Saving the world's natural wonders from climate change

HOW WWF FIELD WORK DEFENDS NATURE AND PEOPLE FROM CLIMATE CHANGE IMPACTS

WWF Briefing Paper

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IPCC Working Group 2 is finalising its report showing how climate change is and will be affecting the different regions of the planet. WWF, with its conservation programmes in over 90 countries, is witnessing some of these impacts already. In the following document, we provide short overviews on ten of the places where we work and what we are doing there to build defenses against the effects of climate change.

The regions presented are:
►Great Barrier Reef and other coral reefs around the world ►A desert drying out – Chihuahua (Mexico and USA) ►Turtles in the Caribbean ►The oldest Climate Witness Alive: Valdivian temperate rainforests (Chile) ►Tigers and People in the Indian Sunderbans ►China: Upper Yangtze ►The Amazon ►The fate of the wild salmon - Bering Sea and Pacific North-East/Alsaka, USA ►Melting Glaciers in the Himalayas ►East African Coastal Forests ►East Africa Marine

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From 6 April 10 a.m. CET, find a detailed map on IPCC messages for over a hundred countries and regions at www.panda.org/climate/ipcc . Find stories and a map of WWF Climate Witnesses at www.panda.org/climatewitness

BLEACHED AND DEAD?

Around the Equator from the South Pacific to the Caribbean Sea

WHAT?

Coral reefs are home to 25% of all marine life, but comprise just 0.25% of all the ocean. WWF works in coral reef ecosystems from the world famous Great Barrier Reef to Fiji in the South Pacific to Tanzania in the Indian Ocean to the MesoAmerican Reef in Belize. These reefs are home to not only coral but sea turtles, crocodiles, whales and sharks. Coral reefs are estimated to be worth at least US$30 billion dollars and they support livelihoods in many of the world's developing countries.

CLIMATE CHANGE IMPACTS:

- Warming sea water causes coral bleaching where zooxanthellae, the delicate organism that live within coral, are expelled or digested by the coral leaving the coral a white or bleached skeleton. Unless zooxanthellae return, and they only return under optimal conditions, corals will not recover.
- Acidification of the world's oceans decreases the ability of corals to grow and respond to other stresses, making it more difficult for them to recover from bleaching and disease events.
- More severe storms wreak havoc in the coral reefs.

WWF ACTION IN THE FIELD:

- In the **Mesoamerican reef** WWF and partners have taken stock of the whole 720 km reef, an area of around 1500 square kilometres. We continue to fight off human-induced threats, such as working with companies and local farmers to reduce toxic chemical usage, and working with fishermen to adopt alternative fishing methods. WWF focuses on public outreach; training for local experts; and climate change policy recommendation based on local consultation.
- In **Fiji**, part of the Pacific coral work in the so-called Coral Triangle, WWF is working on developing new strategies that will help protect coral reefs from climate change, but protecting coastal mangroves.
- There is discussion of trying to "seed" more resistant coral species into especially vulnerable areas.
- In the **Great Barrier Reef**, the world's largest reef system, WWF is working to build the resilience of the Reef by reducing land based sources of pollution. Around 700 reefs are threatened by pollutants such as fertiliser, pesticides and sediment from farming activity along the coast.
- In partnership with the tourism industry, WWF has raised the profile of the social and economic consequences to local communities and industries along the Reef coast from climate change.
- WWF continues to advocate at the highest level of industry and government for significant reductions in Australia's greenhouse gas emissions.

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Links:

►Great Barrier Reef Marine Park Authority - www.gbrmpa.gov.au

►WWF Australia page - wwf.org.au/ourwork/oceans/gbr/

►New research in the MesoAmerican reef http://www.panda.org/about_wwf/what_we_do/climate_change/index.cfm?uNewsID=96980

CHIHUAHUA DESERT ECOREGION

Mexico and USA

WHAT?

