas hopes his device can treat anaemia and lung disorders, but also will enhance performance in physically demanding areas such as sport and war.

Have regulations

According to projections of the US National Science Foundation, the world market for nanotechnologies (nanobiotechnology being the prominent one) is going to be US \$ one trillion by 2011-2015. Given the sheer magnitude, scientists and critics alike feel that there should be regulatory frameworks at national and international levels to control the run-away growth leading to potential threats — though they disagree on the degree of regulation. The UK's scientific bodies recommend extensive health and safety studies of these novel technologies. They have asked all regulatory bodies in the country (in fields such as health, environment and industry) to debate if the current level of regulation and expertise is adequate to protect humans and the environment from the hazards of nanomaterials, including nanobiotech products.

The ETC group, which in mid-2002 called for a moratorium on use of synthetic nanoparticles in the lab and in any commercial products until governments adopt a "best practices" for research, on the other hand, says current regulations are at least a decade behind. "Nanotech products are already available commercially and laboratory workers and consumers are exposed to nanoparticles," says the group's executive director Pat Mooney.

Only a few companies in a handful of countries control nanotechnology today. So, an even greater worry is that unregulated scientific quest for finding newer commercial applications might result in these companies and countries ignoring all accepted safety norms. ■

Schooled in self-rule

What do tribal children living in Nagarhole National Park in Karnataka learn at school? Take pride in what they are, reports **NITIN SETHI**



It's more democratic: village school teachers report to a tribal school committee



In a small house in the back alleys of H D Kote, Mysore, Karnataka, school-teachers are being taken to task. They are presenting quarterly reports on their

work to a parents' association, but the occasion is almost festive and not acrimonious. This is not the regular parents-teacher meeting in a city school. The teachers are part of the community-owned and managed education programme of Development Through Education (DEED), a Hunsur-based non-governmental organisation (NGO), which educates children of tribal communities living inside or near the Nagarhole National Park in H D Kote and Hunsur divisions of Mysore.

The programme started two-and-a-half years ago but has already revolutionised education among tribals in 34 villages. It runs 33 schools, with 2,900 tribal children as students. Till the schools began, tribal children had the highest drop out rate. Last year, 375 of these dropped out children joined the DEED schools. "The standard education system is just not meant for tribal children. It alienates them from their ethos," says DEED's director S Sreekant.

Attend the parents-teacher meet at H D Kote, and one comes to know what is so right about these schools. The teachers report to education committees of Kuruba and Yerava tribal elders in *haadis* (hamlets). Teachers are hired

with the consent of education committees. Government-hired teachers also work in these schools but it's the community-hired teachers who form the backbone of the process.

From revolution to education

In the early 1990s, DEED and Sreekant agitated against relocation of tribal communities from the park during the World-Bank-funded India eco-development projects. This gained them the respect of the tribal communities, and a reputation in the administration for being very vocal advocates of tribal self-rule. "But we soon realised that mere talk about self-rule was not going to bring revolution to our doorstep. To take over governance, tribals had to be educated in a manner that they understood what self-governance would be about. That decision laid the foundation of our programme," says Sreekant.

As the schools began, DEED began to create a curriculum based on tribal lifestyle and ethos. It began work on textbooks that would incorporate their language as well as their context. The forest and life inside it became central to education. "For us, to build a school was not to construct a building. Regular schools forget that there are learning spaces beyond stifling classrooms. We want to make use of all such spaces. For tribals, this means making their *hudloos* (houses), their *haadi* and their forest a place of learning for children and their parents to be treated as reservoir of knowledge and not ignorant illiterates,"

says Sreekant. Realising that degrees and certificates would not fetch jobs in and around the forests, the students are provided vocational training. Tribals do not want to become literate but cheap daily wage labour. "If children have to leave their house to earn a living after their education, I do not think the education is worth it," says Nanjundaiah, who helps in the education programme though his Nisarga Foundation, a H D Kote-based NGO.

Singing songs written by their elders, Kuruba children today learn mathematics and science. The idiom is familiar and the metaphors their own, so understanding is easy. Jayaba, an alumnus of a programme school and a co-author of school textbook, understands this well. "Education is not a burden for these children because now it does not tell them that their culture is primitive, instead it instills pride in them," he says.

"It is such pride that shall make these children demand their rights where ever they go. In higher schools in cities or if they go out for work, they will not forget their context but enrich it," says Sreekant. It's early days now, but the programme promises to widen its base. With the government providing some financial support, mid-day meals and scholarships, and the Chennai-based agency Aid et-Action funding them, the partnership DEED has forged could create the model for transforming tribal hinterland into a self-governed society. Watch them map their course. ■



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Step 2: IIFM Application Form:

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Forms complete in all respect should reach IIFM Bhopal on or before 30th November 2004.

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Chairman, Admissions
Indian Institute of Forest Management
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Issue of IIFM Application Form STARTS from; August 16, 2004

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VILAS BABURAO

MUTTEMWAR, minister

of state (independent

charge) for

non-conventional

energy sources, tells

KUSHAL P S YADAV

What will be your main focus areas?

We will primarily concentrate on increasing awareness about renewable energy sources amongst people in villages. This has not been done in the past. There have been many schemes and programmes but their impact has not been as desired.

We started work on renewable energy much before other nations. For long we have had a dedicated ministry for renewable energy. But our progress has been poor compared to many other countries, which started much later...

We realise that it is very important to give a thrust to renewable energy, and so an independent status has been given to this ministry. We have renewable energy resources in plenty. Unfortunately, we have not been able to exploit them adequately. But doing that is just a question of increasing people's awareness.

We have to make people understand that coal will get over in 200 years, while our oil and gas reserves will finish in the next 100 years. So, we have to create a culture of energy-efficiency.

What about the national renewable energy policy, which has been in the pipeline for a long?

The policy needs a few amendments. We are getting new suggestions about areas that should be addressed by this policy. What we really want is to turn the whole idea into a movement.

What are the main problems that you currently face?

We do not have the infrastructure to monitor our programmes. Currently state governments monitor the imple-

mentation of our schemes, but we are not sure if they accord adequate priority to this task. So, we are thinking of initiating our own monitoring schemes. This will help us keep track of the overall progress of plans and programmes promoted by our ministry. The first monitoring stations will be set up in Pune and Nagpur, Maharashtra. If these succeed, we will set up similar offices in all states where we have ongoing programmes.

Is the current budgetary allocation enough or does the ministry need more resources?

Budgetary allocation is not a problem. In fact, we must first spend whatever we have. The Planning Commission has asked us to provide energy through renewable sources to 25,000 remote villages by 2012. We have to go ahead and make programmes and schedules to attain this target.

What other major changes and new programmes can we expect from the ministry?

We have already prepared an outline plan for a new programme, 'Village energy security through biomass'. The ministry will soon identify the villages where this programme will be implemented and work on the project will start this year itself. Village communities will own and manage the schemes under this plan. We do not expect all of them to succeed, but with increased awareness the programme's success rate is bound to increase. We expect that such schemes will generate employment for at least 25 people in each village. The

intricacies of the schemes, such as the selection of the technology to be deployed, will be decided in consultation with the villagers, the *panchayat* and district officials along with the technical input from our scientists.

Your ministry had earlier announced that 10 per cent of all additional electricity generated till 2012 will be from renewable sources. Any changes on this?

