

# 2006 OVERVIEW



*Source: Thomas Reineke*

- Global
- Africa
- Asia and the Pacific
- Europe
- Latin America and the Caribbean
- North America
- West Asia
- Polar

# Global

Environmental threats in 2006 highlighted the need for national and international efforts to address global problems. Climate change commanded increased attention, including a number of business initiatives, but policy makers also addressed issues such as marine biodiversity and global chemicals and waste management.

## CLIMATE CHANGE: A GLOBAL PROBLEM

Following an ongoing trend since the late 1980s, 2006 was the sixth warmest year since records began in 1880 (NOAA 2006a). There were other signs of increasing climate instability. Chinese officials attributed extreme droughts to climate change—droughts that left millions short of water (Reuters/MSNBC 2006). In East Africa, persistent drought was followed by heavy rainfall and flooding that displaced two million people and took hundreds of lives (Oxfam 2006, CNN 2006).

New research and climate modelling published in 2006 strengthened the case for action on global warming. A new US National Aeronautics and Space Administration (NASA) study found that the world's temperature had increased by about 0.2°C per decade in the past 30 years, reaching the warmest levels since

the end of last ice age nearly 12,000 years ago. It is now within 1°C of the maximum temperature of the past million years, threatening dangerous climate change based on the likely effects of sea level rise and species loss (Hansen 2006) (Figure 1).

New data showed an alarming increase in the human output of greenhouse gases. Figures published in 2006 showed that between 2000 and 2005 carbon dioxide (CO<sub>2</sub>) emissions grew by 3.2 per cent—four times faster than in the preceding 10 years, according to researchers at the Global Carbon Project (Le Quéré 2006). Average concentrations of CO<sub>2</sub> in 2005 were measured at 380 parts per million (ppm), up from 377.5 ppm in 2004 (NOAA 2006b).

Among countries with commitments to cut emissions under the Kyoto Protocol only Denmark, France,

Iceland, the UK, Germany, and Norway reported lower emissions in 2004 than in 1990, along with ten formerly communist countries where problems of transition depressed economic activity. These results exclude activities related to land use, land use change, and forestry (UNFCCC 2006a).

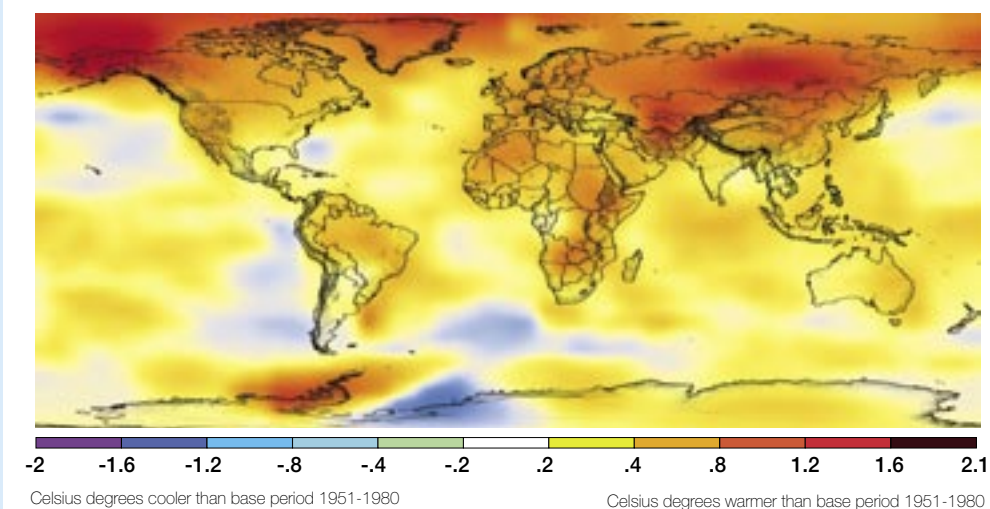
Given the complexity of reducing CO<sub>2</sub> emissions, interest has grown in sequestration. Amid some controversy regarding sequestered CO<sub>2</sub>'s potential contribution to ocean acidification, the London Convention on marine dumping was amended in November, making it legal from February 2007 to bury CO<sub>2</sub> in natural structures under the oceans (IMO 2006).

The story for methane has been more encouraging. Atmospheric methane concentrations have remained stable for the past seven years (Simpson and others, 2006). Among 41 Annex I parties to the Kyoto Protocol who reported data, overall methane emissions fell by 18 per cent between 1990 and 2004. In 24 of these countries methane emissions declined by more than 10 per cent and increased by more than 1 per cent in only 8 countries (UNFCCC 2006a).

Ocean surveys are illustrating that the pace of planetary change is variable and not linear. Over time global warming is expected to raise ocean temperatures, but a 2006 study found that the average temperature of the upper ocean fell by 0.03°C from 2003 to 2005, compared with an increase of 0.09°C from 1993 to 2003. The dip was significant, equal to about one-fifth of the heat gained by the ocean between 1955 and 2003 (Lyman and others 2006).

Last year a 30 per cent slowdown was reported in the Atlantic Conveyor currents, which carry warm water from the Gulf of Mexico to Northern and Western Europe (Bryden and others 2005, UNEP 2006c). In 2006 this alarming finding was subject to downward revision and doubt. Readings from the first year of detailed monitoring show a very high variation within the year. Many scientists now suggest that years or decades of monitoring will

Figure 1: Mean Surface Temperature Anomaly 2001-2005



Source: NASA Goddard Institute for Space Studies

be needed to determine if any long term trend in the conveyor is under way (Kerr 2006). Other studies have revealed no sign of a slowdown (Meinen and others 2006, Schott and others 2006).

Meanwhile, the Stern Review on the Economics of Climate Change, released in late 2006, warned that failure to control climate change could cut 5 to 10 per cent annually from the global economy by the end of the century and lead to economic and social disruption on a scale similar to the Great Depression. In the same report, research indicated that tackling climate change could boost economic growth (Stern 2006).

Stakeholders and groups around the globe increasingly voiced their alarm about climate change in 2006. In a recent international survey, at least 80 per cent of respondents in 27 of the 30 countries polled described climate change as either 'very serious' or 'somewhat serious' (Globescan 2006). This heightened concern was paralleled by increased media coverage in many countries, most dramatically in the US (see North America section).

### Taking on the climate agenda at multiple levels

Action on climate is being undertaken by private and public actors at all levels. In the business sector, many companies are demonstrating a genuine commitment to addressing the problem, while many more are recognizing that there are promising opportunities to reduce costs and find new sources of profit (Green Money Journal 2006,

LaMonica 2006, Lash 2006, Webb 2006). Rupert Murdoch declared that his News Corporation would become a carbon neutral company (NewsCorp 2006). Lee Scott, president of Wal-Mart, the world's largest retailer, committed to reduce the company's greenhouse gas emissions by 20 per cent over the next seven years and to double fleet fuel efficiency over 10 years (Alter 2006). Virgin Group Chairman Richard Branson pledged to invest US\$3 billion over ten years in renewable energy and to cut greenhouse gas emissions by aircraft (Virgin Atlantic 2006).

For several years, insurance and reinsurance companies have been among the leaders in highlighting the challenges of climate change. Following record damage from extreme events in 2005 (Hurricane Katrina created US\$45 billion in insured losses), the industry announced many new initiatives, including 'green building credits' and incentives to invest in renewable energy (Mills and Lecomte 2006). According to a new report from UNEP's Finance Initiative, disaster losses could reach US\$1 trillion annually by 2040, posing huge challenges to the industry (UNEP 2006d).

At the level of local government, in August mayors belonging to the Large Cities Climate Leadership Group—which includes Cairo, Delhi, Johannesburg, London, Mexico City, New York, and Sao Paulo—announced a partnership with the Clinton Climate Initiative to combat climate change in large urban areas (Blood 2006). Close to 650 local governments now belong to Local Governments for Sustainability (ICLEI),

which promotes action on climate change locally and lobbies for action internationally (ICLEI 2006).

On the national front, positive news included China's new energy law committing US\$180 billion to renewable energy (Li 2006).

Internationally, diplomats at the 12th Conference of the Parties of the UN Framework Convention on Climate Change (UNFCCC), held in Nairobi in November, considered how an international climate change regime could look after 2012, when the current commitments come up for evaluation and renewal. Despite mounting scientific evidence and concerns of civil society, multinational commitments regarding GHG emissions cuts were not agreed. However, significant initiatives were launched to help Africa benefit from the international carbon finance market and the Clean Development Mechanism (CDM) (see Africa section). It was also agreed to launch a scientific study of the potential for expanding the CDM to reward developing countries that act to halt deforestation (IISD 2006d) (**Box 1**).

The UN Framework Convention on Climate Change (UNFCCC) was one of four initiatives emerging from the 1992 Earth Summit held in Rio de Janeiro. All of these initiatives continued to guide the global environmental agenda in 2006. The original initiative on Forest Principles has evolved into today's UN Forum on Forests (**Box 2**). There were two other 'Rio Conventions', the Convention on Biodiversity and the Convention to Combat Desertification (**Box 3 and Box 4**).

