

Fact sheet #6

Climate information for a healthy environment

www.wmo.int/wcc3

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that are official records

By the World Meteorological Organization (WMO), with the United Nations Environment Programme (UNEP), the International Union for Conservation of Nature (IUCN) and other international partners

Ecological systems are extremely sensitive to changes in climate conditions. Even the slightest changes can put a species over the edge and in danger. From the skies to the land to the oceans to the glaciers, all animals and plants — as well as their habitats — are at risk from global warming and the associated changes in climate affecting the planet. Climate information, including seasonal-to-multidecadal predictions, is needed to identify those regions and wildlife most at risk and to allow for the development of conservation strategies.

In recent years, scientists have noted an increasing number of plants and animals at risk of extinction due to regional climate changes. The drying out of wetland areas in Yellowstone National Park in the United States of America, for example, has caused a dramatic decline in the populations of frogs, toads and salamanders. These amphibians depend on wet conditions for their survival. Norwegian lemmings, however, depend on drier winters for their survival into the spring, and researchers now report that climate change is bringing wetter winters to their habitat in southern Norway. These regional differences, which are likely to continue to grow in coming decades, are affecting biodiversity everywhere, as are pollutants arising from emissions of particles and gases linked to climate change.

Nowhere is that more true than in the world's oceans, which are increasingly feeling the effects of warmer

temperatures and rising levels of carbon dioxide. Warmer temperatures are fuelling the growth of potentially harmful algal blooms and are exacerbating coral bleaching, which occurs when corals expel naturally occurring algae under stress. At the same time, corals and marine species are reacting to increased levels of carbon dioxide. The oceans are a natural "sink" for carbon dioxide, continually absorbing the gas from the atmosphere. As atmospheric levels of carbon dioxide have risen, so have levels in the oceans — so much so that the gas has acidified the oceans: the extra carbon dioxide combines with carbonate ions in seawater to produce an acid. This acidification is threatening many marine species, as it reduces the availability of calcium carbonate for shell-forming species to grow and maintain their skeletons. These risks affect not only marine biodiversity but also the health of global fisheries.

Weather extremes, such as storms and floods, also threaten the coastal ecosystem, bringing increased erosion and threatening wetland plants and animals. Likewise, weather extremes threaten land systems, such as forests. Droughts and other climate extremes degrade the soil and change the outlook for many ecosystems, including expansion of drylands and deserts and increases in sand- and duststorms. At the same time, changing temperatures, particularly at high altitude, are causing many plants and trees to "migrate" poleward.



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World Climate Conference-3
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Many countries are seeking to expand their forest management practices, using climate information to shift harvesting patterns, change the mixture of hardwood and softwood species and plan landscapes to minimize fire and insect damage, among other actions. Likewise, fishery managers use climate information to alter catch size

and breeding conditions to sustain yields of fish stocks. Increasingly, environmental and resource managers are recognizing the need to understand the vulnerability of their systems to climate variability and change and are working with climate information providers and other partners to respond to current and future change.

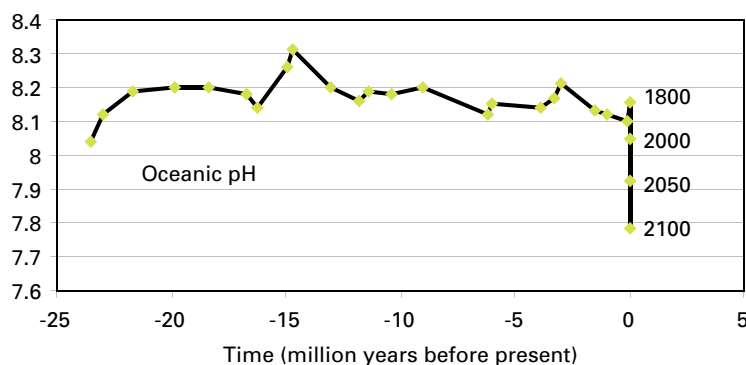
Aiding Aussie wildlife with climate predictions

The mountain pygmy possum lives in the Australian Alps, where every winter it hibernates under the snow. Current predictions of decreased future snow cover do not bode well for the mountain dweller, whose metabolic rate, foraging strategies and general behaviour are shaped by the local climate. If the region's average annual temperature increases even 1 degree Celsius, the pygmy possum, native only to Australia, could become extinct. Climate information plays an important role in the pygmy possum's future, giving local communities the tools they need now to assess local possum populations, reduce other environmental stress and increase the resilience of the species.

The mountain pygmy possum is one of more than 1 million species of plants, fish, birds and other animals in Australia. While these species have evolved to cope with large climate variability, many, such as the pygmy possum, have very narrow climate ranges in which they can now survive. The corals of the Great Barrier Reef similarly have a narrow range of suitable climate conditions and are suffering the effects of coral bleaching.

The Australian Government has established a set of adaptation strategies to minimize the impacts of climate change on biodiversity. Begun through the National Biodiversity and Climate Change Action Plan in 2004, the adaptation measures highlight the role that climate information plays in developing management tools for biodiversity. A current project is assessing the vulnerability of the National Reserve System to climate change. Another project is developing the National Ecological Meta Database to store historical and current records of plant and animal patterns to feed into climate modelling and assessments.

With the help of vulnerability studies and long-term climate monitoring, local planners can take action now to build up the resilience of Australian ecosystems, such as measures to reduce weed incursions in a forest area to ease non-climate pressures. Similarly, coral reef managers are working with local communities through the Great Barrier Reef Marine Park Authority to reduce terrestrial runoff and other stresses, so as to help the corals better cope with the climate changes. When reefs are weakened by chronic stress, their ability to adapt to new climate conditions is impaired.



