

FEELING THE HEAT

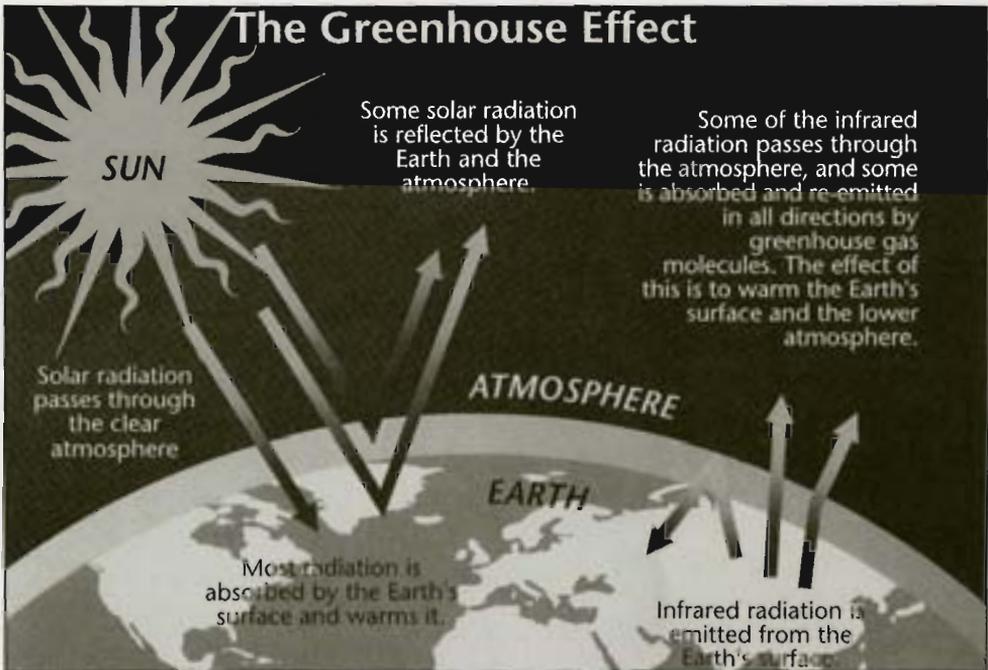
Global warning on climate change

Temperatures are rising. Whether or not this is linked to greenhouse gases, the variability in climate already has significant impact on developing countries.

By Rakesh Kalshian

By late spring in 1999, Orissa on India's east coast was reeling under a heat wave. With the mercury at a sizzling 40 degrees

Celsius, summer was expected to be a far deadlier scorcher than the last, which claimed about 650 lives. Meteorologists predicted that coastal towns



The greenhouse effect naturally warms the Earth's surface. Without it, Earth would be 15.5° C cooler than it is today - uninhabitable for life as we know it.

Source: CLIMATE CHANGE, State of Knowledge, Office of Science and Technology Policy, Washington, D.C.

and villages could be the worst hit, with temperatures crossing the 50-degree Celsius mark. With six people already succumbing to the heat, the state government wasn't taking any chances this time. Brick kilns were asked to shut down, buses were taken off the roads, and siestas were expected to become the order of the day. Schools were ordered to conclude all examinations by April-end. People were advised to drink lots of water; and hospitals ordered to stock up enough salt, ice and medicines to treat heatstroke. Then in October 1999,, Orissa was hit by a super typhoon - the worst storm this century.

It wasn't Orissa alone that saw unusually extreme weather. Temperatures soared across the entire northern half of the Indian subcontinent. There were

no rains across the northeast during the first six months of 1999 affecting the region's most important export - tea.

But what heated up Orissa? Is it a natural caprice of climate, "a gush of hot air from the desert of Rajasthan," as the meteorological department put it? Or, as some environmentalists reckon, a "heated" reaction provoked by human meddling with the environment. Is deforestation to blame? Or, as many weather-watchers suspect but would not aver for lack of scientific evidence, could it be yet another indicator of global warming thanks to the rising concentrations of greenhouse gases (GHGs) in the atmosphere because of deforestation and the burning of fossil-fuel?