If we increase awareness, we can even surpass this target.

There have been major problems in the way rural electrification has been approached in the past. Even if a single household in a village gets a bulb, the entire village is declared as having electricity. Shouldn't this warped procedure change?

Yes, it should. Many villages have transformers and electric poles but no electricity. We want to change this state of affairs and give assured power through renewable sources. And this will not be restricted to providing lighting amenities. All energy requirements of villagers will be met: they will have lighting in their houses, their heating and cooking requirements will be provided for, we even plan to give them enough energy to set up a small household run business.

At the recently concluded Bonn conference there was a very vocal call for regional or global targets for renewable energy. What is our stand on this?

We don't agree. We have to keep Indian conditions in mind while designing and implementing our programmes. ■



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In Mowgli's land

ANJOLI BANDYOPADHYAY **visits Pench Tiger Reserve, the site of many a conservation scheme and finds the woes wrought upon the people there by ecodevelopment**



PHOTOGRAPHS: ANJOLI BANDYOPADHYAY

In the Pench forest, wandering sambars. But where are the tigers?

At the entrance to the Pench Tiger Reserve — spread over 758 square kilometres (km) in Madhya Pradesh and Maharashtra — there is a signpost. Welcome to Mowgli's land, it says. Mowgli's land has been the object of many a conservation effort. In 1977, it was made into a sanctuary to protect tigers and in 1983, the Pench National Park was carved out of this sanctuary. When the government — with World Bank aid — embarked on its much-flaunted ecocodevelopment project in the late nineties (see *Down To Earth*, 'Officially Bankrupt', Vol 13, No 5, July 31, 2004, p 22), Pench was among those selected to receive a share of the largesse. So are Mowgli's folks any better off as a result of it? Not at all; ecocodevelopment has become another word for misery for the predominantly tribal people who stay in the villages in the buffer zone of Pench.

At Salae

Salae — a village of about 500 Gond tribals — is about a km from the sanctuary. People here practice subsistence agriculture and depend on monsoons for irrigation



The forest remains out of bounds for the tribal doctor. Where will he source for herbs now?

water and on the forest department for work. The forest provides them *tendua*, *mahua* and fuelwood. The village *bhumka* do doctor, visits the forest to collect the numerous herbs, nuts and fruit. The villagers consult this doctor for all their health-related problems; the nearest government health centre is in Gouari — ten km away.

Ecodevelopment began in Salae in 1997. But the term remains a mystery to its residents even today. Press them a little and they will tell you that the forest department installed nine biogas plants in their village. The plants were meant to generate cooking gas from cow dung and help wean off the villagers from their traditional dependence on fuelwood from forests. But Salae's residents have little use for them. Ask anyone in the village and you will hear this: "Operating these plants requires water, how can we afford that when there is hardly enough drinking water for us." Salae's only source of water is a well, half a km away.

Some villagers will also tell you that they were given saplings of oranges, bamboo and lime trees for Rs 10 each. And then with a wistful smile they will inform you that most of these saplings withered away just after a year: there was no water for them.

Then you notice the wide road that runs through Salae — the forest department claims to have built it — and for a while you might feel that eco-development has actually done some good to the village. The villagers will immediately set you right: "The forest officers wanted to make their rounds of the village in their vehicles and so this road." And after this, their litany of woes will most certainly burst out: "Men are

migrating to Nagpur and nearby towns for employment. During the monsoons, we practice agriculture and for the rest of the year we only get work as casual labourers on construction sites in towns. There is no compensation when wild animals from the reserve damage our crops. On the contrary, hefty fines are imposed if our animals stray into the park. Sometimes we are even put behind bars. We were harassed before the project and are still harassed. Salae had a water problem before eco-development and we still have this problem."



Village Tikadiriya still waits for the promised bounties. So do many others around Pench

At Tikadirayat

Tikadirayat — a small village of 145 Gonds whose boundary touches the sanctuary — does not have a water problem. But that is small consolation. Before ecodevelopment started, villagers here visited the park for firewood, fruit and other forest produce quite regularly; they continue to do so even today. So what has changed? “Before this project, we were merely fined on going into the jungle, now we are arrested,” the villagers say. Most adults in the village lament that they are arrested two to three times every year. Some also complain that they have worked with the forest department but have not been paid for it. And then there are complaints galore about crop depredations. One villager puts it all quite pithily, “If the numbers of wild animals increases, our crops will be destroyed even more. As it is, occasionally tigers take our cattle away.”

In Durgapur

Durgapur village, two km from the sanctuary has accommodated fifteen Gond families who ‘moved out’ of Alikatta — a village within the sanctuary. The village is right on the banks of the river Pench and these fifteen families had good agricultural land where they grew rice, maize and wheat. But why did they move out? In 1993, a dam was built near their village and their village was flooded and then wild animals from the park started destroying their crops. The villagers did not have much choice after all. Besides, the forest department also promised them money, good irrigated land, wells and a dam if they moved out. They have got nothing of that. Of course, the forest department will tell you that they gave each family five or six acres (2-2.5 hectares) of land — that is unfertile and hardly a substitute for the fertile tracts in Alikatta. These



Most biogas plants provided by the project lie unused. Where is the water to run them?

‘voluntary evacuees’ also have severe water problems but the forest department has forgotten all its promises of providing wells and irrigated water. It did remember them briefly — a little after ecodevelopment started — and said that very soon Durgapur would have ponds and wells. But the villagers are yet to see any of these.

What they did get from ecodevelopment were six biogas plants — three of them actually work! The fifteen families were also given a pressure cooker each. And their women folk were told that they could learn sewing at a centre four kilometres away; there were sewing machines and bicycles for those who attended the course. So, some women went ahead and attended the training programme but the promised bounties are yet to materialise.