Ocean pH has been dropping in contemporary times, in part due to extra carbon dioxide, making the oceans more acidic and widely affecting marine life. Future predictions of pH levels are from models based on IPCC mean scenarios.

Source: Turley et al, 2006. Cambridge University Press, 8, 65-70

Activities that support climate information for nature conservation

Australia's biodiversity adaptation project is just one of several collaborative projects to better understand how climate affects biodiversity and ecological health. A sampling of other recent and ongoing projects includes:

WMO participates in research and activities in support of marine and coastal environmental management, as well as both short- and long-term climate predictions based on oceanic data. WMO coordinates activities through the National Meteorological and Hydrological Services working in any given region of high seas and coastal waters.

In response to the global issue of climate change, the Government of Indonesia has formulated the National Action Plan on Climate Change Mitigation and Adaptation, which is a set of adaptation and mitigation strategies to minimize the impact of climate change in various sectors. It also established the National Council on Climate Change, in which the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG) is actively involved.

The International Ocean Carbon Coordination Project (IOCCP) promotes the development of a global network of carbon observations. Sponsored by the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO), the project seeks to improve research on and understanding of how carbon cycles through and affects the oceans. It houses the Ocean Acidification Network, which is focused on gaining a better understanding of the role of carbon dioxide in acidifying oceans globally.

The Web-based Guidance on Integrating Biodiversity into Climate Adaptation Planning gathers information and tools about climate adaptation from a number of relevant partners and posts it online. The project supports parties to the United Nations Convention on Biological Diversity as they continue to integrate climate information into their activities.

The Coral Reef Targeted Research and Capacity Building for Management Program is leading an international effort to provide science-based information for managing coral reefs. Its recent publication *Reef Restoration Concepts & Guidelines* outlines restoration practices for coral reefs in the context of climate and other global changes. It contains several case studies, including an effort in Fiji to restore a portion of reef degraded by bleaching events in 2000 and 2002. All such activities require long-term climate monitoring for optimal results.

The World Bank-funded Gourma Biodiversity Conservation Project is testing whether local communities in drought-prone areas can work to save an endangered species. By helping elephants migrate through inhabited areas in Mali, the project aims to help the local communities adapt to climate change in the Sahel. The elephants' arrival in an area can, for example, signal to local farmers and herders the start of the rainy season, as the animals will not move in until they can find water. Other animals affected in the Mali region include giraffes, lions, cheetahs, dwarf hippos and many bird species.

Facts and figures

- Since the industrial revolution, the oceans have become 30 per cent more acidic. [IOCCP-UNESCO/IOC]
- Over the past 200 years, the oceans have absorbed approximately half of the carbon dioxide emitted by human activities, providing long-term carbon storage. [National Oceanic and Atmospheric Administration (NOAA)]
- Ocean chemistry is currently changing more than 100 times more rapidly than it has during the past 21 million years. [IOCCP-UNESCO/IOC]
- In 1998, 16 per cent of the world's corals died in a mass bleaching event spurred by elevated tropical sea surface temperatures during an El Niño. Such bleaching events are expected to increase with climate change, according to many scientists. [UNESCO]
- The frequency of coral bleaching events is increasing at a rate of about 1.6 per cent each decade and bleaching thresholds will be reached on an annual basis well before 2100 with projected temperature increases. [UNESCO]
- Tree ranges in the northern hemisphere could expand 100 kilometres northward, while their southernmost boundaries could retreat by the same magnitude for each degree of warming beyond current regional temperatures. [United Nations Food and Agriculture Organization (FAO)]
- One of every three known plants endemic to islands is threatened; among birds, approximately 23 per cent of island species are threatened, compared with only 11 per cent of the global bird population. [Intergovernmental Panel on Climate Change (IPCC)]
- Between 20 and 30 per cent of species are at increasingly high risk of extinction if global warming continues at its current rate. [IPCC]
- The great majority of well-studied species are declining in distribution, abundance or both. Although the decline in the area of temperate forest has been reversed, with an annual increase of 30 000 square kilometres between 1990 and 2005, deforestation in the tropics continued at an annual rate of 130 000 square kilometres during the same period. More than 16 000 species have been identified as threatened with extinction. [UNEP Global Environment Outlook-4]
- Alpine plant species have migrated to higher altitudes at rates ranging from less than 1 metre to nearly 4 metres per year over the last century, corresponding to a warming in the central Alps by 0.7 degrees Celsius during that same period. [FAO]

WCC-3 will initiate actions to enhance climate services for climate adaptation and the management of climate risks and opportunities around the world.

For more on climate and the environment:

WMO Atmospheric Research and Environment Programme:
http://www.wmo.int/pages/prog/arep/index_en.html

Web-based Guidance on Integrating Biodiversity into Climate Adaptation Planning:
<http://adaptation.cbd.int/>

United Nations Environment Programme Global Environment Outlook GEO:
<http://www.unep.org/geo/>

International Union for Conservation of Nature (IUCN):
<http://www.iucn.org/>

International Ocean Carbon Coordination Project:
<http://www.ioccp.org/>

The Ocean Acidification Network:
<http://www.ocean-acidification.net/>

National Ecological Meta Database, Australia:
<http://www.bom.gov.au/nemd>

Climate change and biodiversity in Australia:
<http://www.climatechange.gov.au/impacts/biodiversity.html>

UNEP World Conservation Monitoring centre:
<http://www.unep-wcmc.org/climate/default.aspx>

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