### Box 1: Carbon markets and new technologies

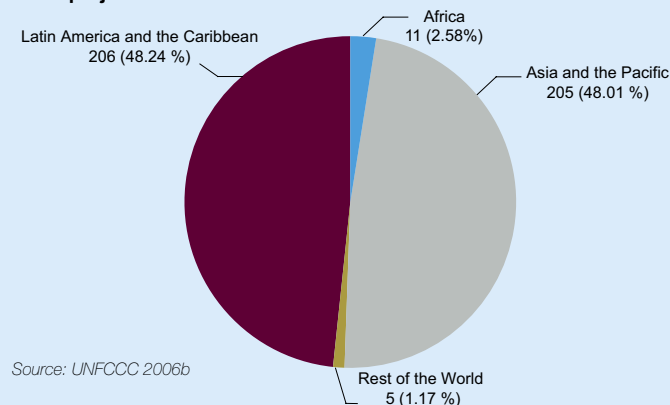
2006 marked a breakthrough year for global and regional cooperation to employ market-based mechanisms and find cost effective solutions in combating climate change. The Kyoto Protocol's Clean Development Mechanism (CDM), which encourages investment from industrialized countries in renewable energy and other emissions reduction efforts in the developing world, also experienced a very rapid increase in support. By early December, more than 1 300 projects were in the pipeline and 427 were fully registered, with the UN's Framework Convention on Climate Change (UNFCCC) estimating that more than 1.5 billion tonnes of emissions reductions would be achieved from the CDM by 2012—the equivalent of the UK and Spain's annual emissions combined.

Emissions trading experienced a surge in popularity. At the regional level, the European Union's Emissions Trading Scheme was expected to generate almost US\$30 billion in trades in 2006—almost a threefold increase on the previous year (see Europe section). Other emissions trading initiatives, such as the Chicago Climate Exchange, the New South Wales Emission Trading Scheme in Australia, and the Regional Greenhouse Gas Initiative in the Northeastern US, also continued to develop. Such mechanisms seem certain to continue growing rapidly and are becoming increasingly interconnected. Given the difficulty of meeting short-term energy demand with renewables, discussions have already started on carbon capture and storage in the context of the UNFCCC and Kyoto Protocol.

Sources: UNFCCC 2006b, Environmental Finance 2006, Point Carbon 2006, Mitchell 2006, IISD 2006b,c

### Registered CDM projects by region 2006

Total projects 427



Source: UNFCCC 2006b

## Box 2: Illegal logging on the agenda

With less than 10 per cent of the world's forests being managed sustainably, illegal logging remained on the international agenda in 2006. A major achievement early in the year was the completion of negotiations of a successor agreement to the International Tropical Timber Agreement, which now states as an objective the need to address illegal logging and its related trade in tropical timber. While the sixth session of the UN Forum on Forests did not follow suit with an equally decisive decision on illegal logging in February, the Secretariat later announced that the Forum would build on the ongoing efforts of the Forest Law Enforcement and Governance processes to galvanize international and multi-stakeholder commitment to combat the problem of illegal logging and its related trade. In September, the G8 Illegal Logging Dialogue was launched to bring together stakeholders from the G8 and major timber producing nations to develop a plan of action to address illegal logging by focusing on financial transparency, support for progressive companies committed to sustainable production, and the development of a discerning market for legal and sustainable timber in EU and G8 markets.

Additional efforts in 2006 to stem illegal logging included the release by the International Tropical Timber Organization (ITTO) and FAO of guidelines on best practices to improve law compliance in the forest sector. These best practice guidelines support national and regional initiatives in design and implementation of measures to combat illegal logging. Demand-side policies are also playing a role in combating illegal logging. Certification schemes have been used to inspire private sector involvement in this issue. There are now 10.5 million hectares, or three per cent, of natural production forests in ITTO producer member countries where sustainable production practices are certified by independent forestry organizations such as the Forest Stewardship Council. In light of the small percentage of certified tropical forests, consumer country experts have also pointed to public timber procurement policies as a means to reduce their countries' contribution to illegal logging.

Sources: Brack and Saunders 2006, ITTO 2006a,b, UNFF 2006, USTR 2006, World Bank 2006.



FSC timber hauled from certified forest in Amazonas, Brazil. Over 90 per cent of the certified wood from the area is exported to Europe.

Source: Joerg Boethling / Still Pictures

## MARINE BIODIVERSITY: GLOBAL RESPONSES AND INSTITUTIONAL INTERLINKAGES

In 2006, scientific information derived from explorations carried out during the previous decade created alarm over the mounting vulnerability of marine biodiversity, particularly in areas beyond national jurisdiction (DOALOS 2006c). There was also concern over the limitations of the current legal system in dealing with scientific and technological advances and humans' expanding impact on the oceans (UNEP and IUCN 2006).

One of the most comprehensive studies of marine biodiversity ever made established that diversity was crucial to productivity. Ecosystems with higher diversity had 80 per cent more biomass and greater system stability than more impoverished ones (Worm and others 2006). The study cast doubt on the feasibility of reaching the 2002 World Summit on Sustainable Development (WSSD) target for the restoration of fish stocks to sustainable levels by 2015. Documenting an alarming decline in marine biodiversity across most marine ecosystems, the authors projected that the last of today's commercial fish and seafood species would collapse by 2050. However, protected areas and fishing closures boosted the biodiversity, measured in species richness, by 23 per cent and led to a fourfold improvement of fishing in neighbouring waters. The report called for the creation of more marine reserves, sustainable management of fishing, and tighter control of pollution (Worm and others 2006).

Contradictory national initiatives in 2006 further highlighted the need for an enhanced international framework. While France announced in June 2006 the creation of a new sanctuary for whales and dolphins in the West Indies, Iceland resumed commercial whaling in October (WWF 2006, Oceana 2006). The International Whaling Commission (IWC) adopted a declaration recognizing that it had failed to complete and implement a management regime to regulate commercial whaling and supporting 'sustainable' whaling in principle (IWC 2006). The United States started work with regional organizations on guidelines for sustainable fisheries practices, while the European Union, rejecting the advice of scientists and conservationists, did not close its cod fisheries in the Eastern Baltic, but instead cut the quota by ten per cent (White House 2006, ENS 2006).

### High seas protected areas

The WSSD also set a goal of establishing representative networks of marine protected areas by 2012. Evaluations in





School children watch a Beard's Beaked whale brought to the Japanese port city of Wada 21 June 2006. Beard's Beaked and pilot whales are not subject to the International Whaling Commission's 1986 ban on commercial whaling.

Source: David Guttenfelder/AP Photo

2006 showed that such areas account for only 0.6 per cent of all the oceans—at the current rate of designation, the target will not be reached until 2085 (Cicin-Sain and others 2006). The Review Conference of the UN Fish Stocks Agreement, convened in May 2006, also recognized the role of marine protected areas, but called upon States and regional fisheries management organizations to develop these areas and protect marine biodiversity only on a case-by-case basis (DOALOS 2006b).

### Ecosystem approach

The WSSD called for the application of the ecosystem approach for sustainable development of the oceans by 2010. Reports in 2006 confirmed that the ecosystem approach provides the “best available framework for managing multiple threats, ecological uncertainties, human uses and interests,” but is still sparingly applied in open oceans and deep waters (UNU 2006). Enhanced application of the ecosystem approach received widespread support at the international level. The Review Conference of the UN Agreement on Fish Stocks concluded with a commitment to integrate ecosystem considerations in fisheries management (DOALOS 2006b).

The seventh meeting of the UN Open-ended Informal Consultative Process on Oceans and the Law of the Sea, held in June 2006, reached consensus on elements for a definition of the ecosystem approach as it applies to oceans, for implementation tools and principles and for its improved application (DOALOS 2006d).

### Competence and institutional collaboration: the high seas as a final frontier

Many biodiversity-oriented and oceans-related instruments and forums have addressed issues related to marine

biodiversity in a sectoral fashion. The UN Food and Agriculture Organization and the International Maritime Organization have dealt with illegal, unregulated and unreported (IUU) fishing; the International Seabed Authority has dealt with the environmental impacts of mining on the deep seabed; the Informal Consultative Process has discussed bioprospecting and destructive fishing practices; and the Convention on Biological Diversity (CBD) has dealt with high seas protected areas (IISD 2006a).

In 2006, the focus of the international community shifted to integrated responses and better institutional coordination at the global level to tackle the multiple threats to oceans. This was particularly evident during the CBD's eighth Conference of the Parties in March 2006, when discussions on marine biodiversity were dominated by the question of the CBD mandate in regards to other international organizations. The Conference concluded that the CBD should concentrate on specific tasks: providing scientific and technical information and advice related to marine biodiversity, advising on the application of the ecosystem and precautionary approaches, and delivering the WSSD target to significantly reduce the current rate of biodiversity loss by 2010 (CBD 2006). This newly defined role was intended—together with



Trawlers in the Elbe River, Germany.

Source: argus / Still

### Box 3: Biodiversity threats and conservation hopes

The year brought new evidence of growing threats to global biodiversity—especially to bird species in tropical habitats. However, studies also indicate that conservation efforts such as listing and protection can reverse declines.