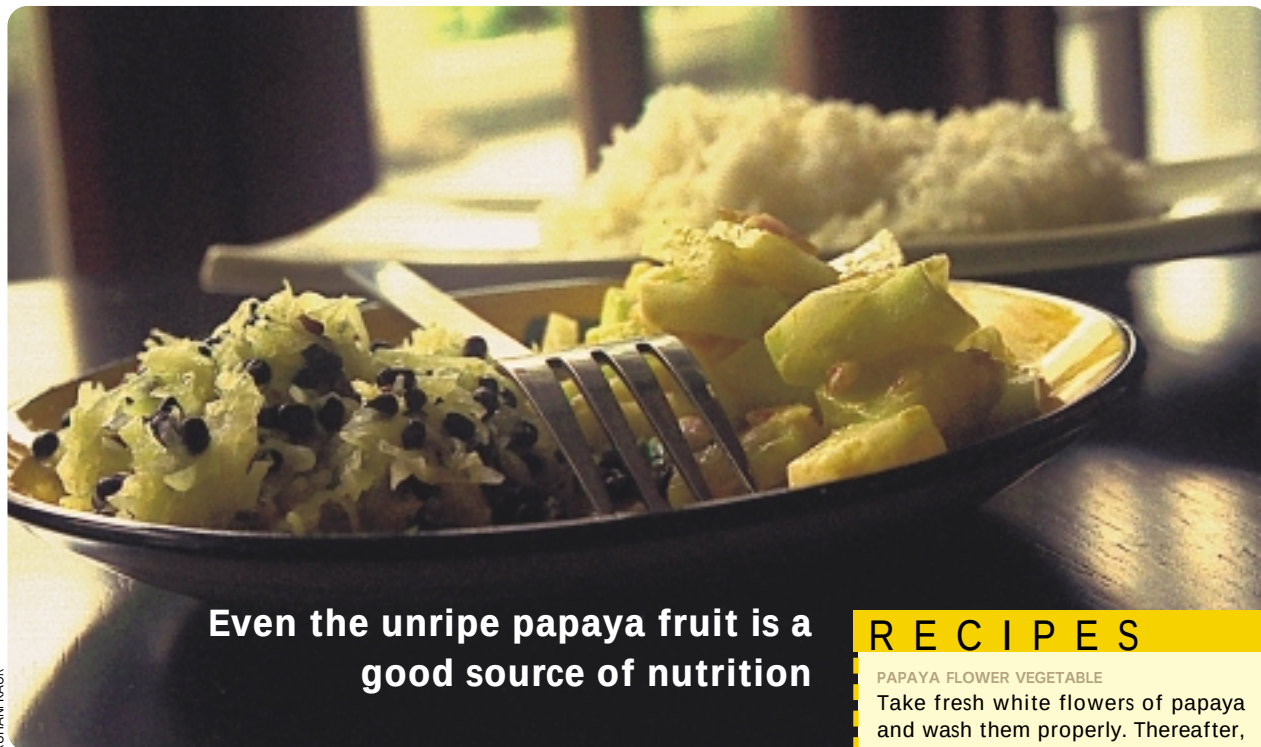
It's clear that villagers in the buffer zone of Pench National Park were not even consulted when the ecodevelopment project was planned. Gond culture and identity has been a given short shrift even though the national park is in a Fifth Schedule area. While the forest has become out of bounds for the tribals, much wildlife habitat has been submerged by a dam built near the reserve by the governments of Maharashtra and Madhya Pradesh. Along with Mowgli's folks, the tigers in Pench are not safe at all.

In Rudyard Kipling's *Jungle Book*, Mowgli is a young boy who grows up talking to denizens of the jungle. Clearly, our government thinks that Mowgli's folks are incapable of such friendly relations with the forest. But then Mowgli was just a fictional character. ■

Anjoli Bandyopadhyay is an independent researcher. She thanks Samata and the Forest People's Program for their support



Wholesome cure



Even the unripe papaya fruit is a good source of nutrition

RUHANI KAUR

HOIHNU HAUZEL

Papaya or *Carica papaya* is a soft-wooded, evergreen tree. It is mostly cultivated in tropical countries for its easily digestible fruit. In Manipur, there is a belief that papaya flowers are the perfect remedy for diabetes. Slightly bitter in taste, the flowers keep sugar levels in control when consumed regularly as a vegetable.

Even the papaya fruit is relished by many. In the northeastern states of India, people rustle up delicacies even from the raw variety. Across the country, the raw fruit is used to soften meat and enhance its flavour.

Papaya may be regarded as a wholesome fruit, as it is rich in essential nutrients like proteins, minerals and vitamins. The vitamin C content of papaya increases as the fruit matures. Its carbohydrates are present in the form of 'invert sugars', which are nothing but a form of pre-digested food.

Papaya has remarkable medicinal values that have been recognised since time immemorial. It is not only one of the most easily digested fruits, but also aids the digestion of other foodstuffs. Papain in the raw papaya is beneficial to combat several health problems — deficiency of gastric juice, excess of unhealthy mucus in the stomach, dyspepsia (indigestion) and intestinal irritation. The ripe fruit, if eaten regularly, corrects habitual constipation, bleeding piles and chronic diarrhoea. The juice of the raw papaya, being an irritant, is useful to cure several skin diseases — it is applied on swellings to prevent pus formation; it can also help treat corns, warts, pimples, horn and abnormal outgrowth of the skin.

The milky juice of the unripe papaya is a must for those having worms in their stomach. A tablespoon of the fresh juice along with the same quantity of honey and three to four tablespoons of hot water is an ideal dose for the adults. ■

Hoihnu Hauzel is working as a journalist with the Hindustan Times, New Delhi

RECIPES

PAPAYA FLOWER VEGETABLE

Take fresh white flowers of papaya and wash them properly. Thereafter, fry them for two minutes and add a pinch of salt. Serve with hot rice.

PAPAYA SALAD

Take half-a-kilogramme of unripe papaya and peel it. Thereafter, cut it into thin slices. Fry two tablespoons of gram flour (*besan*) on a griddle (*tava*) till it turns golden brown.

Roast three or four red chillies and then grind them. Mix all the ingredients, and add salt to taste. Finely chopped onions and coriander leaves can be added by those who have a liking for garnishing.

PAPAYA AND DAL

Boil 200 grammes of black beans (*sabut urad*). Then heat a little bit of oil in a *kadhai* and add one teaspoon of fenugreek (*methi*) seeds. When they start sputtering, add the *dal* along with two cups of grated unripe papaya fruit.

Fry for about 10 minutes. Then add two-and-a-half cups of water, salt and sugar to taste, as well as sodium bicarbonate. Cook till the papaya and *dal* become tender. Add a little bit of ginger paste and serve with hot rice.

Ecologically subsidised city

Kolkata's ecosystem can educate one about living creatively with nature



DHRUBAJYOTI GHOSH

Let us take an ecologist's look at Kolkata. It has the river Hooghly to its west from where it draws water. Another river, the Kulti Gong, 28 kilometres to Kolkata's east, drains the city's wastewater into the Bay of Bengal. No other mega-urban ecosystem can boast of such assistance from a river jacket. Besides, the city is endowed with a copious supply of groundwater: dig a hole and get any amount of water.

If all this is not enough, Kolkata has a huge wetland to its east, the East Calcutta Wetlands. This is a unique ecosystem that uses wastewater in fisheries and agriculture and in the process purifies it to a standard that compares very well with what comes out from many urban secondary level treatment plants. Even by conservative estimates, this has saved the city authorities from spending Rs 400 crores on capital expenditure and incurring a recurring maintenance cost on water

treatment plants — want of such huge sums money is a good enough cause to shut down plants in many Third World municipalities

Additionally, this ecosystem produces more than 10,000 tonnes of fresh and relatively cheaper fish and 147 tonnes (this estimate was done some 20 years back and a new estimate is required) of vegetable daily, just on the outskirts of the city. In this process more than a hundred thousand village folk work out their livelihoods. Indeed if this ecosystem is conserved, the volatile urban edge remains stable and acts as a provider of ecosystem services.

Opportunities and problems

The East Calcutta Wetlands has recently been included in the Ramsar list (it contains all internationally significant wetlands). The resource recovery system created and developed by the local people through ages is the largest of its kind in the world apart from being the most people/economy friendly water regime. Kolkata may well stake its

claim to be designated as an ecologically subsidised city. But there is a rub: human ability to inflict self injury.