Climate being what it is - a hard nut



HIMAL

How will climate change affect places like the arid Mustang region?

to crack - it is difficult to put a finger on it. "While a hot summer in Orissa this year is consistent with a warming trend coupled with diminishing rainfall in parts of Orissa and Madhya Pradesh, we cannot confidently say who's the culprit, be it El Nino or GHGs," remarks G B Pant, Director of the Pune-based Indian Institute of Tropical Meteorology.

This ambiguity in interpreting regional climate variations in terms of global warming is precisely why it is so difficult to relate to global warming. Take Chhattisgarh district of Madhya Pradesh, for instance. For the last three years since 1996, villagers here haven't seen monsoon rains. Relentless droughts together with untimely downpours during the dry season have destroyed paddy crops, bringing misery and despair to the peasants. Is this customary monsoon madness or a coherent testimony to global warming?

In big cities where there is greater interference with the environment, climatic fluctuations are more frequent and pronounced. In 1998, for instance, Delhi had one of its hottest summers. As it turned out, it was also the hottest year of the century globally. People immediately made the obvious connection.

"But, for all we know," cautions Pant, "it may well have been a local aberration. The heat-island effect, in which a thinning green canopy and thickening concrete cover dry up the earth, could have jacked up the temperatures."

The last year of the century also be-

gan hot. The switch from spring to summer jumped the gun by 15 days with Delhi experiencing its hottest April of this century. The entire north-west and central India was reeling under a heat wave in 1999. Some places in Rajasthan were baking at 48 degrees. Even peninsular India has been caught in this heat trap, with many cities recording abnormally high temperatures.

Is this a mere flash in the pan or are we being gradually pushed, as it were, from the frying pan into the fire? Public perceptions tend to veer towards the latter but weather diviners are sceptical. According to Pant: "People often declare that a particular winter is the coldest they have experienced, or a summer the hottest, but history may not support such views. Human memory in most cases is too short to remember long-term temperature changes, and one is biased towards the most recent experiences."

If personal recollections are prejudiced and unreliable, what do objective analyses of temperature and rainfall records tell us about India's climate? Is there a warming trend, consistent with the theory of global warming? Have some regions warmed more than others? Has warming affected the monsoon pattern, both in terms of its geographical distribution as well as intensity? Has it contributed to more floods? More droughts?

Again, there are no straight answers. Only indicators. Primarily because of the complexity of climate behaviour but partly also because of the lack of doggedness on the part of Indian scientists

to crack it. A 1985 analysis of temperature variations between 1901 and 1982 suggests that the annual mean temperatures for the country as a whole has risen by a significant 0.4 degrees Celsius over the last century. This is in line with the 0.5 degree Celsius rise in the average global temperatures this century. The study reveals that while there is more warming over northern and southern parts of the west coast, the interior peninsula and the northeast regions of the country, parts of north-west India are cooling off. Some more vagaries of Indian climate:

- The post-monsoon and winter warming are largely responsible for the rise in mean annual temperatures. In contrast, in the northern hemisphere warming has been most pronounced in spring and late autumn.
- Warming over India is almost entirely because of hotter days. In contrast, warming in the northern hemisphere is due to warmer nights.
- The last two decades have warmed up faster than earlier decades.
- Since 1951, there has been a general increase in the diurnal range of temperatures unlike in developed countries where it has decreased.
- Calcutta, Bangalore and Mumbai show significant warming; Delhi showed significant cooling. Chennai and Pune showed no significant trends.
- Jabalpur showed the maximum increase, 2.3 degrees Celsius in the last 100 years.

The effect of this warming trend on the monsoon is unclear. For the country as a whole, rainfall records show no marked increasing or decreasing trend over the century although there seems to be a 30- to 40-year cycle of alternate generous and niggardly monsoons.