A very detailed species-by-species assessment published in 2006 found that the rate of extinctions among birds may be far higher than previously estimated. The extinction rate before human impact was about one extinction per million species per year (E/MSY). The rate since 1800 has been estimated at 26 E/MSY. However, allowing for extinctions before 1800 and probable extinctions not yet recorded, the rate since 1800 may have reached 100 E/MSY. Rates in the last decades are less than 50 E/MSY—but they would have reached 150 E/MSY without conservation efforts.

The researchers conclude that most bird species' extinctions were previously confined to islands but that continent-wide extinctions have been documented recently. They predict that the 21st century rate could reach 1000 E/MSY and that, if the predicted deforestation and transformation of tropical landscapes continues, extinction rates may reach 1500 E/MSY by the end of the century. The scientists attribute extinctions to invasive species, expanding human technologies, and global environmental change. However, the most intriguing—and motivating—result of their inquiry suggests that conservation efforts can work to significantly reduce species loss.

The World Conservation Union (IUCN) issues a biennial Red List of Threatened Species based on criteria including quantitative thresholds of population size, distributional range, rates of decline, and extinction risk. The 2006 Red List provides an accurate measure of progress, or lack of it, in achieving the globally agreed target to significantly reduce the current rate of biodiversity loss by 2010.

The overall number of species considered to be critically endangered increased by seven per cent between 2004 and 2006—from 2 791 to 2 985. The most significant increases in the critical category were among fish species (48 per cent increase), insects (45 per cent), and reptiles (14 per cent).

The percentage of 'described species' which were threatened was highest among vertebrates, ranging from 31 per cent among amphibians and 20 per cent among mammals, to 12 per cent of birds and 4 per cent each of reptiles and fishes. Among gymnosperms such as conifers, 31 per cent were threatened. Mammals, birds, amphibians, and gymnosperms were the first groups to be completely or almost completely evaluated.

Sharks and rays are among the first marine groups to be assessed: 20 per cent of the 547 species listed are threatened with extinction. Freshwater fish are also at risk: 56 per cent of the 252 endemic freshwater Mediterranean fish are threatened.

One species which moved into the threatened categories in the 2006 Red List is the polar bear. There are an estimated 20 000 to 25 000 polar bears left in the Arctic and their survival is severely threatened by the retreat of ice due to global warming. Bears rely on broad expanses of ice to gain access to their food sources. When unstable or absent ice prevents access to food, they will give birth less often to smaller cubs with higher mortality rates. Their slow rate of reproduction means that they are unlikely to develop new behaviour patterns in time to adapt to global warming. The 2006 IUCN assessment projects a population reduction of more than 30 per cent within 45 years—and possible extinction in the wild in 100 years. Other stress factors include pollution, shipping, tourism, oil and gas operations, and traditional hunting by indigenous communities.

Following a 2005 petition from three environmental organizations, the US Fish and Wildlife Service officially announced in December 2006 that it would propose listing the polar bear as a threatened species under the Endangered Species Act (ESA). This decision is highly significant. This would be the first listed species to which global warming is officially acknowledged to be the major threat. Protection under the ESA would require the US government to develop a conservation plan and to ensure that government agencies take

no action that might jeopardize the animal's existence. There follows a 12 month review of threats and options for conservation. While the official announcement downplays any implications for US climate and oil exploration policies, environmental NGOs believe they would be empowered to take legal action over these threats.

Protection and conservation can pay off. A well known example of a species which would be extinct save for conservation is the California condor, which was down to the last nine in the wild before a conservation breeding and release programme began in 1987. Numbers in the wild have now risen to 138. However, the released condors are still highly vulnerable and conservation efforts must remain vigilant. Most of the chicks hatched in the wild have died—some by ingesting trash left by hikers, such as bottle caps and glass fragments. Since 1997, nine condors have died of lead poisoning derived from hunters' ammunition and three hunters have been convicted under the Endangered Species Act and required to pay fines varying from US\$1500 to US\$20 000.

Sources:  
*Pimm and others 2006, IUCN 2006a, Schliebe and others 2006, US Fish and Wildlife Service 2006, Church and others 2006, CRES 2006.*



Polar bear on thin ice

Source: Fred Bruemmer / Still Pictures

other international organizations and processes on biodiversity or oceans—to complement the central role of the General Assembly. The Assembly's capacity to steer ocean and biodiversity related agencies, treaty bodies, and forums towards effective and timely international action to protect marine biodiversity in the deep sea is now to be tested.

### CHEMICALS AND WASTE MANAGEMENT: TOWARDS A GLOBAL APPROACH

A number of efforts in 2006 moved the international community towards the 2002 WSSD agreed objective that, by the year 2020, chemicals should be produced and used in ways that minimize significant adverse effects on the environment and human health. The importance of a global approach to chemicals and waste management was closely tied to the globalization of trade in wastes.

During 2006, cases involving the transboundary movement of wastes confirmed the need for a globally accepted life cycle approach to chemicals and waste. The Secretariat of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was asked to become involved in two prominent cases of this type. The first involved a retired French aircraft carrier en route to Alang, India, to be dismantled. Several non-governmental organizations protested that the departure violated the Basel Convention. The Secretariat encouraged India and France, both Parties to the Convention, to resolve the issue bilaterally (Basel 2006a). The ship was eventually ordered back to France. The Secretariat was also involved when a foreign ship delivered toxic material to Abidjan, Côte d'Ivoire, in August (see Africa section). As of late December 2006, donor contributions of US\$15 million were still being sought to meet clean-up costs.

Problems associated with electronic equipment waste raised international attention due to both the escalating levels of e-waste and the growing tendency to export it for disposal to countries other than the country of production or use. According to one report, 20 to 50 million tonnes of e-waste are produced each year, much of it containing toxic materials (Economist 2006). In response, beginning on 1 July 2006, Europe began limiting the use of particular substances—including lead, mercury, and cadmium—in new electronic products. On the same date California began requiring mobile phone retailers to take back and recycle old phones. The Conference of the Parties

to the Basel Convention took up this issue for the first time at its November-December meeting in Nairobi. Delegates recommended phasing out technologies that are not environmentally sound and agreed to develop a plan on the environmentally sound management of e-waste, focusing on the needs of developing countries and countries with economies in transition (IISD 2006e).

Amid the growing need for a global approach to chemical waste, negotiations on the Strategic Approach on International Chemicals Management (SAICM) were completed in February 2006, bringing a new policy framework for international action on chemical hazards to the three legally binding multilateral instruments that currently govern chemicals issues: the Stockholm Convention on Persistent Organic Pollutants (POPs), the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (PICs), and the Basel Convention. SAICM is a voluntary agreement that covers issues from risk assessments of chemicals and harmonized labelling to elimination of obsolete and stockpiled products. It includes provisions for establishing national centres to help countries, especially in the developing world, to train staff in chemical safety, including dealing with spills and accidents.

The three legally binding convention bodies considered a global approach to chemicals and waste management through the use of a life cycle or 'cradle-to-grave' approach, and addressed the possibilities of coordinating and combining their activities. All three conventions agreed in 2006 to establish an ad hoc joint working group to consider options—such as establishing a common Executive Secretary and core

management functions for the three conventions or integrating administrative support, implementation, and technical assistance—with the Parties to the Stockholm Convention calling for cooperation and coordination among the three conventions (UNEP 2006a, IISD 2006e).

### LOOKING TOWARD 2007

Developments in 2006 suggest a few encouraging trends in addressing sustainable development concerns. Multilateral efforts to enhance the coordination among, and to rationalize the different inputs of, international institutions and natural resource management were underway at a number of levels. At the same time, there is a growing recognition of the importance of addressing cross-cutting issues in a holistic manner and developing global partnerships between international institutions and non-State actors.

The High-Level Panel on UN System-Wide Coherence in the areas of Development, Humanitarian Assistance, and the Environment, along with consultations on international environmental governance within the General Assembly, delivered options to improve coordination among UN agencies. The High-Level Panel recommended an independent assessment of international environmental governance within the UN system. It also recommended that any duplications should be eliminated and that UNEP should be upgraded and have real authority as the environmental policy pillar of the UN system (UN 2006).

However, 2006 was not a 'breakthrough year' in key negotiations such as climate change. The issue will require some countries to act as champions if the world is to act in a timely manner. Efforts must be made to



Boy hired to haul electronic scrap from Alaba market in Lagos, Nigeria to this nearby informal dump sitting on a swamp. Imported scrap televisions and computers that could not be repaired are burned.  
Source: Basel Action Network

link the environment and economics—as pioneered by the UN Economic Commission for Europe's Recommendations on Payments for Ecosystem Services in Integrated Water Resources Management, which offer international guidance for the establishment of payment for ecosystem services at the local, national, and transboundary levels (UNECE 2006). All stakeholders will need to be involved if emerging issues are to be dealt with from a sustainable development perspective—and sustainable development will need to move from the periphery to the center of decision-making considerations.