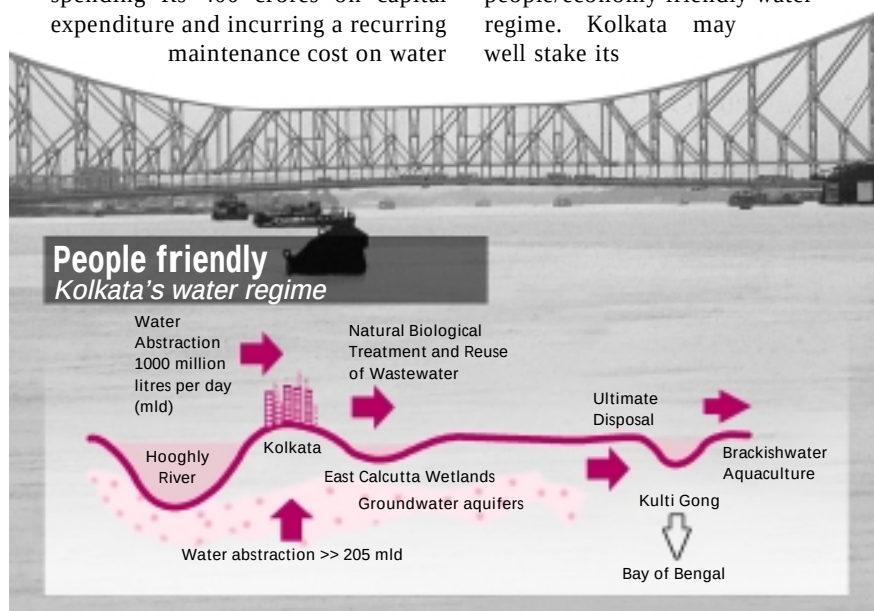
Hooghly's water quality continues to be a problem. The groundwater level in Kolkata has gone down alarmingly and arsenic has been found in the city's aquifer. New urban estates have jeopardised the future of the wetlands. Moreover, the Kulti Gong is rapidly silting up and this can upset the entire drainage system of the city. In short the friendly water regime of Kolkata stands imperiled.

The situation, however, can be reasonably remedied if there are sincere efforts.

For ecologists (not just urban) this ecologically subsidised city is an outstanding tutorial ecosystem and can attract students and researchers from all over the world. It has numerous examples of resource cycles that can teach ecology in the most interesting and fundamental manner. For example, snails in pond beds are bad for the fish but are feed for ducks. So, elderly rural women collect these creatures and sell them off to the fisherfolk, who in-turn crush the snails to feed ducks. The birds go back to the ponds and we know that their excreta is food for fish. Traditional knowledge thus makes ecology and economy go hand-in-hand.

Ecologists and environmentalists can draw important lessons in the grammar of living creatively with nature from this. In fact, living creatively with nature should be the founding pedagogy of sustainable development and the East Calcutta Wetlands can be a global hot-spot which can help draw road maps of sustainable development for poorer parts of the world. ■

Dhrubajyoti Ghosh was formerly chief environment officer, department of environment, government of West Bengal



When all flows out

The recent dispute over the Indus' waters stems from its faulty allocation



RAVINDER SINGH

On July 12 this year, Punjab's legislators passed an act which annulled all previous water sharing agreements with neighbouring Haryana and Rajasthan. It sparked off a dispute whose roots actually go back to the 1960 Indo-Pak Indus Water Agreement. In its haste to exact much more than India's due share, the then Union government included non-riparian areas in our side of the Indus basin. India eventually got only 20 per cent of Indus waters — that barely meet the needs of present day Punjab. But the government's foible meant that 70 per cent of it was transferred outside the Indus basin, much to the chagrin of people in Punjab.

As per last ten years data, the annual water release from the three rivers of the Indus basin — Satluj, Ravi and Beas — is about 28 million acre feet (MAF). But water losses and fluctuating flows mean that only 21 MAF water is actually available. However, our planners had not reckoned this in 1981. That year, a water sharing agreement was signed between Punjab and its neighbouring states and 17.17 MAF water was allocated to all the parties from the Ravi-Beas — in addition to 15.6 MAF Satluj waters allocated by an earlier agreement. Punjab was initially allocated 3.5 MAF (20 per cent) Ravi-Beas waters; that was increased to 5 MAF (30 per cent) as per the Rajiv-Longowal accord. Today, the Ravi-Beas system releases about 14.1 MAF but 12.1 MAF of that flows down to non-riparian states.

The good neighbour's ire

So Punjab's grouse is quite legitimate. Since it is a lower riparian state, Punjab's residents are entitled to all the

water the state receives from the Ravi-Beas and the Satluj river systems. But Punjab's Doaba area, which produces 5 million tonnes of foodgrains annually and has 6 million people, gets water only from the 1408 cusecs capacity Bisht Doab Canal. In contrast, the Rajasthan Canal takes away 18,500 cusecs water to 2 million people in Bikaner and Jaisalmer districts, where food productivity is negligible. And this is not all: the Satluj Yamuna link canal — when



ready — will take away 15,000 cusecs to Rohtak district, Haryana.

Deprived of canal waters, Punjab's farmers now depend on increasingly scarce groundwater for irrigation; extracting it through tubewells means precious electricity or diesel consumed — the former costs Rs 4 per unit, while the latter comes at Rs 25 per litre. It is estimated that Punjab loses more than Rs 6,000 crore every year because Indus' waters are diverted away from the state.

Some might argue that this is a sacrifice that Punjab's people have been enjoined to, for a greater national good. Such people would have been on solid turf if canal networks had worked well.

They haven't: recent figures show about 40 per cent of the Ravi Beas and Satluj waters are wasted in transmission.

Bad utilisation

The recent dispute is therefore a chance to re-examine our wasteful water allocation system. India utilises just about 12 per cent of the usable potential of its river waters. In comparison, neighbouring Pakistan utilises 104.7 MAF of canal waters out of the 144.9 MAF available to it — a usage rate of more than 70 per cent. Pakistan has managed this by keeping the length of its canals small. The average length of its 9 main canals is only 68 km and they transfer eight times more water than the 660-kilometre long Rajasthan canal. But we have not learnt from our neighbours. The last government's much-flaunted river-linking system is based on long canal systems. Even if we assume, that the new canals will be more efficient, substantial wastage cannot be ruled out. We should also remember that our 71 major dams store only 1.5 per cent river waters during peak flow seasons. The rest goes waste.

Moreover, does damming rivers and channeling their water through canals actually increase agricultural productivity? Consider this: Maharashtra has 1651 dams and its per hectare (ha) agricultural productivity is 757 kg while Madhya Pradesh with 803 dams produces 907 kg per ha. Gujarat with even less dams — 576 — produces 1169 kg per ha. In comparison, Punjab has 12 large dams and shares water in three dams with two neighbouring states, but its production is 4032 kg per ha. Clearly, India's water allocation system requires a thorough overhaul. ■

Ravinder Singh is a scientist and inventor



High-yield, low agro-diversity

Green Revolution crops have also snuffed out farmers' wisdom in the Western Himalaya



GOPAL S SINGH

Traditional agricultural practices in the Western Himalaya are in concord with local environmental conditions. But introduction of high yield crop varieties (HYVs) and orchards have led to a decline in such practices; the region's rich biodiversity has also suffered. The Chhakinal watershed area in Kulu district, Himachal Pradesh, is among those affected.