Emerging trends

However, there are some regional trends emerging. The west coast, north Andhra Pradesh and northwest India are getting more rains while parts of east Madhya Pradesh, west Orissa, northeast India and parts of Gujarat and Kerala have been experiencing a lax monsoon. For instance, the north-east - usually a rain-surplus region - did not receive any rains for over five months in the winter of 1998. Forest fires raged across the Himalayas from the Garhwal hills through Nepal and Bhutan to the northeast. The winter drought is also expected to decrease precipitation yield by 20 percent.

But the most ominous change for climatologist Murari Lal of the Indian Institute of Technology, Delhi, is the increase in the number of intense short bursts of rain over the last decade. "I believe that the killer landslides in the Garhwal Himalayas and floods in 1998 were fashioned by the monsoon's epileptic fits," he says. Climate modellers predict such disasters would go up as GHG emissions shoot up.

But by far the least ambiguous signal of global warming seems to be retreating glaciers in the Himalayas and other mountain ranges of the world. Says S I Hasnain, a glaciologist at



PANOS/Tim Crowther

Lakes dammed by moraine below Mt. Gokyo in Nepal.

Jawaharlal Nehru University (JNU): "Once 25 km long, the Gangotri glacier has receded by 8 km since 1970. Not only are glaciers receding, they are also becoming thinner. I believe that most of our glaciers are slowly shrinking, but unfortunately we haven't studied our glaciers as much as the Nepalese or the Chinese." Their studies too show clearly that the glaciers are in retreat.

In Nepal, melting glaciers have created numerous lakes trapped behind natural dams of ice and moraine. "These lakes are imminent disasters," says Suresh Chalise of the International Centre for Integrated Mountain Development (ICIMOD) at Kathmandu. In 1985, for example, the Dig Tsho glacier lake in Sagarmatha National Park burst its natural dam,

unleashing a devastating flash deluge. "Similar bursts cannot be ruled out in the Indian Himalayas," says Chalise.

More alarmingly, if the prediction that a quarter of all glacial mass will disappear by 2050 is true, millions of people dependent on the Ganga, Brahmaputra and Indus rivers for survival could face a severe water crisis. "This is because in the dry season – September to June – water supply to these rivers from glaciers, which is almost 75 percent, is more stable and predictable than that from rainfall," explains Hasnain.

This warming trend could also render many ecologically fragile species extinct. According to biodiversity expert P S Ramakrishnan of JNU, in warmer climates exotic hardy weeds have already begun to creep up moun-

tain slopes, wiping out species vulnerable to small changes in climate. "In the Corbett National Park area for example, the exotic weed lantana is fast expanding its empire. And so are a few other exotics in the northeast Himalayas," he says. Baba Sundaranandji, an amateur naturalist who has spent his last 50 years at Gangotri, says that many plants he had photographed 30 or 40 years earlier have disappeared. Peter Smetachek, a Hungarian lepidopterist, has also recorded the disappearance of many butterfly species in the Kumaon Himalayas.

Clearly, the Indian climate is changing. But whether it is because of global warming caused by rising GHG emissions will remain a matter of scientific inquiry for some time to come. Despite the fiendish uncertainties lurking between regional climate change and global warming, most climate experts agree that the planet is becoming warmer and that this warming has much to do with rising GHG emissions from our factories and vehicles. They warn that as the concentration of carbon dioxide doubles, the earth will become warmer by at least two degrees Celsius over the next century, leading to irreversible changes in climate. Sea levels may rise, drowning small islands and submerging coastal populations, extreme events like droughts, floods and cyclones may become more frequent and devastating, species vulnerable to small changes in climate may become extinct; crop-yields may decrease, diseases like malaria and dengue may invade fresh territories and vulnerable populations.

Remember though that these dire predictions are based on mathematical models of climate change. And the degree of damage predicted - the rise in sea levels for instance - differs depending on which model is chosen and what data is fed into it. Given the uncertainties of climate behaviour, it is possible that many predictions may turn out to be exaggerated or even completely wrong. If that is the case, is it wise, ask sceptics, to invest billions of dollars in curbing GHGs? Perhaps not, but imagine if all or much of it turns out to be true. The damage then would be immense. This is the Precautionary Principle on which much of what is happening in the science and politics of climate change is premised.