## Box 4: Priorities for Action on Deserts and Desertification

The UN's designation of 2006 as the International Year of Deserts and Desertification (IYDD) sought to focus international attention and action on the situation of approximately 500 million people who live in deserts and desert margins, totaling eight per cent of the global population. An average of 68 per cent of the species found in the desert biome are endemic, but the pressures and impacts of agriculture and other human land use, fragmentation associated with infrastructure, and climate change may cause biodiversity losses that could decrease this average of original species to 58.3 per cent by 2050.

IYDD-related events identified actions to address the issue in relation to migration, scientific options, and sustainable water and land management among other matters. Several studies released in 2006 further identified approaches to manage the water crisis in drylands. *Global Deserts Outlook* stressed the need to discourage wasteful water consumption as well as to combine new technologies such as drip irrigation, micro-sprinklers, and fog harvesting in coastal deserts, with traditional water-efficient management techniques. The Comprehensive Assessment of Water Management in Agriculture identified improving agricultural water management in developing countries as a key priority, particularly on rain-fed farms on Africa's savannas, and recommended building more water storage, installing better irrigation systems, and developing drought-resistant crops. The 2006 *UN World Water Development Report* emphasized modifying water demand and usage through increased awareness, education and water policy reforms, and adopting Integrated Water Resources Management (IWRM) and water efficiency plans. Ministers at the 4th World Water Forum in Mexico City in March 2006 reaffirmed their commitment to achieve internationally agreed IWRM goals of access to safe drinking water and basic sanitation agreed upon in Agenda 21, the Millennium Declaration, and the Johannesburg Plan of Implementation.

Sources: CA 2006, National Water Commission of Mexico 2006, UNEP 2006b, World Water Assessment Programme and UNESCO 2006, and UNESCO 2006



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# Calendar of selected events in 2006

PHOTIE Brandelet Dider / Still Pictures



## JANUARY

**1 January** The United Nations launches the International Year of Deserts and Desertification to raise global public awareness of advancing deserts, which cover 41 per cent of the earth's surface.

**1 January** A voluntary mechanism to exchange information about registered importers of chlorofluorocarbons (CFCs) before issuing import/export licenses is piloted in countries of South and South East Asia.

**4 January** The Framework Convention on the Protection and Sustainable Development of the Carpathians enters into force. The convention provides key principles for cooperation on conservation, agriculture, forestry, transportation, and infrastructure among the Czech Republic, Hungary, Poland, Romania, Serbia, the Slovak Republic, and Ukraine.

**11-12 January** The first ministerial meeting of the Asia-Pacific Partnership on Clean Development and Climate adopts a charter document and a work plan.

**8 February** The Strategic Approach to International Chemicals Management is adopted at the International Conference on Chemicals Management, to ensure that chemicals are used and produced in ways that minimize adverse effects to health and the environment.

**13-24 February** Delegates at the sixth session of the UN Forum on Forests agree on a successor agreement to the International Agreement on Forests. There are four global objectives: to prevent forest degradation; enhance forest benefits and their contribution to international development goals; increase the area of forests; and increase official development assistance for sustainable forest management.

MARK EDWARDS / Still Pictures



## MARCH

**6-9 March** The Africa Ministerial Conference on Hydropower and Sustainable Development commits to working together to unlock Africa's hydropower potential. Ministers recognize the need for sound environmental and social impact assessments, for investing in capacity building, and for ensuring that affected local communities derive positive sustainable benefits.

**14 March** The World Meteorological Organization's first annual Greenhouse Gas Bulletin reports that globally averaged concentrations of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) in the planet's atmosphere reached their highest ever recorded levels in 2004.

H. Wroblek/UNEP / Still Pictures



**26 April** 20th anniversary of the world's largest ever nuclear accident, at Chernobyl in Ukraine. The effects continue to affect the lives of people in Ukraine, neighbouring Belarus and Russia, and across the northern hemisphere.

PHOTIE Brandelet Dider / Still Pictures



## MAY

**16 May** The African Union, World Bank, FAO, and the World Wildlife Fund launch an Africa-wide partnership with the aim of restoring depleted fish stocks and reducing poverty. This partnership establishes a Sustainable Fishing Investment Fund—the first of its kind—focussing on fisheries in Africa's large marine ecosystems.

Ron Cling / Still Pictures



## JULY

**3 July** The Millennium Development Goals Report 2006 finds that developing countries have made progress in providing access to clean water and schooling, but efforts to achieve other internationally agreed targets are falling behind schedule.

/ Still Pictures



**7 July** The World Conservation Union (IUCN) announces that despite improvements in conservation of most of Africa's black and white rhinoceros sub-species, the West African black rhinoceros (*Diceros bicornis longipes*) is now feared extinct mainly due to poaching for rhino horn. Wild northern white rhino (*Ceratotherium simum cottoni*) populations have reached an all time low.

**15-17 July** Leaders at the G8 Summit, hosted by Russia, issue a Global Energy Security Statement in which they agree that ensuring sufficient, reliable, and environmentally responsible supplies of energy at prices reflecting market fundamentals is a challenge for G8 countries and for mankind as a whole.

**4 September** The creation of the first international organization to reduce the negative impacts of soy production is announced at the second Conference of the Roundtable on Responsible Soy in Asunción, Paraguay. An initiative of soy producers, processors, traders, financial institutions, and non-governmental organizations, it will develop principles, criteria, and indicators for the responsible production, processing, and trade of soy.

**28 September** UNEP awards the 2006 Sasakawa Prize to two grassroots initiatives—Mauritania's Tenadi Cooperative Group and Rodrigo Vivas Rosas of Colombia—for their achievements in combating desertification and land degradation. The Tenadi Cooperative developed immersed borehole pumps for drinking water and reforested 80 hectares around the boreholes to stabilize dunes.

## OCTOBER

By October 2006, Avian flu is found among poultry in Niger, Cameroon, Cote d'Ivoire, Burkina Faso, Egypt, and Sudan. In 2006 ten people died in Egypt, nine in Europe. The largest number of cases continues to occur in East and South East Asia, with 45 deaths in Indonesia alone. Vietnam and Thailand—first to be affected in the recent outbreak—have zero and three deaths respectively in 2006.

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**5 October** The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) decides to suspend exports of 60 tons of elephant ivory from Botswana, Namibia, and South Africa. Permission for the sales is conditional on the Monitoring of Illegal Killing of Elephants (MIKE) system establishing comprehensive baseline data on elephant poaching and population levels, which has not yet been achieved.

**26 October** The European Commission proposes legislation to ban all European Union exports of mercury beginning in 2011.

**30 October** The Stern Review on the Economics of Climate Change by the head of the UK's Economic service, Sir Nicholas Stern, calculates that the costs of unabated climate change range from 5-20 per cent of GDP or more while the costs of action to avoid the worst impacts of climate change can be limited to approximately one per cent of global GDP per year.

## NOVEMBER

**6-17 November** UN Climate Change Conference in Nairobi fails to result in commitments for the post-Kyoto era that begins in 2012, or in a timetable for negotiating new targets.

**10 November** Environment ministers of the Association of South East Asian Nations (ASEAN) endorse a Plan of Action to implement the ASEAN Agreement on Trans-boundary Haze Pollution, signed in 2002.

**9 November** The High-Level Panel on UN System-wide Coherence in the Areas of Development, Humanitarian Assistance, and the Environment recommends consolidating all UN country-level programme activities, upgrading UNEP into the lead UN agency for environment with a renewed mandate and improved funding, and increasing the resources of the Global Environment Facility.

**15-17 January** The first World Assembly on Labour and the Environment proposes adding environmental rights such as access to water and energy to workers' traditional rights of freedom of association and collective bargaining.



Enrico Barolucci / Still Pictures

## FEBRUARY

**6 February** The deadly H5N1 bird flu virus is detected for the first time in Africa—on a large commercial chicken farm in Nigeria.

**7-9 February** Environment ministers at the ninth special session of UNEP's Governing Council/Global Ministerial Environment Forum discuss issues related to energy and environment, environmental governance, and approve an agreement on international chemicals management.

**20-31 March** The eighth Conference of the Parties to the Convention on Biological Diversity adopts an island biodiversity work programme, reaffirms a ban on field testing of genetic use restriction technologies, and rejects case-by-case risk assessments.

**27 March** The world's largest Forest Stewardship Council tropical forest, totalling 570,000 ha, is certified in Guyana.

**27-29 March** The Third International Conference on Early Warning calls for more funds and emphasizes the importance of local communities in readiness training and the need to integrate early warning into disaster risk reduction strategies in national development frameworks.

**16-22 March** The fourth World Water Forum is attended by almost 20 000 participants. The adopted Ministerial Declaration calls for international action on water and sanitation issues.

## APRIL

**1 April** The International Association of Antarctica Tour Operators reports that over 26 000 visitors travelled to the Antarctic region from November 2005 through March 2006, the austral summer period. This is a record number and a threefold increase since 1992.

**20 May** Final concrete is poured for the Three Gorges Dam's main wall amid controversy over costs and benefits, including environmental costs. It is the largest hydroelectric dam in the world. Designed for power generation as well as flood control, when operating at full capacity now scheduled for 2008, the project's 26 hydropower turbines are expected to produce 18.2 million kilowatts, up to one-ninth of China's electricity output.