Till three decades back, agriculture here was a complex product of crop and animal husbandry and use of forest-based resources. As many as 17 crops were cultivated in this 45-square kilometre (sq km) area — all these, except wheat, were locally bred. These included cereals (two local paddy varieties, one local barley species and two varieties of wheat — one locally generated and the other HYV), millets and pseudo-millets (amaranths, three varieties of buckwheat, finger millet and maize), pulses (blackbean, frenchbean, horsebean, soybean, green gram and peas), potato and mustard. Such diversity was maintained through a variety of cropping patterns. As many as 12 crops (amaranths, 3 varieties of buckwheat, finger-millets, maize, blackbean, frenchbean, green gram, horsebean, pea and soybean) were produced through mixed cropping while only five — wheat, barley, paddy, potato and mustard — were

cultivated by mono-cropping.

Crop diversity was the local agriculturist's response to the immense topographical and geo-climatic variations within the 45-sq km area. Different altitudes, slopping patterns as well as varying temperature, humidity and rainfall necessitated diversification of the farming landscape. Such conditions also meant that holdings were small — the origin of small holdings producing varied agricultural products is a complex topic but its functional significance is probably related to ensuring diverse yields to a population that had very little day-to-day interaction with the plains.

All locally generated

Crop yields also depended upon inputs of locally available manure, derived from animal excreta and forest resources. Besides, the farmers ploughed back much of the agro-residue into the fields; this ensured a good dose of nutrients for the soil. Significant amounts of weed were left behind in fields for replenishment of nutrients and improvement of the soil's physical and chemical properties. The fodder was then used as animal feed.

This integrated production system evolved through generations-old processes of trial and error. But the introduction of HYV crops — particularly wheat, rice and apple — since the 1970s has upset this system. It has led to the incorporation of new farm technologies and made farmers dependent on external markets for agro-chemicals and hybrid seeds; simultaneously many native crop varieties have vanished from the agricultural landscape. For example, crops such as the *Setaria italica* (foxtail millet), *Panicum miliaceum* (hogmillet)

and *Chenopodium album* (whitegoose foot-katah) — once major crops of the area — have disappeared, while species of *Fagopyrum* (locally known as *kathu*, *besa* and *gangri*), *Eleusine coracana* (finger millet), *Amaranthus paniculatus*, *Triticum aestivum* (a local wheat variety) face extinction.

Telling impacts

The impact of HYV crops has been telling in other areas as well. The earlier agricultural practices involved a prominent role for women. However, introduction of new crops and fruit trees means very little use of local knowledge systems. And this has meant that the once women-dominated agricultural system is giving way to a more male-oriented agro-horticultural system. Moreover, lack of technical know-how and unplanned use of agro-chemicals have affected farmers' health.

All this does not mean that the Western Himalayan farmers should do away with modern agricultural practices completely. That would be economically unfeasible. The new alternatives must combine modern scientific knowledge with traditional practices. For example, having fruit orchards are not advisable in the higher reaches of Kulu. In valleys, land should be used for local food crops and vegetables. But in the more environmentally congenial lower reaches of the region orchards can be introduced to help mixed crop cultivation. Such a model should be initiated with local people's participation. ■

Gopal S Singh is with the Centre of Advanced Study, department of botany, Banaras Hindu University, Varanasi, Uttar Pradesh



BOOK>> THE HUNGRY TIDE • Amitav Ghosh • Ravi Dayal • Delhi • 2004 • Rs 350

Lost lands and forgotten people

NITIN SETHI

Some coastal animals have a rather ingenious ploy for sifting wheat mixed with sand. The mix is tossed into water whereupon, the sand settles down leaving the wheat afloat. Distinguishing historical fact from the fictive element in Amitav Ghosh's latest novel *The Hungry Tide* is not quite so simple. Ghosh treats the novel as a metaphor, an extension of his belief: "the poor in our country pay the price for our ideas of environmentalism."

As war breaks out in Bangladesh, dalits from the 'other' side of the *chars* (sandbars of the Sundarbans) are captured by the Indian army and relocated to Madhya Pradesh. But unable to strike roots in the unfamiliar environs, they decide to colonise one of the islands of the archipelago and create their own space.

The island they choose, Morichjhapi, is part of the Sundarbans barred to humans under the forest laws. The dalits however, decide to hold ground and ignore government orders to quit the island. One night, the government, keen to save the wilderness, sets loose a pack of hoodlums to butcher the villagers. This is part truth and partly what Amitav Ghosh makes of it.

The story is about Morichjhapi but the novel is about much more. Let's assume that the novel is a photograph. It then becomes easy to explain its composition, and Morichjhapi's position in the set-up. At the forefront of the novel are characters sketched so brilliantly that you can feel their fears and trepidations

seep in with gulps of air as you read. These characters are located very much in the present, but their relation to each other is tied to a past painfully anchored in the Morichjhapi massacre. But Ghosh merely alludes to the massacre, and is careful not to launch into a discussion. The novel is thus subtly built, upon the reference to Morichjhapi.

In the process, Ghosh creates uncannily real characters, as anyone who has worked with in the forest fringes will vouch for. So real, that they risk being mistaken for stereotypes. Their joys and sufferings in all their starkness are equally convincing. Take

who love animals so much that they are willing to kill us for them?"

Against the flow

This is the first fiction in Indian English literature to challenge the idea of environmentalism in the country. In that, the novel breaks new ground. In the construction of the narrative too Ghosh tries new tools. He uses the tricks and methods of oral tradition in narrating stories and fables to launch into sub plots and new twists to his main plot. At times it jars and at times it helps build a pitch for the narrative. Yet, in comparison to his earlier novels the structure of the narrative remains relatively linear.

His positing the debate about poverty and environment is a tad simple. By keeping the story (reality or fiction) of the massacre off from the centre of his novel he is able to keep much of the ugliness of the debate out too. However, when in an interview Ghosh scorns at the Left government's keenness to help the Sahara Group set up a multimillion-dollar tourism resort in the same region — the Sundarban — one is sure that the author is politically more astute than his characters.

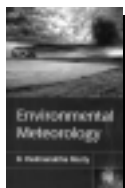
Ghosh has chosen

his words so well and scripted his fiction with such elegance that the novel is bound to be a success. The novel will presumably be read widely by a subset who consciously or otherwise, define a class's morality as environmentalism. How well will they digest the work of fiction that alludes to their reality? And, did our author tone his work harsh enough to give his readers one bad night's sleep? ■



In *The Hungry Tide* the narrative is like a palimpsest. The ghost of Morichjhapi a constant reminder of the many atrocities in the name of 'environmentalism'

for instance, the anguished cry of Kusum, an islander in Ghosh's novel. The policemen, government agents aiding resettlement of the islanders, argue: "This island has to be saved for its trees, it has to be saved for its animals, it is a part of a reserve forest, it belongs to a project to save tigers, which is paid for by people from all around the world." Then, a perplexed Kusum wonders: "Who are these people, I wondered,



BOOK>> ENVIRONMENTAL METEOROLOGY • by B Padmanabha Murthy
• I K International • New Delhi • 2004 • Rs 225

Measures to measure

T V JAYAN

Owing to concerted efforts by civil society organisations, awareness about air pollution in India and its resultant impact on human health has increased in the past decade. Timely judicial interventions forced state and central pollution control boards to broaden their purview to accommodate air pollutants. For a long time, these bodies restricted their monitoring activities to only visible forms of waste — found on land or in water bodies. Today, many cities in the country — big and small — have set up stations to regularly measure pollutants such as carbon monoxide, oxides of nitrogen and carcinogenic hydrocarbons, belched out by power plants, chemical industries and an ever swelling automobile fleet.