The Chihuahuan Desert is North America's largest desert, extending on both sides of the US-Mexican border. The legendary Rio Grande or Rio Bravo crosses the desert, and rugged mountains define the basin and range landscape. Vast grasslands grace the valley floors and host the southernmost species associated with the American Prairies. This dry highland with its harsh climate is famous for an enormous variety of yucca and cacti and is thought to be the world's most biologically rich desert. Of the 3500 plant species growing in the desert, a thousand are endemic- found no where else on the planet. In the mountain regions you find legendary animals like Jaguar (*Felis onca*), Bighorn sheep (*Ovis canadensis*), Black bear (*Ursus americanus*), and zone-tailed hawk (*Buteo albonotatus*).

CLIMATE IMPACTS:

Dependent on snowpack in its US headwaters, the Rio Grande now supplies less water to famers and cities due to erratic snowfall levels in recent years. The headwaters of the Rio Conchos, the river's largest tributary, has experienced drought in the past decades. The Rio Grande/Rio Bravo has become so depleted that in some drought years it dries out before it reaches the sea. The Chihuahuan Desert has already suffered from intensive farming, overgrazing, and massive depletion of ground and river water for settlements. Shifts in rainfall patterns and snowpack levels have caused uncertainty in water deliveries and have led to increases in groundwater pumping.

WWF ACTION IN THE FIELD:

Water management is key for this region. WWF is working with regional and local partners to devise water security strategies for communities, farmers and the environment.

- WWF assisted farmers with implementing water-saving irrigation techniques by providing water meters and conducting a study on the use of alternate furrow irrigation with cotton farmers.
- WWF secured larger protected areas to encompass entire watersheds, and implemented best management practices with communities in the forested headwaters.

Contact:

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Ms. Jennifer Montoya is coordinator of WWF US Chihuahuan Desert Program

►Ecoregion:
http://www.panda.org/about_wwf/where_we_work/ecoregions/chihuahuan_tehuacan_deserts.cfm

►Article:
http://www.panda.org/about_wwf/what_we_do/freshwater/news/index.cfm?uNewsID=69260

HAWKSBILL TURTLES

Caribbean

WHAT?
Six out of seven marine turtle species in Latin America and the Caribbean are endangered or critically endangered.

CLIMATE CHANGE IMPACTS:

- The turtles' nesting beaches will disappear as sea levels rise.
- Turtles will not be able to reproduce as rising temperatures alter the ratio of male to female turtles.
- Their feeding grounds will disappear as coral reefs and sea grasses die.
- Their long distance migrations will become impossible as ocean currents change.

WWF ACTION IN THE FIELD:
WWF is focusing on Hawksbill Turtles and working to improve local conditions to buy sea turtles some time in the face of climate change. What can be done?

- Protecting inland space so beaches can migrate as seas rise, allowing turtles to still find nesting areas.
- Improving beach vegetation so that the eggs are kept reasonably cool – hotter temperatures cause eggs to perish or lead to sex change.
- Strengthening the protection of coral reefs and restoration of sea grasses so that the turtles' feeding grounds are more resistant to warming.

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Dr Lara Hansen is senior climate change scientist at WWF International.

►LAC turtles programme
http://www.panda.org/about_wwf/where_we_work/latin_america_and_caribbean/our_solutions/marine_turtle_programme/index.cfm

►Turtles and climate change
http://www.panda.org/about_wwf/where_we_work/latin_america_and_caribbean/our_solutions/marine_turtle_programme/news/index.cfm?uNewsID=19554

VALDIVIAN TEMPERATE RAINFORESTS

The Oldest ClimateWitness Alive

Chile and Argentina

WHAT?

One of the oldest living "climate witnesses" on earth. It is the Alerce tree, growing in the Valdivian coastal and mountain temperate rainforests in Chile and Argentina. This tree can become over 3600 years old, it is the second-longest living tree in the world (after the Bristlecone tree in California). The Alerce only grows 1 mm per year but can become over 50 meters high.