**25 May** The International Tropical Timber Organization, in an analysis of the state of tropical forestry in 33 countries in Asia, the Pacific, Latin America, the Caribbean, and Africa, reports that over 90 per cent of tropical forests are not being managed sustainably.



FFREE/ENS Pool / Track / Still Pictures

## JUNE

**9 June- 9 July** The 2006 FIFA World Cup goes carbon-neutral. Greenhouse gas emissions are cut drastically, partly by encouraging half of the estimated 3.2 million fans to take public transport. FIFA also offsets the carbon produced by financing alternative energy projects in India and South Africa.

**12-16 June** The first session of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture adopts a standard Material Transfer Agreement, implementing the Treaty's multilateral system of access and benefit-sharing. Recipients who commercialize plant material without making it freely available for further research and breeding will pay a percentage for activities to help small farmers in developing countries.

**28 July** A new US federal rule takes effect protecting over 95.83 million hectares of ocean floor around Alaska from bottom trawling to help save Alaska's rare coral gardens.

## AUGUST

**12 August** The Framework Convention for the Protection of the Marine Environment of the Caspian Sea enters into force. It will coordinate efforts by Azerbaijan, Iran, Kazakhstan, Russia, and Turkmenistan to reverse an environmental crisis of habitat destruction, industrial pollution, and over-exploitation of fish and other marine life.

**28 August** The Global Environment Facility (GEF) Council, led by its new CEO/Chair Monique Barbut, endorses the outcome of the long-negotiated fourth replenishment of the GEF Trust Fund at a level of US\$3.13 billion for 2006-2009 to finance environmental projects over the next four years.

**30 August** California, the 12th largest carbon emitter in the world, passes the first bill in the United States to cap CO<sub>2</sub> emissions. It aims to cut them by about 25 per cent, back to 1990 levels by 2020.

## SEPTEMBER

**1 September** 'Project Sky-Hole Patching' is launched—a far-reaching operation to curb illegal trade in ozone-depleting substances and dangerous waste by 20 national customs administrations in Asia and the Pacific. Customs authorities will cooperate with environmental agencies to monitor suspicious shipments of ozone-depleting chemicals and dangerous commodities.

**5 October** A draft bylaw of the Arab Union for Wildlife Sanctuaries is ratified in Riyadh, Saudi Arabia. The Arab Union aims to provide technical support and consultation to member-countries in the establishment and management of wildlife sanctuaries.



AETE/LAFRED / Still Pictures

**24 October** WWF's Living Planet Report 2006 calculates that humanity's Ecological Footprint—the demand we place upon the natural world—has exceeded the Earth's sustainable capacity by about 25 per cent. Measures such as carbon sequestration and emission reductions due to energy conservation or new technologies would improve the situation.



S. Zeeb / Still Pictures

**26 October – 3 November** The first Meeting of Contracting Parties to the London Protocol decides to allow burial of CO<sub>2</sub> in natural structures under the oceans from February 2007, despite concerns over the potential for leakage that would exacerbate ocean acidification dangers.



INCK COBBING / Still Pictures

**17 November** The US National Oceanic and Atmospheric Administration releases its State of the Arctic report, highlighting continued warming in the Arctic. On average, global temperatures have been steadily warming for decades but the Arctic appears to be warming twice as fast as the rest of the world.

**22 November** Five Central Asian countries endorse the Framework Convention on Environmental Protection for Sustainable Development to more effectively address common and transboundary environmental issues.



Peter Huth / Still Pictures

## DECEMBER

**13 December** EU Member States approve Registration, Evaluation and Authorisation of Chemicals (REACH), the much debated law on toxic chemicals. REACH will enter force in June 2007 requiring companies to prove that new or existing substances in every-day products like cars, clothes, and paint are safe.



# Africa

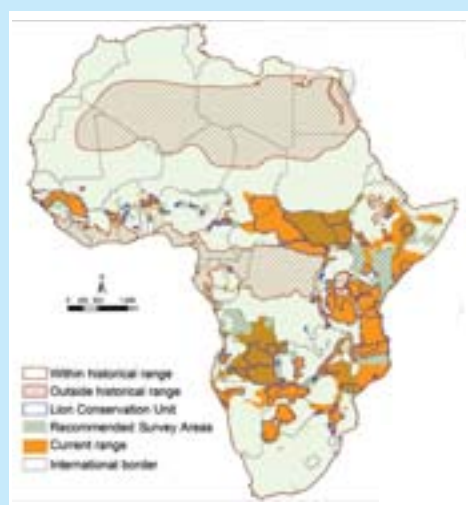
In 2006, man-made and natural disasters continued to hamper Africa's development opportunities. However, environmental cooperation proved to be a valuable tool for reducing conflict, increasing economic opportunities, and enhancing livelihoods as well as achieving conservation objectives.

## ENVIRONMENTAL COOPERATION—AN INVESTMENT IN PEACE AND REGIONAL INTEGRATION

Violent conflict and pressures on arable land continue as significant causes of environmental degradation in Africa, leading to deforestation and the bush meat trade as well as undermining the resilience of local communities. But conversely, environmental cooperation can offer a promising route to regional peace and integration (Hamill 2005). Several new and ongoing environmental initiatives in Africa are exploring this promise for different species and for different ecological regions.

Lion populations have disappeared from about 80 per cent of their former rangelands (Figure 1)

**Figure 1: Africa's lion population is in steady decline. Lion Conservation Units are areas that are critical for the long-term conservation of lion populations. In Recommended Survey Areas further monitoring and research are necessary to determine population status and appropriate responses.**



Source: Wildlife Conservation Society

(UNEP-WCMC 2006). Over the last two decades their numbers are believed to have declined by 30-50 per cent and current estimates suggest that between 23 000 and 39 000 lions remain (Bauer and Van der Merwe 2004, Chardonnet 2002). Approximately 90 per cent of the remaining lion population is located in eastern and southern Africa, half of these in Tanzania. There are smaller viable populations in Kenya, South Africa, Mozambique, Botswana, Zimbabwe, Zambia, and Namibia. Lions have been completely eliminated in Egypt, Libya, Tunisia, Algeria, Morocco, and Mauritania. In western and central Africa only small, fragmented lion populations remain. This biodiversity loss also represents an economic loss, as lion populations are a focal point for tourism.

In 2006, 24 lion range states began a process to develop a pan-African lion conservation strategy. Two sub-regional strategies—one for western and central Africa and another for eastern and southern Africa—have been developed (IUCN ROSA 2006). Africa's lion range states recognize that protecting this asset means addressing the causes of declining lion populations (IUCN ROSA 2006). These include the vulnerability of lions in conflict zones, conflicts between lions and rural people whose lives and livestock they may threaten, and various diseases (Dudley and others 2002, Chardonnet 2002, Frank and others 2006).

Great apes are even more severely threatened by the bush meat trade, encroachment, and conflict (Box 1). The 2005 Kinshasa Declaration on Great Apes pledges signatories to reduce the current loss of great ape populations by 2010 and to secure the future of all species and subspecies of great apes in the wild by 2015. Sierra Leone and Sudan signed the declaration in March 2006, followed by Rwanda and Gabon in May and by Equatorial Guinea in June (UNEP 2006a). Only two of the 23 African great ape range states have not yet signed. By connecting protected areas, the parties hope to improve conservation and livelihood opportunities (UNEP and UNESCO 2005).

## Box 1: Building peace through environmental cooperation

The International Gorilla Conservation Programme (IGCP) promotes cooperation for mountain gorilla conservation in the Great Lakes region, which has experienced multiple conflicts over several decades.

IGCP has three coalition partners—African Wildlife Foundation, Fauna & Flora International, and the World Wide Fund for Nature. It works with all stakeholders whose activities potentially affect the survival of gorillas and their habitat including farmers, park and military authorities, local and regional governments, and environmental experts. By building partnerships and developing synergies between conservation and development, IGCP has changed attitudes to the gorillas.

Since IGCP's inception, there has been a 12 per cent increase in the mountain gorilla population which totalled 700 at the time of the latest census. Preliminary assessments suggest that conservation activities have improved dialogue between different stakeholders. Improved communication builds trust and understanding while joint activities create interdependencies, all of which helps to reduce political tensions.



Source: Johannes Reifisch

Separating farming communities and the gorilla population, the Nkuringo buffer zone along the south side of Uganda's Bwindi Impenetrable Forest is 12 kilometres long and a few hundred metres wide.

IGCP aims to build partnerships between development and humanitarian agencies and environmental efforts. Mainstreaming environment in development and humanitarian activities potentially creates new support for conservation development initiatives that can enrich local livelihoods. However, success depends on making sure that interventions do not entrench inequities or create new ones—such as unequal rights to land and forest resources.

Sources: IGCP 2006, Besançon and Hamill 2006, van der Giessen 2005, Larjouw undated

The declaration encourages cooperation, including partnerships with the private sector, to create sustainable economic activities that enhance livelihoods.

