



Over **one-half**
of the world's population lives
within **100 kilometres**
of the sea.



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MEDIA RELEASE

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IT'S OFFICIAL: THE CARBON CRISIS IS LETHAL FOR CORAL REEFS

- Major new research indicates that coral reefs will not survive the rapid increases in global temperatures and atmospheric CO₂ that are forecast this century by the IPCC.
- The livelihoods and welfare of 100 million people living along the coasts of tropical developing countries will be among the first casualties of the loss of coral reef systems.
- Marine scientists argue for drastic action from world leaders on CO₂ emissions.
- The immediate use of proven policy and management tools to address over-fishing, pollution and unsustainable coastal development is critical to saving coral reefs.

The situation

The largest living structures on Earth and the millions of livelihoods which depend upon them are at risk, the most definitive review yet of the impact of rising carbon emissions on coral reefs has concluded.

In a paper published in the prestigious *Science* Magazine today, 17 eminent marine scientists reveal that world leaders face a race against time in preparing coral reefs and the coastal communities dependent upon them for the inevitable impact of rising levels of carbon dioxide (CO₂) in the Earth's atmosphere.

On the eve of the International Year of the Reef 2008 the scientists, from seven countries, have warned that most coral reefs will not survive the rapid increases in global temperatures and atmospheric CO₂ that are forecast over this century by the Inter-governmental Panel on Climate Change (IPCC), which released its report a few weeks ago, unless drastic action is taken to curb CO₂ emissions.

The scientists, who are leading members of the international Coral Reef Targeted Research and Capacity Building for Management Program (CRTR), argue that rising global CO₂ emissions represent an 'irreducible risk' that will rapidly outstrip the capacity of local coastal managers and policy-makers to maintain the health of these critical ecosystems, if CO₂ emissions are allowed to continue unchecked.

www.gefcoral.org



The problem

"This crisis is on our doorstep, not decades away. We have little time in which to respond, but respond, we must!" says Professor Ove Hoegh-Guldberg, lead author of the *Science* paper, *The Carbon Crisis: Coral Reefs under Rapid Climate Change and Ocean Acidification*.

"The livelihoods of 100 million people living along the coasts of tropical developing countries will be among the first major casualties of rising levels of carbon in the atmosphere," says Professor Hoegh-Guldberg.

"The warmer and more acidic oceans caused by the rise of carbon dioxide from the burning of fossil fuels threaten to destroy coral reef ecosystems, exposing people to flooding, coastal erosion and the loss of food and income from reef-based fisheries and tourism. And this is happening just when many nations are hoping that these industries would allow them to alleviate their impoverished state."

Coral reefs are often portrayed as natural wonders of great beauty which makes them an important tourism attraction. In Australia, revenue from international tourism to the Great Barrier Reef exceeds \$6.8 billion per year. It is estimated that coral reef-related tourism generates tens of billions of dollars per year worldwide. They are the economic engine of a vast number of economies around the world.

Professor Hoegh-Guldberg, who is based at The University of Queensland, says coral reefs occupy a unique niche in the world's environment, where water temperatures and other environmental factors are 'just right'. "But raising as little as 1°C the temperature that ocean surface waters reach in summer subjects coral reefs to stresses which lead quickly to mass bleaching. Raise the temperature a little more, and the corals that build reefs die in great numbers. No coral, no coral reef ecosystem," says Professor Hoegh-Guldberg.

"The double whammy, however, is ocean acidification. Increased CO₂ not only warms the climate but it also dissolves in sea water making it more acidic. This, in turn, decreases the ability of corals to produce calcium carbonate, which is what the spectacular framework of coral reefs is made of.

"In summary, the environment that has surrounded coral reefs for hundreds of thousands of years is changing so fast that compensatory biological responses are lagging behind, putting at risk the marine ecosystem with the highest biodiversity on Earth."

Professor Hoegh-Guldberg says the concentration of CO₂ in the Earth's atmosphere is 380 parts per million (ppm), which is 80ppm higher than where it has been for the past 740,000 years, if not 20 million years. Increasing atmospheric CO₂ has already brought about a +0.74°C rise in temperature, he says.



The response needed

"If current CO₂ emission trends continue, then even the most conservative estimates predict CO₂ concentrations exceeding 500ppm and global temperature increases of 2°C or more by the end of the century," Professor Hoegh-Guldberg says. "Under these conditions coral reefs are likely to dwindle into insignificance; they'll be reduced to rubble, threatening the fate of those tens of millions of people whose livelihoods depend upon them.

"We clearly have to do more to reduce CO₂ emissions and still more in preparing vulnerable communities to the almost inevitable problems that they will face as a result of already entrained climate change."

As world leaders gather for the last day of the United Nations Framework Convention for Climate Change (UNFCCC) meeting in Bali today, the CRTR scientists argue that the issue of global CO₂ emissions demands leadership at the international level, including a collective agreement on carbon emission reductions.

Says Dr Marea Hatzios, CRTR Team Leader, World Bank, and a co-author of the *Science* paper: "There is an urgent need for high carbon growth countries to reduce their total CO₂ emissions and a responsibility on the part of industrialized nations to assist the most vulnerable coral reef states adapt to climate change impacts while reducing local risks to reefs."

Dr Hatzios points out that most coral reefs occur within developing countries where poverty and reliance on ecosystem goods and services place great pressure on them.

"In developing countries, tourism based on ecosystem services provided by coral reefs is a vital and rapidly expanding industry," Dr Hatzios says. "Much of the protein consumed by poor coastal communities is supplied in one way or another by coral reefs.

"Less visible, but no less important, is the essential role played by coral reefs in providing habitat for a vast array of marine species which contribute to a complex food chain that extends across the oceans.

"The threats to this natural capital from increased CO₂ emissions generated on a global scale simply raise the urgency for local reef managers and policy-makers to take responsibility for the 'reducible risk' to coral reefs, such as over-fishing, pollution and unsustainable coastal development.

"However, this is unlikely to happen, at the intensity and scale required, unless industrialised nations make funds available to assist the most vulnerable coral reef states manage these reducible risks."



The opportunities

Dr Hatzios says a range of policy and management tools are readily available, some of which have been refined through support from the CRTR Program, and no time should be lost in applying them more widely and effectively.

“These tools include coastal zone management, co-management arrangements between governments and local communities to foster effective stewardship, integrated catchment approaches to managing water quality and environmental flows, enforcement and compliance with fishing regulations, restoration of reefs and coastal vegetation and sustainable tourism,” she says.

The CRTR is a leading international coral reef research initiative that provides a coordinated approach to credible, factual and scientifically-proven knowledge for improved coral reef management.

The CRTR Program is a partnership between the Global Environment Facility, the World Bank, The University of Queensland (Australia), the United States National Oceanic and Atmospheric Administration (NOAA) and approximately 40 research institutes and other third-parties around the world.

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Imagery is available for download at www.gefcoral.org

Caption: How CRTR Program scientists envisage the world's coral reef systems will look under three environmental scenarios (left to right): 375ppm, +1°C; 450-500ppm, +2°C; and above 500ppm, above +3°C.