CLIMATE CHANGE IMPACTS:

- Analysis of the Alerce tree rings shows the sudden temperature rise over the last 100 years. This makes the Alerce tree one of the oldest living climate witnesses.
- As the glaciers and ice fields in the Andes are melting rapidly, over a few decades influence the whole water household of the region will change dramatically.
- We also see the weather patterns change – rainfall comes more rarely, with longer drought periods and more forest fires.

WWF ACTION IN THE FIELD:

- WWF is working on the conservation of alerce and other endangered long-lived species, which are climate witnesses.
- WWF and partners are adjusting conservation plans to ensure that resistant forests can be protected, mainly through the creation of protected areas.
- WWF has developed a project (still to be financed) to enhance the understanding and capabilities to address climate change, evaluate the vulnerability of the ecoregion´s biodiversity and human populations to change, and increase public awareness.

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Ecoregion:
http://www.panda.org/about_wwf/where_we_work/latin_america_and_caribbean/our_solutions/ecoregions/valdivian/index.cfm

http://www.panda.org/about_wwf/where_we_work/ecoregions/valdivian_temperate_rainforests.cfm

http://www.wwf..cl

TIGERS AND PEOPLE IN THE SUNDARBANS

India, Bangladesh

WHAT?

Part of the world's largest remaining mangrove forest where the Ganges, Brahmaputra and Meghna rivers converge and flow into the Bay of Bengal – a 20,000 square km network of creeks and canals, tidal rivers and estuaries, with about one hundred islands on the Indian side alone, supporting an incredible number of species.

The most remarkable of them is the Bengal tiger (*Panthera tigris tigris*). The Sundarbans is the only mangrove tiger habitat in the world and supports the largest tiger population in the wild. Bengal tigers are mighty, solitary animals which use a large territory.

CLIMATE CHANGE IMPACTS

- Rainstorms, always heavy in the monsoon season, now often come later but are then even more violent.
- Locals realise that sea water levels have started to rise. Scientists estimate that by 2020, 15 percent of 12 islands identified as the most vulnerable in the Sundarbans will have disappeared. More than a million people will be directly affected in India and Bangladesh by 2050.
- The hand-built dykes that protect settlements and rice fields are breached more often, and more work needs to be put in to keep them intact. Salt water intrusion into the ground water makes growing the tender rice plants difficult. Two islands on the Indian side have disappeard over the last few years.

WWF ACTION:

- WWF works on the Indian side of the Sundarbans and helps people to cope with the impacts of sea level rise on livelihoods.
- WWF is determining how protected areas will be affected by climate change in the region, especially sea level rise. The goal is to determine which tiger populations and parts of protected areas are most at risk and which are more stable.

Contact:

Mr A. Anurag Danda is Programme Coordinator, WWF India Sundarbans Programme.

►Ecoregion:
http://www.panda.org/about_wwf/where_we_work/ecoregions/sundarbans_mangroves.cfm

►World Heritage Site
http://whc.unesco.org/en/list/452
http://whc.unesco.org/en/list/798

►History:
http://www.smartoffice.com/tiger/id21.htm

UPPER YANGTZE

China

WHAT?

The Yangtze is Asia's longest river and the third longest river in the world. It provides water, food and electricity for 450 million people. Inland, towards the western border of China, there are some of the richest temperate forests in the world. The Upper Yangtze is one of only two regions where the Panda survives in the wild. Two less known animals distinguish themselves by their golden colour: the Chinese golden monkey, and the Takin, a big gazelle-related ox. Some people believe that the mythological 'golden fleece' sought by the Argonauts of ancient Greece came from the Takin.

CLIMATE CHANGE IMPACTS:

- Glaciers located in the Tibetan Plateau, where the Yangtze originates, are likely to shrink from 1168km^2 in 1970 to 1087km^2 by the 2030s.(Chen Dongmei's alteration)WWF research has shown that on average in the Eastern Himalaya, glaciers recede by ten meters a year. At this stage, more ice melting during the summer adds to the waterflow in the rivers.
- Yet once the majority of the glaciers are gone China's main rivers will experience major water problems during the hot season.
- The region experiences seasonal change: Massive storms and floods occur at odd times, interrupted by sudden and often catastrophic droughts. Scientists confirm these changes in rainfall and moisture.