Ecological regions can also act as a focus for regional cooperation. The upper Zambezi and Kavango region is biodiversity-rich and home to the well-known Okavango Delta. The area has significant tourism potential but three decades of violent conflict have hindered investment. Landmines from Angola's 26-year civil war have displaced communities, disrupted livelihood activities, and blocked elephant (*Loxodonta africana*) migratory routes, restricting the largest surviving elephant herd to Botswana's northern protected areas (Hoare 2004, UNEP undated). This constrained elephant herd is growing at an unsustainable rate of five per cent per year, resulting in environmental degradation and conflict with communities living nearby. On 7 December 2006, government ministers from Angola, Botswana, Namibia, Zambia, and Zimbabwe signed a Memorandum of Understanding that establishes the Kavango-Zambezi Transfrontier Conservation Area



After de-mining in Angola, elephants in Botswana's wetlands should be able to resume their transfrontier migratory habits.  
Source: © BIOS Gunther Michel / Still Pictures

## Box 2: Regional cooperation in early warning and conflict management

In east Africa, environmental change and the lack of rural investment combine to create fertile ground for pastoral conflict. The convergence of pastoral groups around state boundaries increases the likelihood of cross-border migrations. In recent years pastoral conflict has increased and currently there are 30 potentially threatening inter-community conflicts in the region. Tension points include the Karamoja cluster composed of pastoral groups in southwestern Ethiopia, northwestern Kenya, southeastern Sudan, and northeastern Uganda.

Increased tension is linked to:

- growing competition for land as a result of desertification, displacement of pastoral people, and population growth among herders and farmers;
- the breakdown of traditional cattle-raiding rules and the commercialization of raiding;
- the proliferation of small arms from wars in the region; and
- reduced food security and water availability due to rainfall variability and extended droughts.

In one significant regional initiative, the Intergovernmental Authority on Development (IGAD) has linked its drought and conflict monitoring activities into the Conflict Early Warning and Response Mechanism (CEWARN). CEWARN monitors pastoral conflict and provides timely information on specific events and their causes, thus helping member states to prevent escalation into larger conflicts. CEWARN's Drought Monitoring Centre reports on drought and forage conditions and makes food production projections—important factors influencing migrations.

Sources: CEWARN 2006, Grahm 2005, Nori and others undated, Arne 2006, NASA 2006

((KAZA TFCA) (Peace Parks Foundation 2006). The KAZA TFCA will link human security and development with conservation. An initial step will be a project run by UNDP, Conservation International, Roots of Peace, and the Government of Angola to de-mine 150 000 hectares and restore elephant migratory routes. This will link protected areas within KAZA TFCA, increasing tourism potential and related development (Suich and others 2005). The initiative will restore elephant migratory routes.

Covering an even larger area, the African Union is considering a 'Green Wall for the Sahara Initiative,' which will include over 20 countries in a 30-year project.

This initiative aims to arrest desertification and improve sustainable livelihoods in the fragile Sahelo-Sahara zone. The Green Wall concept recognizes that policy coordination and better integration of environment in development policies are essential to harmonize approaches to community participation, to rehabilitate transboundary ecosystems, and to develop a strong data base (AU Commission 2006).

Recovering from violent conflict can leave countries and communities vulnerable to natural and man-made disasters (**Box 2 and Box 3**). Regional cooperation can build local resiliency as well as transboundary conservation success.

## Box 3: Illegal dumping crisis in Côte d'Ivoire



Citizens of Abidjan wait outside a local hospital to be examined by medical personnel for the effects of toxic exposure.

Source: Luc Gnago/Reuters/The Bigger Picture

In Abidjan, Côte d'Ivoire's largest city, the illegal dumping of over 400 metric tons of toxic sludge in late August killed at least 12 people and led more than 100 000 others to seek medical care. Reportedly, a ship unloaded petrochemical waste into trucks that then dumped it in at least 15 sites around Abidjan. The waste contained a mixture of petroleum distillates, hydrogen sulphide, mercaptans, phenolic compounds, and sodium hydroxide.

The disaster led to the resignation of the government, which had been reaching the end of a UN-brokered administration comprised of parties that were warring factions in the recent civil war. International waste treatment experts helped with the first phase of clean-up but even by the end of 2006 residents still suffered as local dumps were closed and waste piled up on city streets. The Ivorian Government estimated a total cost of US\$30 million to recover and transport the waste to France for de-contamination. As of 20 December 2006 US\$15 million was still needed from international donors to finish the job.

Source: (UNNS 2006, UNEP 2006)

## INVASIVE ALIEN SPECIES

Invasive alien species (IAS) are the second largest threat to global biodiversity after habitat loss (MA 2006). In many small island developing states, IAS are the greatest threat to biodiversity. They pose a region-wide challenge to Africa, driving environmental change, affecting agriculture and water availability, and under-mining the continent's ability to meet the Millennium Development Goals and other efforts to reduce extreme poverty and hunger (GISP 2006).

The threat is likely to increase due to the combined effects of climate change, land-use change, and globalization (Mooney and Hobbs 2000). Climate change and land conversion disrupt ecosystems and favour the establishment of opportunistic species (Mace and others 2006). Increased human mobility and trade have opened new pathways of introduction, creating new management challenges and complicating efforts to exclude IAS (Chenje and Mohamed-Katerere 2006, Barnard and others 2006).

Globally-accepted IAS policy focuses on the prevention of new introductions as top priority. Once a species becomes established, the focus shifts to eradication and control. The parties to the Convention on Biological Diversity (CBD) agreed to significantly reduce the rate of biodiversity loss by 2010—including the loss attributable to invasive species. For IAS, the goals are to control pathways of invasion and to establish management plans for the most threatening alien species (CBD 2002, CBD 2004).

With only four years left before the 2010 target date, challenges to meeting these goals remain and it seems unlikely that IAS can be eradicated in the foreseeable future. For example, by 2006 only five countries out of the 22 assessed had identified some or all major IAS and established a tracking system. Africa's capacity to control IAS is affected by weak policy and institutions, inadequate

funds, and lack of information and managerial capacity (GISP 2006). Prevention measures are insufficient: There is a lack of standards to address animal IAS, as well as inadequate control measures on IAS introductions via civil air transportation, shipping, transboundary waters, tourism, and emergency relief (CBD 2006a).

IAS can affect livelihoods in positive as well as negative ways, making some management choices difficult. While particular IAS may have financial value, in situations where these species displace native species and cause significant environmental change, the environmental and social costs may outweigh any economic benefits. For example, in 2005 the export of Nile Perch fillets from Lake Victoria earned Uganda, Kenya, and Tanzania US\$272 million. But since the species was introduced in the 1950s, Nile Perch have transformed Lake Victoria's ecosystem and reduced the diversity of fish species on which many local people rely (Josupeit 2006).

Once established, IAS are extremely difficult to eradicate (MA 2005). One promising approach that complements other control measures is to encourage enterprises that use IAS by-products, creating an incentive to harvest invasive species (**Box 4**). In Niger, planners are considering management approaches to develop economic use of the invasive *Prosopis spp.*—commonly known as mesquite (Geesing and others 2004). Mesquite was introduced to Mauritania, Senegal, and other Sahelian countries to help combat desertification by stabilizing dunes. In some parts of northwestern Africa mesquite is one of the sole sources of firewood. While mesquite has become an invasive problem in areas with more rainfall, in parts of Africa subject to desertification and drought due to climate variability and climate change mesquite serves as a valuable resource (**Box 5**) (FAO 2006).

In 2003, the New Partnership for Africa's Development (NEPAD) named IAS as a priority area in its Environmental Action Plan, marking a first step towards establishing a regional framework and identifying 14 projects to address the issue (NEPAD 2003). However, only 29 African countries met reporting requirements under the CBD in 2006 and country reports reveal ongoing managerial challenges (CBD 2006b).

In 2006, the CBD drew attention to the need for a multilevel cooperative approach to capacity-building at national, sub-regional, regional, and global levels to promote consistency and mutual support for adopted measures (CBD 2006a). A 2006 UNEP Global Invasive Species Programme capacity-building initiative will assist countries to develop and implement national and regional strategies and action plans, as well as facilitate information sharing.

## LOOKING TO THE FUTURE

For Africa, building durable peace as the basis for development and human prosperity will remain a long term priority. Environmental cooperation can contribute to this vision by decreasing tensions over livelihood resources, by equitable sharing and joint planning—and by building trust. Successful environmental cooperation requires improved funding to support better integration of environment and development policies and stronger partnerships between governments and other stakeholders.

By continuing to invest in environmental cooperation among governments and other stakeholders (including non-governmental organizations, experts, communities, and entrepreneurs) Africa can make important steps towards achieving sustainable development goals and reducing vulnerability to both man-made and natural disasters.

### Box 4: Value-added industries

In South Africa, 8 750 plants are introduced species and 198 of those are classified as invasive. Recent estimates suggest that these plants cover over 10 million hectares—about 8 per cent of South Africa's land area. South Africa's 2006 report to the CBD noted that its Working for Water (WfW) Programme invests heavily in eradication, increasing from about US\$6 million in 1995/6 to more than US\$72 million in 2003/4, and has cleared over a million hectares of land of invasive alien plants. Nevertheless, invasive alien species continue to spread—wasting 7 per cent of water resources, intensifying flooding and fires, eroding soils, silting dams and estuaries, degrading water quality, and reducing biodiversity.