The United Nations Framework Convention on Climate Change, initiated in 1994 and ratified by India, represents the political commitment of nations to combat the threat of climate change. Barring a few dissenting voices, there is a general consensus that global warming is not an abstraction. Indeed, the billion dollar question now is not whether GHGs are warming up the planet but who the greatest emitters are, how serious the threat is, who would suffer the most and how, and what the least expensive ways of getting around this looming menace are.

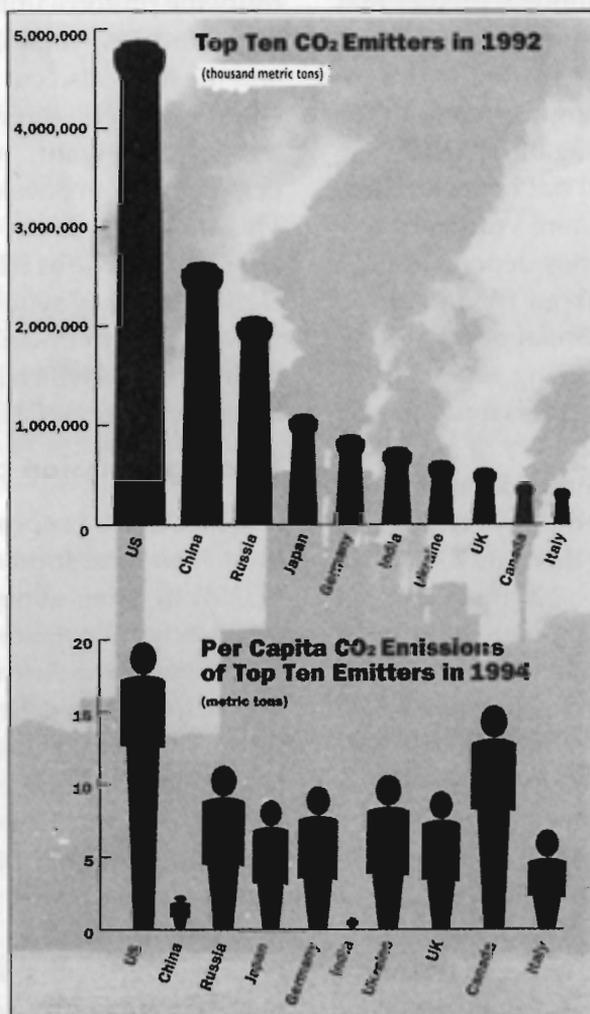
There are as many political as scientific posers. For, how one assesses the impact of climate change and apportions the responsibility for it would determine not only how much but also how quickly nations, mainly the industrialised world, will have to invest

in curbing GHG emissions. The small island nations, for instance, would want a bigger and speedier cap on GHG emissions lest they are consumed by the swelling oceans. But industrialised nations would prefer a smaller and gradual reduction so that its economy is not badly hurt.

So where does India stand in the emissions standings? Its net contribution to the global GHG kitty is insignificant. Against 1,355 million tonnes per year for the US and China's 1,300

million tonnes, India emits a meagre 150 million tonnes. The per capita figures illustrate the gap even more starkly: the U.S. has 5.4 million tonnes, Japan 2.5 and the global average is 1.1; India contributes only 0.22 tonnes. Conversely, however, India's carbon emissions per dollar of GNP are much higher, implying an energy-inefficient industry.

While only a minor player in the drama of climate change, India could - assuming the predictions of impact



Source: THE AMICUS JOURNAL, Winter 1998

are not belied - become a major casualty. According to recent climate model projections, India may experience a further rise in temperature of one degree Celsius by 2050, about four times the rate of warming over the past 100 years. Apart from higher incidence of natural calamities like droughts, floods and cyclones, it could also lead to a famine situation, with crop yields tapering off in the long run.