WWF ACTION IN THE FIELD:

- WWF is assessing the vulnerability of the Yangtze River Basin to both climate and non-climate stresses.
- Develop the adaptation strategy through eliminating non-climatic stresses and creating protected areas that plan for future changes.
- Facilitating outreach – identify audiences, develop materials, identify opportunities, and participate in outreach and education events.
- Documenting voices of the people – WWF is developing a climate witness project in the Yangtze River Basin, allowing the people affected to speak fro themselves.
- Leverage government funding to support rural energy development in communities in panda habitat, including the WWF demonstration of various new energy technologies and promote carbon credit projrects in Minshan or Upper Yangtze China.

Contact:

Mr Lin Ling is leading WWF's work in the temperate forest ecoregion Upper Yangtze.

Ms Dongmei Chen is the leader of WWF China's climate change programme.

►Yangtze river
http://www.panda.org/about_wwf/where_we_work/asia_pacific/where/china/yangtze_river/index.cfm

►Central Yangtze
http://www.panda.org/about_wwf/where_we_work/asia_pacific/where/china/index.cfm?uProjectID=CN0088

►Forests of the upper Yangtze
http://www.panda.org/about_wwf/where_we_work/ecoregions/upper_yangtze_forests.cfm

THE AMAZON

Bolivia, Brazil, Peru, Colombia, Ecuador and Venezuela

WHAT?

At 6,400 km, the Amazon River is the world's second longest river, discharging approximately one-fifth of all fresh water that drains into the world's oceans. The region's rainforest is spread across the Amazon River Basin (approx. 6.9 million km2), a vast natural tropical area more than half of which is located in Brazil. Some 30 million people live in the region, including hundreds of indigenous peoples. To date, at least 40,000 plant species and 427 mammals have been scientifically classified in the region. Most species remain undiscovered by scientists.

CLIMATE CHANGE IMPACTS:

- Models suggest that by the year 2050, temperatures in the Amazon will increase by 2–3°C. At the same time, a decrease in rainfall during dry months will lead to widespread drying.
- Research carried out under the auspices of INPE – Brazil's National Space Research Institute – shows that a warmer and drier environment for the region could convert from 30% up to 60% of the Amazon rainforest into a type of dry savanna.
- The Amazon's hydrological engine plays a major role in maintaining the global and regional climate. Water released by plants into the atmosphere and by the rivers to the ocean influences the world climate and the circulation of ocean currents.

WWF ACTION IN THE FIELD:

The traditional population has their own ecological knowledge based on centuries surviving in natural habitats like rainforests. Often this kind of traditional knowledge includes climate interpretation.

- WWF is currently setting up an initial Climate Witness project in Upper Acre River region, Amazonas State, Brazil to leverage such ´traditional knowledge´.
- WWF will work with several local communities to help them develop adaptation strategies.
- The lessons learned from this first project will be expanded throughout the region, based on partnerships with community groups, NGOs and local and regional authorities.

Contact:

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►WWF Amazon website
http://www.panda.org/about_wwf/where_we_work/latin_america_and_caribbean/solutions_region/amazon/index.cfm

►Climate change impacts on the Amazon
http://www.panda.org/about_wwf/where_we_work/latin_america_and_caribbean/solutions_region/amazon/problems/climate_change_amazon/index.cfm

THE FATE OF WILD SALMON - Bering Sea and North Pacific

Alaska (USA)

WHAT?