WfW's Valued-added Industry Programme encourages entrepreneurs to use the biomass collected from land-clearing operations. IAS biomass is used to make screens and blinds, interior décor items such as lamps, bathroom accessories, indoor and outdoor furniture, fencing and arches, and toys, as well as fuel.

The programme has three primary objectives:

- Improving the economic benefits of the WfW programme, by creating extra jobs through the harvesting and processing of plant material.
- Reducing the cost of clearing invasives by involving entrepreneurs, contributing to the sustainability of the WfW programme.
- Minimizing the potential negative environmental impacts, such as fire damage, by leaving less biomass behind after clearing.

Source: Working for Water Programme 2006, Government of South Africa 2006



Craftsperson using bark from IAS, Working for Water Programme, South Africa  
Source: Working for Water



## Box 5: Climate change mitigation and Africa

Climate change in Africa was one of the key priority topics at the 12th Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC), held in Nairobi in November 2006. A conference background paper reported that Africa is acutely vulnerable to climate change. It is already stressed by climate factors such as rainfall variability, water shortage, and low crop yields as well as climate-related diseases such as Rift Valley fever, cholera, and malaria. During the 21st century 30 per cent of Africa's coastal infrastructure could be inundated by sea-level rise. Cereal crop yields could decline by up to five per cent by the 2080s. Meanwhile the range, frequency, and severity of disease outbreaks may increase.

So far Africa has received the least help with mitigation efforts that benefit developing countries. The Clean Development Mechanism (CDM) permits industrialized countries to offset their CO<sub>2</sub> emissions by funding emission-reducing projects in developing countries. But sub-Saharan Africa had just five of the 410 registered Clean Development Mechanism (CDM) projects—four in South Africa and one in Nigeria, as of November 2006. This compares with 192 for Latin America and the Caribbean and 203 for Asia. The situation with projects in the planning stage is no better.

Africa has a huge potential for carbon sequestration through afforestation and reforestation projects that would also deliver strong local community, environmental, and economic benefits. However, these approaches are not yet accepted under the CDM.

Several initiatives announced at the UNFCCC Conference will begin to remedy this situation. UN Secretary-General Kofi Annan announced the Nairobi Framework—a joint initiative of five UN agencies to help poorer countries benefit more from the CDM. UNEP and UNDP announced a partnership to help poorer countries, especially those in sub-Saharan Africa, to secure a greater share of the international carbon finance market. This partnership will provide rapid expert support to governments assessing potential climate change impacts on infrastructure projects such as roads, dams, and power systems.

Meanwhile the World Bank announced that its Community Development Carbon Fund will buy 900 000 tons of carbon credits from the Kenya Electricity Generating Company (Kengen). Clean geothermal energy from the planned expansion of Kengen's Olkaria II power plant will displace electricity produced by fossil-fuel powered plants, equivalent to 150 000 tons of carbon dioxide per year. This is the first CDM geothermal project on the continent.

Sources: UNFCCC 2006a and 2006b, World Bank 2006, UNEP 2006b, Ayeiko 2006.

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# Asia and the Pacific

Warming temperatures, extreme weather events, and threats to sustainable water supplies and biodiversity pose growing environmental challenges in the region while Governments are beginning to address some key environmental problems.

## REGIONAL WARMING TRENDS

In 2006, researchers reported a progressive and accelerated long-term Asian warming trend over the period 1860-2004 (Huang 2006). This trend has been accompanied by an increase in frequency of extreme weather events. Analysis of rainfall gauge data in India shows that over the last fifty years the frequency of severe rainstorms increased while the frequency of moderate events decreased. The number of storms delivering more than 100 millimeters in a day has increased by 10 per cent per decade while those delivering over 150 millimeters per day doubled. This trend suggests increasing risks of extreme rainfall. The resulting landslides, flash floods, and crop damage could have major impacts on the economy, society, and environment (Goswami and others 2006).

Throughout 2006, storms lashed countries across Asia, flooding landscapes in Timor-Leste, China, India, Pakistan, Thailand, Bangladesh, Sri Lanka, Korea, Kashmir, and Afghanistan. The flooding brought mudslides and, in Sri Lanka, re-exposed landmines. In December, the Philippines faced the fourth typhoon in

as many months with flooding and deadly mudslides that buried hundreds of victims (ReliefWeb 2006).

In Australia, a drought trend persisting since 2002 reached severe levels in 2006. According to the Australian Bureau of Meteorology, the situation worsened since August, with a near total failure of the rains needed for planting season (BOM 2006).

Underlying continent-wide trends, local and regional climate patterns are also shifting (Box 1). Despite episodes of flash flooding, parts of Central Asia will soon mark a decade of drought (Figure 1). Theories explaining the persistent lack of precipitation over the Iranian Plateau vary from a teleconnection (long-distance relationship) with warmer temperatures in the western Pacific and the eastern Indian Oceans to an anomalously persistent South Asia High over the region (Hoerling and Kumar 2003, Qian and others 2002). In China, 2006 was a disastrous year of weather, characterized by less rain, drought, and high temperatures. The anomalous weather was attributed to global warming by the Beijing Climate Center of the China Meteorological Administration (CMA 2006, Xinhua 2006). (Box 2 and Box 3).



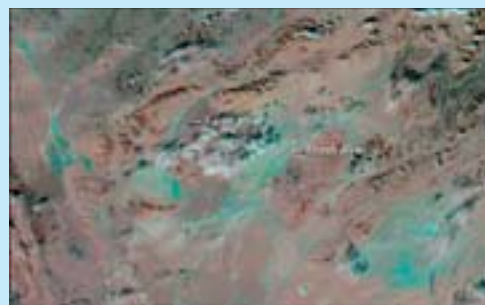
Source: Still Pictures

In India the frequency of severe events has increased over the last fifty years.

Figure 1: November 2006 floods in the normally arid desert of western Afghanistan



30 October 2006



17 November 2006

At least 56 people were killed and thousands of hectares of farmland were washed away during this flooding in arid western Afghanistan. The dried-up beds of the Farah and Khash Rivers and their tributaries on 30 October 2006 turned into flood plains (in turquoise) less than three weeks later on 17 November 2006.

Source: NASA Earth Observatory and Reliefweb 2006



Source: Reuters/The Bigger Picture

On 25 August 2006 a boatman repairs his craft on the dry bed of the Jialing River that joins the Changjiang (Yangtze) River in Chongqing municipality.

## Box 1: Anomalous patterns in Indus Valley Basin Glaciers

The Himalaya Mountains contain high altitude glaciers that supply water to many of Asia's major rivers. The Syr Darya and Amu Darya supply water to much of Central Asia, while the Huanghe, Changjiang (Yangtze), Red, Mekong, Salween, Brahmaputra, Ganges, and Indus Rivers provide water to more than half of the world's population.

Throughout much of Asia, people depend heavily on glacial melt-water for their main dry season water supply. Currently, this water is supplied gradually to downstream users—including hydroelectricity generating plants—as ice and snow pack melt over the warm months. But in a warmer world problems of water scarcity will be exacerbated. Rising temperatures will add glacier melt to snowmelt, increasing flooding during planting season. They will also lead to less winter precipitation being stored as snow. Dry season flows of water will be reduced and crop production will be affected.

According to monitoring data, temperatures in the mountain and high plateaus are rising and most glaciers are rapidly retreating. In Nepal and Bhutan, melting glaciers are filling glacial lakes beyond their capacities, resulting in outburst floods. Tibet's glaciers have accelerated their rate of melting since the 1990s. According to China's foremost glaciologist, Yao Tangdong, most glaciers in the Himalaya region of Tibet could melt by 2100, causing ecological catastrophe.

However, in the western extremes of the Himalaya, along the Karakoram and Hindu Kush ranges, scientists have recently detected some contrasting trends. According to an analysis of data collected for the Upper Indus Basin from 1900 to 2000, winters since 1960 have been warmer and summer temperatures cooler in the basin. At the same time winter and summer precipitation has increased. The lower summer temperatures produce a downward trend in runoff because the winter accumulation is not melting away quickly. Glaciers are gaining volume and mass. The researchers have found similar tendencies in parts of northwest India and in some of Nepal's lower altitudes, as well as in northern parts of Pakistan and the Wakhan Corridor of Afghanistan.

Scientists suggest this cooling may be related to shifts in large scale atmospheric circulation patterns in Asia and feedback related to the Indian monsoon. The implications for water resources in the Indus valley are complex but researchers anticipate that understanding climate variability at these smaller scales will lead to better forecasting of water supply over the short and long terms.