Overall, in the business-as-usual scenario, climate models predict that Asia and Africa would face the brunt of a much warmer planet, with economic impacts ranging from 2 to 9 percent of GNP, as against 1 to 1.5 percent for developed nations. Developing countries are more vulnerable essentially because they depend hugely on natural resources for survival. These projections are at best ballpark figures since estimating regional impacts of climate change is fraught with huge uncertainties.

"To give you some idea of the uncertainties involved," says climatologist Lal, "currently there are seven global climate models, all of which give wildly varying results when it comes to regional forecasts." So depending on who's doing the study, or more appropriately who's paying for it, these uncertainties can be easily exploited to play up - or play down - the impact.

In November 1997, in the Japanese city of Kyoto, after much hectic parleying and lobbying, the developed nations - US, the European Union and Japan - finally agreed to reduce overall GHG emissions by 5.2 percent below 1990 lev-

els in the commitment period 2008-2012. Some scientists, however, believe these commitments are not enough; rather than the touted 5.2 percent decrease, they argue, a small increase above 1990 levels could be expected. Says R.K. Pachauri, Director, Tata Energy Research Institute (TERI): "What one witnessed in Kyoto owes nothing to science and all to diplomacy."

Two years down the line, even these inadequate targets remain on paper. Chiefly because of US intransigence to ratify the protocol unless the developing countries - mainly China, India and Mexico - also cut down their carbon dioxide emissions. In diplomatic terms, the US wants "meaningful participation" from developing countries. This move has taken developing nations by surprise as it had been agreed earlier that they would be exempted from any commitments for the industrialised world which is and will be the biggest emitter of GHGs.

Trading emission credits

The US has proposed what it calls the Clean Development Mechanism (CDM) to bring about this meaningful participation. Essentially, it's a quid pro quo where industrialised countries invest in carbon-efficient projects in developing countries in exchange for tradeable "certified emission reduction" (CER) units. To oversee this trading, a global executive board is proposed. The board, in turn, will authorise numerous certification agencies that will assess the compliance of the country selling the emission reduction units.

Says Kathleen McGinty, an environmental officer in the Clinton cabinet and currently a fellow with TERI: "It's a very practical idea. While the developing countries get cleaner and energy-efficient technologies, which means better environment and more productivity, the developed nations can meet their GHG targets less expensively and hence quickly. For India, whose environment is under immense pressure from development activities and which is likely to face the brunt of climate change, CDM offers an excellent opportunity."

The Centre for Science and Environment (CSE) in New Delhi disagrees. The CDM, it believes, is an iniquitous mechanism since developing nations will sell their cheap options at rock-bottom prices and be caught out when it is their turn to reduce emissions. CSE Director Anil Agarwal says: "The US plans to buy as much as 93 percent of its emission units at the cheapest cost in the marketplace. It proposes to pay as little as \$14 to \$23 per tonne for its emission credits, as against \$125 if it does it at home." He feels emissions limits must be on a per capita basis so that the right and responsibility of every individual to the atmosphere is taken into account.

CSE's is the lone dissenting voice. For other Indian players with interests

in climate change sweepstakes, notably TERI, the Development Alternatives and the Indira Gandhi Institute of Development Research (IGIDR), CDM is not a bad thing *per se* so long as economic interests are protected.

Says Pachauri, "For instance, we should see to it that the CERs do not account for more than say 10 percent of a buyer's total commitment and that carbon accounts are not fudged; that we are not dumped with outdated technologies; that we do not under-price CERs. Unfortunately, our bureaucrats have very little idea of the subtleties involved in the politics of climate change, and it wouldn't surprise me if they are finally persuaded to endorse CDM without significant benefits to India."

Writes Danish researcher Susanne Jacobsen in her analysis of India's policy on the issue: "A lack of domestic debate on climate change, the ad-hoc style in the Indian bureaucracy's preparations and its tendency to rely heavily on a domestic scientific community which caters primarily to foreign concerns leaves the Indian government poorly prepared for creating bargaining room for its national interest. India is left merely to respond to the agendas on climate change of politicians, researchers and industrial interests of the North." And people are left to sweat it out.

*Adapted from Outlook,
New Delhi, May 3, 1999*