Tackling air-borne pollutants at their source is a good idea, but an impossible practice. Talking of urban air pollution models, B Padmanabha Murthy says: “Air quality monitoring stations usually collect data as per the established norms of Pollution Control Boards. This is inadequate. Networking of

monitoring stations should be on a scientific basis and recording equipment must be set up to obtain precise hourly ground-level concentration.” A host of meteorological conditions — speed and direction of winds, atmospheric temperature, humidity, and precipitation — make mischief, making it difficult to trap the noxious fumes. In *Environmental Meteorology*, Murthy deals with this interplay of meteorological factors and pollutants. According to him, this has spawned environmental concerns such as climate change, ozone depletion, global warming and acid rain.



AMIT SHANKER / CSE

Many cities
in the country
now have
set up
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regularly
measure
air pollutants

The book delves deep into the science of various meteorological parameters that are influenced by urban changes. A typical example is the ‘heat island effect’ in urban areas. Space cooling in summer, heating in winter, industrial and transport activities as well as household energy consumption lead to formation warm pockets within a city. This anthropogenic heat combines with summer heat, enhancing the thermal humidity index and making the environment unbearable. In winter, this might cause enhanced heat island effect. Murthy attempts to explain the process in detail through isotherm and isohume maps of Delhi, Mumbai, Kolkata and Pune.

Environmental meteorology is a fairly new subject and there is no comprehensive textbook for students in this interdisciplinary area. So, Murthy’s book is a welcome arrival. The author has taught the subject at the Jawaharlal Nehru University, New Delhi, for nearly two decades. However, the ‘text-book’ tag need not desist other readers from having a go at it. The book makes for a good and informative read even as it explains, quite simply, various meteorological processes and the tools employed used for measuring them. Besides, Murthy’s own involvement in air pollution model studies and his experience in conducting environmental impact assessments enriches the text. ■

DOCUMENTARY SERIES>>

KILL OR CURE • Rockhopper Productions Ltd • BBC World • May 14 to June 18, 2004

Out of focus

VIBHA VARSHNEY

We have our fair share of diseases — malaria, tuberculosis (TB), diarrhoea — but we cannot boast of an equal number of cures. We have received umpteen perorations on how much we receive from our more fortunate cousins — the industrialised world. The documentary series, *Kill or Cure*, aired on BBC World, is yet another reminder.

Each of the first three films focuses on a vector borne disease. The inaugural film focuses on the ravages of malaria. It voices concern over the dwindling efficacy of the popularly used malarial drugs even as the plasmodium develops a resistance to them. It goes on to acknowledge the efforts of the charitable organisation, Medicines for Malaria, in distributing the new low-cost drug, artemisinin.

The film on elephantiasis, too, lingers on pharmaceutical companies GlaxoSmithKline and Merck & Co, Inc. for having donated a useful drug in 38 countries. Ghana and Egypt are held up as examples of grateful beneficiaries. The contribution of foreign aid is undeniable and the intention is not to discredit. But to say that it is the lone solu-

tion betrays a lack of foresight.

When it comes to a disease like TB the film makers have to abandon the back-slapping. TB is infamous for its multi-drug resistance. The convenient option then is to look the other way and focus attention on the DOTS programme (directly observed therapy short course) instead. A programme that has failed in India. The series also suggests that post natal immunisation can help ward off hepatitis B, but does not address the difficulties of implementing it in a country like Cambodia where most children are born at home. Overall, the film glosses over the lack of infrastructure, keeps mum on attempts at prevention and seems more like a paean in praise of certain pharmaceutical giants. ■

CAMPAIGN>> JAL CHETNA YATRA • Haryana

In hot water

On July 12, 2004, Punjab passed an Act scrapping all water sharing agreements with neighbouring states. On July 23, the Haryana Sahitya Akademi launched a two-day Jal Chetna Yatra across 12 Haryana towns to drive in the point that water is a national resource.

If you see a connection between Punjab's decision and the yatra, Akademi officials will vehemently say you have got it wrong. "There is no politics. The yatra was organised by the Akademi, which has nothing do with politics," says an official.

About 40 writers, poets, journalists and academics went around Ambala, Panipat, Kurukshetra and other towns telling people that water is too significant to be a sole state's asset. Newspaper reports quote Akademi director Chander Trikha as saying that the yatra would generate mass opinion against the evil design of those who want to create a division between states on water. If you again read something in that statement, the Akademi will tell you to stop. "Punjab may have heard it wrong, we never said this. Our statement was misinterpreted," says the official.

"The controversy regarding the Satluj-Yamuna link canal had nothing to do with the yatra. Water has become an emotional issue, that's why even campaigns like ours become controversial," he says.

Indeed, water has become an emotional issue in Haryana. *The Indian Express* reports that the Haryana Bhartiya Janata Party has launched its own Jal Chetna Yatras across 90 assembly constituencies in Haryana demanding that the Union government dismiss Punjab's chief minister. The party's yatras will gather at Chandigarh on August 4 and gherao the Punjab Raj Bhawan.

Surely, that's politics. ■



TACTICAL MEDIA>> POSTERS BY A
NON SMOKING GENERATION • Sweden

Lies against lies

Smoking stunts penis growth, cigarette filters contain mouse excrement and girls start smoking because they're stupid. Residents of Stockholm, Sweden, found their city plastered with posters making these claims on July 19. The posters are of course utter lies, but the Swedish organisation which pasted them isn't feeling guilty or ashamed.

"We wanted to raise awareness about how the tobacco industry always promotes its products — through lies," says Anne-Therese Enarsson, head of A Non Smoking Generation, an anti-tobacco group. "Our lies are so exaggerated that we hope they will make people stop and think, and then come to our website to find the truth," she says.

Other lies plastered across the Swedish capital included posters claiming that second-hand smoke is killing birds. "This is an important campaign because it is summer vacation now and most kids start smoking in the summer. There are 70 kids who start smoking every day in Sweden. We hope this will make them think twice," says Enarsson, adding that the posters would stay up for the next two weeks.

A Non Smoking Generation was not worried that tobacco companies would sue over the lies, she says. ■

MAGAZINE>> NATIONAL GEOGRAPHIC • USA

Obesity news, fat ads

Reading about obesity in the *National Geographic* magazine and in its sister publication *National Geographic Kids* can be confusing. The *National Geographic's* August issue explores if genetics, diet, larger meal sizes at restaurants, sedentary living and commercials on bad food lead to obesity. But the May issue of *National Geographic Kids* is being accused of contributing to the obesity problem by running ads for unhealthy food.

So, the Washington-based Center for Science in the Public Interest has written to the National Geographic Society, publisher of the magazines, complaining about the ads for products like Hostess cupcakes and Kellogg's Smorz cereal in the publication, reports the *New York Times*.

"It is unconscionable that the Society has chosen to cram



National Geographic Kids magazine with advertisements for sugary cereals, candy and snack foods," the letter says. The complaints stem from *National Geographic Kids'* May issue, which was wrapped in an ad for Arby's, the sandwich shop chain. The wrapper was marked 'advertisement' but resembled the magazine's cover.