Covering almost 2.6 million square km of arctic and sub-arctic waters, the Bering Sea supports huge populations of fish and shellfish, birds, whales, dolphins, porpoises, walrus, sea lions, polar bears, and seals. The complex shoreline of the Alaskan coast includes island archipelagos, deep fjords, shallow mudflats, estuaries and inlets, kelp and eelgrass beds, strong tidal currents and massive upwellings. More than 50 percent of the United States and Russia's annual fish catch come from the Bering Sea. Seven species of salmon native to Alaska and Canadian British Columbia hatch in freshwater and migrate to spend their adult lives in the northern Pacific Ocean, the Bering Sea and the Arctic Ocean.

CLIMATE CHANGE IMPACTS:

- The Arctic is extremely vulnerable to climate change, and major physical, ecological, and economic impacts are expected to appear rapidly.
- Indigenous communities in the Bering Sea are already noticing some of these changes: warmer winters, earlier break-up of ice in the spring, and thinner ice year round. Their traditional knowledge is supported by scientific evidence.
- Many fish are already heading towards the poles as the water becomes too warm. Unusually warm years have already led to poor Pacific salmon harvests in the southern part of their range.
- In the Gulf of Alaska, surface temperatures have risen and more freshwater is flowing into the sea from melting glaciers. This lighter layer of warm, fresh water diluting the sea water in the Gulf, and there are now fewer nutrients to feed the small organisms that fish depend upon.

WWF ACTION IN THE FIELD:

- Local communities and WWF are developing a network to monitor their changing environment. This work sets the stage for discussion of local climate change adaptation plans.
- Polar Bear Patrol in Russia
- Fisheries planning in the Bering Sea - WWF is analyzing fisheries and ocean data to determine what management practices will make the regions fisheries more resilient to climate change

Contact:

Mr. David Aplin of WWF Bering Sea Program

Ms. Margaret Williams of WWF Bering Sea Program

►Climate change in the Arctic
http://www.panda.org/about_wwf/where_we_work/europe/what_we_do/arctic/what_we_do/climate/index.cfm

►Indigenous peoples in the Arctic
http://www.panda.org/about_wwf/where_we_work/europe/what_we_do/arctic/what_we_do/climate/climate_witness/index.cfm

MELTING GLACIERS IN THE HIMALAYAS

China, India, Nepal

WHAT?

The Himalayas has the largest concentrations of glaciers outside the polar region, with nearly 33,000 km^2 of glacier coverage. These "Water Towers of Asia"contribute crucially to the water supply of hundreds millions of people during dry season, feeding seven of Asia's great rivers: the Ganga, Indus, Brahmaputra, Salween, Mekong, Yangtze and Huang He. The region also includes rare and endangered species like Rhinos, tigers and elephants in the plains, to snow leopards, red pandas, and Himalayan black bears, higher up in the Himalayas.

CLIMATE CHANGE IMPACTS:

- Some of the glaciers in the Himalaya are receding at an average rate of 10 to 15 meters per year.
- As glaciers melts, many glaciers forms lake at their end which are held together only by frozen mud dams. The dams can break and cause flash floods of water, rocks and gravel, destroying villages and fields downstreams and phenomena termed as Glacial Lake Outburst Flood (GLOF).
- As glaciers retreat, water flows are expected to be affected during the dry season, leading to freshwater scarcity in the summer months when melt waters contribute up to 75% of the river water.
- The region's agriculture and power generation are partially dependent on this water supply. In the Ganga, one of the two biggest rivers in India, the loss of glacier melt water is expected to impact downstream water flows, causing water stresses for several million people and also affect irrigated land in the Ganga basin.
- In Nepal, landslides and floods cause about 400 deaths annually and destroy infrastructure worth USD 2.5 millions.

WWF ACTION IN THE FIELD:

- In order to manage the impacts of climate change on glaciers in the region itself, the impacts of individual glaciers on drainage basins need to be understood. WWF is studying the effect of climate change on 5 glaciers in the Himalayas.
- WWF is examining the effect of glacier retreat on the downstream freshwater regime and their implications for canal irrigation systems, hydro-electric power, water quality, and vulnerable species.
- WWF and local communities jointly develop and facilitate a Community Driven Management Response for a particular community and economic sector, as a model for replication.

