# Global Warming

## *The heat is on fish, fishers and fisheries*

***Global warming is no longer a prophecy, it's happening. Its impact on fisheries, which is already under pressure, can be severe. The world's leaders, policy-makers and scientists need to think coolly on one of the hottest issues of today, and follow up with action – fast!***

Is the globe really warming? Indeed, yes! The skeptics have been silenced**.** Signals, facts and trends offer irrefutable evidence of an ominous phenomenon. NASA scientists say that of the 20 hottest years on record, 19 occurred in the 1980s or later. 2005 was one of the hottest years in more than a century.

The earth has a fever, said Mr Al Gore, in his lecture while accepting the Nobel peace award for his work on global warming (jointly with Dr R K Pachauri, who heads the UN Inter-governmental Panel on Climate Change).

Disasters have been striking everywhere – droughts, heat waves, storms, floods, fires, massive glacial melts. Scientists have been predicting this for some time – that man will have to pay for decimating forests and plundering the world's resources; for pumping greenhouse gases into the atmosphere, trapping the heat that flows in from the sun and raising global temperatures.

But carbon dioxide is colourless, odourless, tasteless, as Mr Gore pointed out. Climate change has been impacting our land and marine ecosystems for decades, but we didn't see the effects. Now we see it everywhere, and with regularity. Mr Gore also quoted an apocalyptic line from poet Robert Frost: "Some say the world will end in fire; some say in ice … Either will suffice."

**Basics of global warming**

Global warming is a term that describes the gradual increase in the earth's temperature. Coal-burning power plants, car exhausts, factory smokestacks, and other waste vents of the human environment give off about 23 billion tonnes of carbon dioxide and other 'greenhouse gases' into the Earth's atmosphere each year. The atmospheric concentration of $CO_2$ has increased by 31 percent above pre-industrial levels since 1750. This is far higher than at any time during the last 420 000 years, the period for which reliable data has been extracted from ice cores. Temperatures are expected to rise 1.4-5.8°C more by the end of the century.

It is the 'greenhouse effect' caused by human-generated $CO_2$, particularly during the last 50 years that has accentuated global warming.

This has caused sea levels to rise. Possible outcomes: floods, coastal erosion, impact on agriculture and fisheries (and thereby on food security), species extinction, spread of vector-borne diseases, loss of biodiversity.

**Climate change and fisheries**

What is the impact of global warming ***specifically*** on fisheries? There has been an assortment of studies and papers from many places, but a sustained and passionate campaign has been pursued by the World Wide Fund for Nature (WWF), and ***Bay of Bengal News*** has no hesitation in quoting and citing from WWF reports and investigations.

First, about resources, fish production and fish behaviour. WWF says the world's oceans, lakes and rivers harbour at least 27 000 known species. Fish are a cornerstone of global biodiversity. 132 million metric tonnes of fish are captured or raised each year, and more than 75 percent of this catch is eaten directly by people.

Worldwide, marine and freshwater fisheries generate over US$130 billion annually, employ at least 200 million people, and feed billions of people who rely on fish as their primary source of protein.

But the global warming of rivers and lakes threatens fish stocks already under pressure from overfishing, pollution and habitat loss, WWF says. "The decline in fish catch could devastate human populations, particularly in poorer countries that rely on fish for protein."

WWF says that fish are more sensitive to temperature than many animals because they cannot maintain a constant body temperature like humans. Higher temperatures reduce oxygen levels of fish, stunt growth, reduce food supplies. They can force fish to seek cooler waters which are alien to them. WWF estimates that 76 percent of the world's fisheries are already fished to their limit. Even slight changes in temperature can force economically important species to move their feeding and breeding grounds, hurting local, small-scale fishing activity most.

**Fish, fisheries and global warming – Some other reports, some other phenomena from the Bay of Bengal region**

Several global studies name India as one of those particularly vulnerable to global warming. In fact, a 1995 study by the Tata Energy Research Institute and the Ministry of Environment and Forests said that one meter sea level rise could displace 7.1 million people – including all coastal fishing communities. Yet, climate change does not seem to be a priority research area in India.