Rainer Jenss, publisher of *National Geographic Kids*, says that the criticism would be carefully considered. "We are going to sit down and go line by line over the points that they made. But parents are the real gatekeepers between

Madison Avenue and their children," he says.

According to the Publishers Information Bureau, ad pages in *National Geographic Kids* grew 7.5 per cent from January through June 2004, compared with the period last year. Jenss says advertising provides financing for the magazine's educational mission. "We do accept advertising from these companies because, from a pure economic standpoint, they're the ones with the advertising budget and marketing dollars to reach kids this way," he says. ■

SCIENTIFIC PUBLISHING >> ACCESS • UK

Show all

The Science and Technology Committee of UK's House of Commons believes scientific publishing is presently "unsatisfactory" because it limits free access to results published in scientific literature. But it seems that's where the belief ends.

The Science and Development Network reports that the committee in a July 2004 report called *Scientific Publications: Free for all?* recommends "increased assessment of the viability of open access publishing in science" to increase access to academic journals by researchers in developing countries. Open access requires authors — or their funders — to pay the publication costs in scientific journals. It would mean that electronic versions of journals could be accessed free of charge via the Internet.

Another important recommendation is the establishment of 'institutional depositories' to house research papers electronically so that they can be accessed for free. The report didn't have any comment on research, access to which is restricted because of industrial security and official state security laws.

A publishing house told the panel that open access would present barriers to authors in poorer countries, as they would not be able to afford the fee. But the committee says publishers can form schemes by which authors from developing countries are paid for their submissions. ■



Australian PM John Howard out on a morning walk on his birthday, July 27, is waylaid by Green Peace activists and reminded that he hasn't signed the Kyoto Protocol

NEWS ALERT >> BRITISH COLUMBIA GOVERNMENT AND EMPLOYEES UNION

Corporate watching

If US corporates get access to confidential information about citizens of other countries, will they run to their country's FBI and tell all? That spectre is bothering government workers in British Columbia, a Canadian province, where IBM Canada has bagged a contract, which may give it access to virtually all files handled by the government.

The British Columbia Government and Employees Union (BCGEU) flashed an alert on its website in July 2004 and "demanded answers" from the provincial government regarding a contract to IBM Canada, which privatises desktop support for all government employees' computers.

BCGEU is concerned that US companies like IBM Canada who get contracts to handle Canadian citizens' confidential information may be forced by new security laws to share it with US authorities, including the FBI. According to the contract, IBM Canada may get to handle services like help desk support, administration and technical support in all government ministries. ■

ONLINE

www.indiatogether.org

UNENDING OPINION

If you want to read well researched, comprehensive and non-stop reportage on issues, chances are that your newspaper or magazine will run out of column space after a while. But at indiatogether.org, the edits and opinion pieces don't have that constraint.

No pop-ups, flashes or tickers, and at least 15 'topics' covering the most important concerns in India today. From A for adivasis to W for women, each of these topics contains at least 20 reports and opinion pieces. For example, the media section has a range of articles: from why India isn't 'unshackling FM radio' to 'culture cops and the mass media'. The laws section has debates on capital punishment and the Freedom of Information Act

If that can't fill your reading appetite, you can read about more than 15 states. P Sainath's reportage on the agrarian crisis in Andhra Pradesh is a complete website in itself. The website was set up in 1998, and since July 2003 has been running on donations from readers. It can truly claim to be running for readers' interest.

And what a treat for readers: Each article has sketches, sometimes graphs and charts, blurbs and highlights. Why can't newspapers and magazines be like [indiatogether](http://indiatogether.org)? Because "news organisations are not leveraging the advantages of the Internet, but are merely bringing a portion of their print publication online," the overview section will tell you.

But not at [indiatogether](http://indiatogether.org). The edit here doesn't end at op-ed.

NEWS SNIPPETS

>>> Captain Kirk never used the self-destruct mechanism on his spaceship in the TV serial, *Star Trek*. You can, at the world's first Science Fiction Museum and Hall of Fame in Seattle, USA. The museum, which opened on June 18, has exhibits like *The Changing Face of Mars*, *Fantastic Voyages*, *Out of the Ashes* and *Brave New Worlds*.

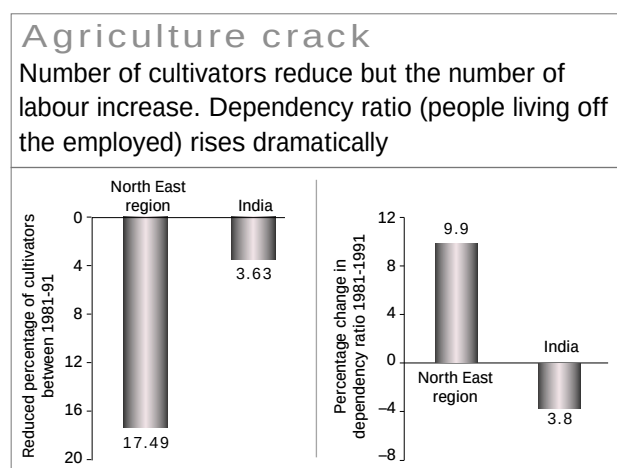
>>> The Sri Lankan government has launched a nation-wide program to train school principals and teachers in Information Technology (IT), and then introduce it in their schools curriculum. Despite an impressive 92 per cent literacy rate, Sri Lanka is still lagging behind in IT education due to decades-long political instability.

Spur to militancy?

Investments in the Northeast fail to generate employment

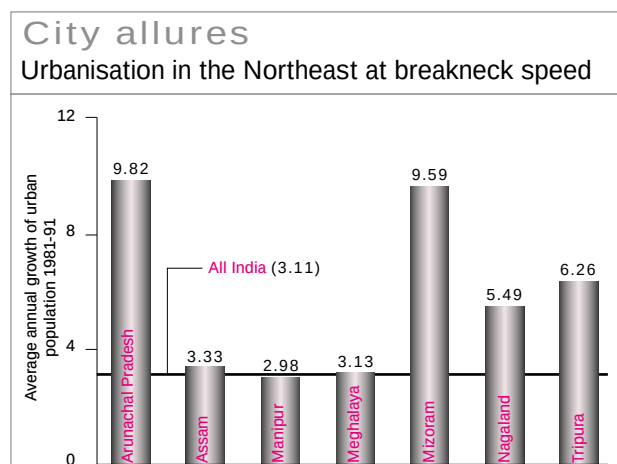
EMPLOYMENT

► Agriculture does not create entrepreneurs that can handle a monetised economy. Urban populations surge as people move to cities looking for options



URBAN JUNGLE

► The educated youth moves to towns. But education fails them. Assam is worst-hit, with 1,486,600 registered unemployed in 2001. That is 61.5 per cent more than the rest of the six states. The seven states put together had only 2,300 unemployed capable of administrative, executive and managerial work



INVESTMENT

► The government believes pouring money in is the panacea. Between August, 1999 and May, 2002 it invests Rs 1,267.87 crore. This generates a mere 18,007 jobs

Money is to fuel...
...energy security and not employment. 44.64 per cent of all funds go to petroleum sector