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►WWF India climate change work
http://www.wwfindia.org/climate
http://www.wwfindia.org/about_wwf/what_we_do/cc_e/r_a/him_climate/index.cfm

►WWF Nepal's climate change work
http://www.panda.org/about_wwf/where_we_work/asia_pacific/where/nepal/our_solutions/thematic_solutions_nepal/climate_change_nepal/index.cfm

►WWF climate change and rivers project.
http://www.panda.org/about_wwf/where_we_work/asia_pacific/where/nepal/our_solutions/projects/index.cfm?uProjectID=NP0898

EASTERN AFRICA COASTAL FORESTS

Kenya, Tanzania and Mozambique

WHAT?

A belt of lowland forests that run along the coast of eastern Africa from southern Somalia, Kenya, Tanzania down to Maputo in Mozambique. This moist forest ecoregion has long been isolated by expanses of Miombo woodlands patches, drier savannas and grasslands. These forests have so far profited from climatic stability: abundant rainfall carried by warm Indian Ocean winds has created an ideal environment for a wide diversity of species.

CLIMATE CHANGE IMPACTS

- Changes in the frequency, intensity and predictability of rainfall could damage agricultural production.
- Warmer temperatures may increase the occurrence and intensity of future disease outbreaks such as malaria epidemics and also wildfires.
- More frequent and more intense extreme weather events are likely.
- Sea-level rise along coastal areas where most people live are likely to disrupt economic activities there, such as agriculture, tourism, industry and fisheries.

WWF ACTION IN THE FIELD:

WWF is initiating a regional effort to more effectively address the threats of climate change:

- WWF builds capacity for climate change work in the region, both scientific and organizational.
- WWF helps to sensitize governments and stakeholders through programs like Climate Witness
- WWF conducts climate change vulnerability assessments and develops adaptation strategies jointly with local representatives.

Contact:

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►Eastern Africa Coastal Forest Ecoregion Program
http://www.panda.org/about_wwf/where_we_work/africa/solutions_by_region/eastern_africa/index.cfm?uProjectID=9F0735

EASTERN AFRICAN MARINE ECOREGION

Somalia, Kenya, Tanzania, Mozambique and South Africa

WHAT?

The Eastern African Marine Ecoregion extends from Southern Somalia down the Eastern seaboard of Africa through Kenya, Tanzania and Mozambique to the north of South Africa – a distance of 4,600 km. The area supports a great diversity of plant and animal life, including some of the Indian Ocean's most diverse coral reefs and mangrove forests. It also has the world's largest population of breeding roseate terns and home to the threatened Dugong and all five species of the Indian Ocean Turtles.

CLIMATE CHANGE IMPACTS

- Rises in sea temperature and increased ultra-violet radiation will increase the occurrence and intensity of coral bleaching.
- More frequent and intense extreme weather events are likely to cause more damage on shorelines, coral reefs and mangroves.
- Sea-level rise along coastal areas where most people live are likely to cause inundation of mangroves and beaches leading to disruption on economic activities, including tourism and fisheries.
- Salinity fluctuations may cause major changes in mangrove areas.
- Changes in the frequency, intensity and predictability of rainfall will cause fluctuations in river flows and sedimentation patterns along the coastal areas.

WWF ACTION IN THE FIELD:

WWF has initiated a regional effort to more effectively address the threats of climate change by:

- Conducts climate change vulnerability assessments and develop adaptation models for mangroves and coral reef habitats.
- Sensitize governments and stakeholders through programs like Climate Witness.
- Reducing non-climate change stresses.
- Establishing representative networks of protected areas.
- Restoring degraded habitats.
- Helping to build social resilience to climate change.

Contact:

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Eastern African Marine Ecoregion Programme
http://www.panda.org/about_wwf/where_we_work/africa/solutions_by_region/eame/index.cfm