Scientific studies show that some of the commercially viable marine fish species in India are adapting to climate change. A study conducted by the Central Marine Fisheries Research Institute, Kochi reveals that highly popular oil sardines have moved to new geographical zones because of sea warming. Essentially a tropical species, oil sardines have moved from the south to the north-west and north-east coasts of India.

Other commercially important species have come up with equally interesting strategies for survival. Species like the Indian mackerel have gone down to different depths, and have been caught by bottom trawlers.

Take species like threadfin beam, off the coast of Chennai. Peak spawning months are now the colder months. And off the Mangalore coast on the southwest, the colder months are the season of abundance for copepods.

What's the inference? Adaptable species may be able to adjust to the challenge of temperature rise by modifying their behaviour. But the more vulnerable groups such as corals are in peril. Extensive coral bleaching was reported from the Gulf of Mannar, the Andaman and Lakshadweep seas when the sea temperature was $31^0$ C or more in 1988 and 2002. The intensity of bleaching was proportional to the temperature.

False trevally (*Lactarius lactarius*) is an economically and culturally important fish in India, says WWF. It ranks as one of the most preferred, high-quality fish in the Gulf of Mannar region. But increased water temperatures and decreased rain because of global warming have led to a drastic decline of the fishery over the last few years.

What will be the distribution and migration patterns of oceanic tuna as the global seas warm up? The sex

of sea turtles is critically determined by the soil temperature at which the embryo develops. Prevailing temperatures above $28^0$ C produces only females. Is the massive intrusion of puffer fish and medusae into the Indian coastal waters in recent years a fallout of climate change?

In Sri Lanka, the National Aquatic Resources Research and Development Agency (NARA) says that most sensitive habitats in the country are in different degrees of degradation owing to a combination of human activity and climatic change. Resulting problems (some already manifest, some predicted): resource decline, enhanced erosion, ecosystem changes such as conversion of brackish water into hypersaline water, damage to historical, religious and cultural sites, loss of beaches and tourism revenue, closing of river mouths, greater pollution (see detailed report on pp. 18-23).

Global warming can aggravate and accentuate problems caused by overfishing, such as loss of biodiversity. This should be a worry for countries who are not adjusting their fleet capacity according to the harvestable potential in their marine waters.

**Conclusion**

WWF seeks to limit global warming of average global temperature to below 2°C (3.6°F) over pre-industrial levels. That's the threshold at which climate change impacts would become unmanageable for nature and people.

Industrialized countries must cut their $CO_2$ emissions as obliged under the Kyoto Protocol. They must all agree to much more serious emission reductions in the next period, after 2012. To stay well below the 2°C danger threshold they must reduce their emissions by 60-80 percent.

"Rapidly industrializing countries too need to lower their emissions while meeting their development goals by 'leapfrogging' into clean and efficient technologies."

Mr Al Gore propagates a carbon tax. "We need to put a price on carbon – with a $CO_2$ tax that is then rebated back to the people, progressively in ways that shift the burden of taxation from employment to pollution. This is by far the most effective and simplest way to accelerate solutions to this crisis."

The single largest source of man-made $CO_2$ is electricity generation, accounting for 37 percent of worldwide $CO_2$ emissions. The first step to move to a clean energy future is to clean up the power sector, says WWF. It urges the coal-burning power sector to cut climate pollution and aim at a major switch to clean power.

"Comprehensive strategies to build resistance and resilience to climate change impacts need to be developed – for threatened communities as well as for nature reserves."

"Unless governments slow the rate and extent of climate change we're all going to feel like fish out of water," says Stephan Singer, Head of WWF's European Climate and Energy Policy Unit.

The WWF calls for responsible fisheries management and networks of Marine Protected Areas to combat both overfishing and global warming,

"The world needs an alliance," Mr Al Gore said in his Nobel acceptance speech. And Dr R K Pachauri made a similar plea in his Nobel lecture. He referred to the ideal of ***Vasudeva kutumbakam*** ('The world is one family'.)

Al Gore said "We, the human species, are confronting a planetary emergency. But there is hopeful news as well: we have the ability to solve this crisis and avoid the worst – though not all – of its consequences, if we act boldly, decisively and quickly."

***– Y S Yadava***

*Paintings by school children in India, Maldives and Sri Lanka depicting post-tsunami reconstruction.*