Products	Number of units	Investment (Rs in lakh)	Percentage of share
Petroleum	2	56,600.00	44.64
Tea	210	19,611.78	15.47
Steel fabrication	333	15,396.16	12.14
Food & Beverages	78	7,947.88	6.27
Pan masala and others	70	7,851.41	6.19
Cement	35	7,832.99	6.18
Plastics/Polymers	28	1,722.46	1.36
Jute	6	971.80	0.77
Printing stationary	20	826.12	0.65
Rubber products	20	728.80	0.65
Coal	3	645.46	0.57
Paints	5	391.4	0.31
Others	123	6,260.48	4.94
TOTAL	646	126,788.64	100.00

► Guwahati is where the buck stops, literally. So Assam gets most of the investments. Other states' capacity to invest is minimal and the industrial sector unwilling

Black hole
for all investments into the Northeast is Assam

State	Number of units	Investment (Rs in crore)	Percentage of share	Employment (numbers)
Assam	511	1,038.08	81.88	12,827
Meghalaya	49	190.24	0.15	4,244
Nagaland	48	19.63	1.55	439
Arunachal	10	10.29	0.81	140
Tripura	28	9.63	0.76	357
TOTAL	646	1,267.87	100	18,007

Source: SK Mishra 2002, 'AGRICULTURE IN THE NORTH-EASTERN REGION', Department of Economics, north east hill univeristy, Shillong.
Anon 2003, Basic Statics for Northeast, North East Council, Shillong

Publications of Centre for Science and Environment

■ Making Water Everybody's Business: Practice &

Policy of Water Harvesting

Edited by: Anil Agarwal, Sunita Narain & Indira Khurana

This report provides in-depth analysis of traditional practices, technologies, policy issues and the work of governments and NGOs in the field of water management. (Pages 456)

HB: Rs 890 / US \$ 30

PB: Rs 490 / US \$ 22

■ Fourth Citizens Report (SOE-4): Dying Wisdom

Edited by: Anil Agarwal, Sunita Narain

This report provides a comprehensive overview of India's millennia-old traditions of rainwater harvesting. Triggered a nationwide interest in community-based water management. (Pages 404)

HB: Rs 590 / US \$ 20

PB: Rs 390 / US \$ 14

PB: Hindi Rs 290 / US \$ 12

■ Tanks of South India

Edited by: Prof A Vaidyanathan

This book analyses the variations between and within tanks – in the distribution of water to different segments of the command and in productivity. (Pages 178)

PB: Rs 490 / US \$ 14

■ Water Harvesters' Manual for Urban Areas



This manual is built out of CSE's experience in providing technical advice to schools, residential colonies, individual households and factories to implement rainwater harvesting in the urban context. It

provides basic information on the need and potential of rainwater harvesting. Available in English, Gujarati, Hindi, Marathi, Tamil and Telugu. (Pages 35) PB: Rs 100 / US \$ 8

■ Mileage – Green Rating of Indian Automobile Industry

In-depth analysis of the environmental performance of major players in the Indian automobile sector during the various stages of its life cycle. (Pages 238)

PB: Rs 490 / US \$ 18

■ Environmental Rating of Indian Caustic-Chlorine Industry

An exhaustive life cycle analysis of players in the caustic chlorine sector and its impact on environment. Deals extensively with the alarming issue of mercury pollution, its deadly effects and a comparative study with the global scenario. (Pages 334) PB: Rs 2999 / US \$ 90

STATE OF INDIA'S ENVIRONMENT – THE CITIZENS REPORTS

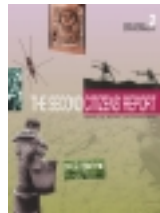
■ First Citizens' Report (SOE-1)

Edited by: Anil Agarwal, Ravi Chopra & Kalpana Sharma

This report analyses the little understood relationship between development and environment, the impact of environmental degradation on individual, social groups, tribals and nomads. (Pages 192)

HB: Rs 290 / US \$ 12 PB: Rs 190 / US \$ 10

■ Second Citizens' Report (SOE-2)



Edited by: Anil Agarwal, Sunita Narain

This report describes major environmental changes in India. It's a balance sheet of India's resources and focuses attention on the effect of ecological degradation on the poor. (Pages 393)

HB: Rs 490 / US \$ 18

PB: Rs 290 / US \$ 12

■ Third Citizens' Report (SOE-3): Floods, Flood Plains & Environmental Myths

Edited by: Anil Agarwal, Sunita Narain

This report remains one of the few chronicles of the ecological change taking place in the Indo-Gangetic plains — India's most densely populated area. (Pages 167)

HB: Rs 290 / US \$ 12 PB: Rs 190 / US \$ 10

■ Fifth Citizens' Report 1999 (SOE-5)

Edited by: Anil Agarwal, Sunita Narain and Srabani Sen

This report documents the extraordinary initiatives in the rural sector and the crisis the urban sector faces. As per The Economist London "A remarkable attempt to put together all the different aspects of the environment, stand back, and see how the picture looks". (Pages: Part I-440; Part II-256)

HB: Rs 1590 / US \$ 59 PB: Rs 590 / US \$ 33

■ Global Environmental Negotiations (GEN-1):



Green Politics

Edited by: Anil Agarwal, Sunita Narain, Anju Sharma

This book provides a close analysis of important environment related conventions and institutions from their origins, and demystifies the politics of 'saving the environment'. (Pages 409)

PB: Rs 590 / US \$ 31

■ Global Environmental Negotiations (GEN-2): Poles Apart

Edited by: Anil Agarwal, Sunita Narain, Anju Sharma & Achila Imchen

The second in the series this book includes updates on the issues dealt within the first report, Green Politics. This report has also new chapters on five conventions and institutions. (Pages 441)

PB: Rs 690 / US \$ 33

■ Global Warming in an Unequal World

Edited by: Anil Agarwal, Sunita Narain

A case of environmental colonialism. (Pages 34)

PB: Rs 30 / US \$ 6

■ Slow Murder: The Deadly Story of Vehicular Pollution in India

Edited by: Anil Agarwal, Anju Sharma & Anumita Roychoudhury

This report discusses the issue of smog and smog makers with shocking revelations on vehicular pollution. (Pages 148)

HB: Rs 390 / US \$ 19 PB: Rs 75 / US \$ 7

■ Homicide by Pesticides

Edited by: Anil Agarwal

A series of articles discuss the effects of environmental pollution on public health – a must have. (Pages 128)

PB: Rs 75 / US \$ 7

■ The Challenge of the Balance

Edited by: Anil Agarwal

This report analyses the proceedings of CSE national seminar on economics and environment discusses the strong bondage between economic growth and environmental sustainability. (Pages 388)

HB: Rs 590 / US \$ 22

■ Natural Resources Links

Directory of Indian government departments and institutions dealing with natural resources with key contact details and area of specialisation. (Pages 454)

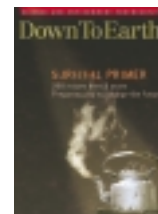
PB: Rs 490 / US \$ 14

■ Health Links

Directory of experts on environmental health in India and overseas with contact details and area of specialisation. (Pages 70)

PB: Rs 65/US \$ 5

■ Survival Primer – Down To Earth Special Issue



Contains prominent articles collated from 200 issues of science and environment fortnightly, Down To Earth, from 1992 onwards. (Pages 240)

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