Sources: Barnett and others 2005, USGS 2005, Cyranoski 2005, UNESCO 2006, Fowler and Archer 2005, Fowler and Archer 2006



*Evidence of glacio-lacustrine deposits and recent tree growth at the foot of an old slope collapse, Karakoram Range, Pakistan*

Source: Karl Schuler/ Mountain Forum

## BIODIVERSITY CONSERVATION INITIATIVES

Many Asian governments recognize the value of biodiversity conservation and actively support surveys to document diversity and programs to protect biodiversity-rich areas. The Asia Pacific region has made progress in protecting natural areas (Box 4). The ratio of protected area to surface area in the region increased from 7.4 per cent in 1990 to 10.6 per cent in 2006 (GEO Data Portal 2006 based on UNEP-WCMC). In 2006, the World Heritage Convention inscribed Khao Yai National Park in Thailand and Shiretoko in Japan as World Heritage sites (IUCN 2006a). Two natural forest areas in central Laos were also certified under the Forest Stewardship Council (FSC) Certification scheme in 2006 (WWF 2006).

In May, Australia announced 58.5 million hectares of new protected zones—a total area as big as the State of Victoria—included in 13 new marine protected areas. Currently, about one-third of the world's marine protected areas are in Australian waters (DEH 2006). Despite these new additions, there is considerable scope for improvement in regional efforts to protect the marine environment—marine protected areas have advanced only modestly from 1.6 per cent of the territorial area in 1990 to 2.2 per cent in 2006 (GEO Data Portal 2006 based on UNEP-WCMC).

The wealth of the region's biodiversity was further documented in 2006. In February, Conservation International (CI) announced the discovery of dozens of new species during a biodiversity survey of Western New Guinea's Foja Mountains. The expedition—co-sponsored with the Indonesian Institute of Science and including scientists from Indonesia, the United States, and Australia—documented a rhododendron with a six-inch wide flower, four new species of butterflies, and 20 new kinds of frogs. The scientists spotted the first

## Box 2: Water Issues in China

In 2006 more than 17 million people and 16 million livestock suffered drinking water shortages in southwest China, caused by drought. Estimates indicate that at least 1.3 million hectares of agricultural land in the Sichuan Basin, which includes Chongqing municipality, suffered drought effects and another 280 000 hectares of crops were destroyed. Crop losses cost the region more than US\$1 billion, with some estimates putting losses as high as US\$2.43 billion. Levels of the Changjiang (Yangtze) River near Chongqing were at a 100-year low during the drought, and reservoirs that supply Chongqing's water were only one-third full, leaving 7.9 million of the city's 31 million inhabitants without adequate drinking water.

In China, urban water supplies have deteriorated in step with booming economies. In a survey of 600 Chinese cities, two thirds had inadequate water supplies and 1 in 6 had severe water shortages. Industrial and domestic wastes are insufficiently treated before entering the surface water so the quality of surface water has become a serious problem. A survey of seven major rivers in the country found that nearly one third of the river section samples registered the worst grade possible of national water quality standards, indicating that the water supply in these sections is of very poor quality and has no practical use, not even for irrigation.

Chinese policy makers recognize the gravity and complexity of their environmental problems and have formulated policies to protect the environment while fostering economic growth. Strengthening water conservation is one of the top priorities set out by the Chinese Premier for environmental protection: others include controlling water, atmospheric, and soil pollution; enhancing protection of ecosystems; adjusting the economic structure to be more environmentally sound; and boosting the environmental technology and protection industry.

Sources: Xinhua 2006, Li 2003, SEPA 2005, Shao and others 2006, Wen 2006





The "Giant White" Rhododendron, a species yet to be described, is the largest rhododendron species in the world.

Source: Wayne Takeuchi/ Conservation International

live male Berlepsch's Six-Wired Bird of Paradise (*Parotia berlepschi*) ever seen and an orange-faced honeyeater, the first new bird discovered on the island of New Guinea since 1939 (CI 2006a).

The Indonesian government has already designated the region a wildlife sanctuary and CI is working with government officials and the people within the greater

Mamberamo Basin, which includes the Foja Mountains, to preserve the area's incredibly diverse wildlife (NPR 2006).

Two more surveys led by Conservation International in 2006 documented the marine biodiversity of the Bird's Head Seascape, off the northwestern end of Indonesia's Papua province. This part of the 'Coral Triangle' includes more than 1 200 species of fish and



A new species of honeyeater was discovered in the Foja Mountains of Papua province, Indonesia, on the island of New Guinea.

Source: Bruce Beehler/Conservation International

almost 600 species of reef-building coral—75 per cent of the world's known total. Only 11 per cent of the seascape is currently protected, most of it in the Teluk Cenderawasih National Park (CI 2006b).

The three surveys are part of CI's Rapid Assessment Program, an initiative to document forest and marine sites around the world to inform and promote knowledge-driven conservation. The collected data supports priority-setting, definition of conservation outcomes, and decision-making by local stakeholders and leaders (CI 2006c).

### Box 3: Supplying water to the thirsty



Source: Li Qiangzi / Chinese Academy of Sciences

initiatives. Health concerns loom over the possible spread of schistosomiasis when the channels all connect. The snails that carry schistosome flukes are endemic to the Changjiang (Yangtze) River in Jiangsu Province—the southeastern source of the scheme's first phase. Public health officials are advising on preventive measures to control the spread of the snails when the water flows.

The official release of the western leg project proposal was scheduled for the end of 2006. Regional scholars and engineers recommend further inquiries addressing concerns about geology, ecology, and the environment; the Qinghai-Tibet Plateau and its shrinking glaciers; the volume of water to be transferred; influence of the transfer on electricity supplies; relocation and protection of people and cultural relics; compensation to residents; and fundraising.

Sources: Chinapage 2006, Stone and Jia 2006, Liu 2006, China Daily 2006, China Newsweek 2006

Over 80 per cent of water runoff in China takes place in the south, while the north—with 37 per cent of the country's total population and 45 per cent of cultivated land—has only 12 per cent of China's total water resources. The colossal South to North Water Diversion Scheme will shift water across great distances to supply drinking and irrigation water to China's northern regions where 96 million people now lack adequate water supplies, according to Chinese government estimates. The project involves creating three canal systems linking the country's four major rivers—the Changjiang (Yangtze), Yellow, Haihe, and Haihe—and is expected to take 50 years to complete.

In July of 2006, construction of a tunnel was completed linking canal sections on either side of the Caohe River. The canals and sub-river tunnels run between pumping stations, reservoirs, and dams. According to the long term plan, two more phases of the scheme—a central route running from the Three Gorges Dam reservoir and a western route delivering water from Tibet—will add to the eastern supply by 2050, altogether transferring a total of 44.8 billion cubic metres of water northward every year.

Critics of the scheme are concerned about ecosystem destruction and contamination from pollution. To counter pollution in the first phase alone, around 130 sewage treatment plants will be established as well as a series of supporting activities that include 149 industrial pollution control projects, 21 polluted water diversion schemes, and 16 comprehensive pollution control

#### Box 4: Fijians honoured with conservation award

Fijian Prime Minister Laisenia Qarase and Paramount Chief Aisea Katonivere of Fiji's Macuata province on the island of Vanua Levu received the second annual Global Ocean Conservation Award on World Ocean Day, 8 June 2006.

They were honoured for their work ensuring that at least 30 per cent of Fiji's inshore and offshore marine areas will be effectively managed and financed within a comprehensive and ecologically representative network of marine protected areas by the year 2020.

Last year Palau, the Federated States of Micronesia, the Marshall Islands, Guam, and the Northern Mariana Islands matched Fiji's pledge to protect 30 per cent of near-shore marine resources and 20 per cent of terrestrial resources on their islands by 2020. Inspired by this 'Micronesia Challenge', the Caribbean island of Grenada pledged in March of 2006 to put 25 per cent of its near-shore marine resources under effective conservation by 2020.

Source: IUCN 2006b

### Regional Biodiversity Conservation

One of the most ambitious multilateral biodiversity conservation projects in the world is taking shape in the Greater Mekong Sub-region (GMS), comprised of Cambodia, Laos, Myanmar, Thailand, Viet Nam, and China's Yunnan Province. Home to more than 300 million people, the sub-region's vast wealth of human and natural resources marks it as a new frontier for economic growth in Asia.

The GMS Biodiversity Conservation Corridors Initiative promotes biodiversity conservation as an important component of economic development and endorses sustainable use of natural resources. By 2015, GMS countries plan to establish nine priority biodiversity conservation landscapes and corridors. Core aims of the initiative include maintaining the quality of ecosystems through enhanced connectivity while restoring and protecting ecological integrity. At the same time, the initiative intends to ensure sustainable use of shared natural resources, reduction of poverty, and improvements in the livelihoods of people (ADB 2005, ADB 2006).

### CONCLUSIONS

Reconciling economic development and conserving nature is a challenging but essential goal of sustainable development. Rapid economic development is a key factor responsible for environmental challenges faced by the region. But that same economic development can provide resources and motivation to drive environmental policy formulation and implementation, especially on the use of scarce resources and conservation.



The Mekong Basin provides ecosystem services, transportation routes, resources—and a location for floating markets like this one in Can Tho, Viet Nam.

Source: Jean-Léo Dugast / Still Pictures

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# Europe

Growing concern over climate change and energy security dominated the political agenda in Europe in 2006. Urban air quality has much improved in the region, but air pollution continues to have serious adverse health effects.

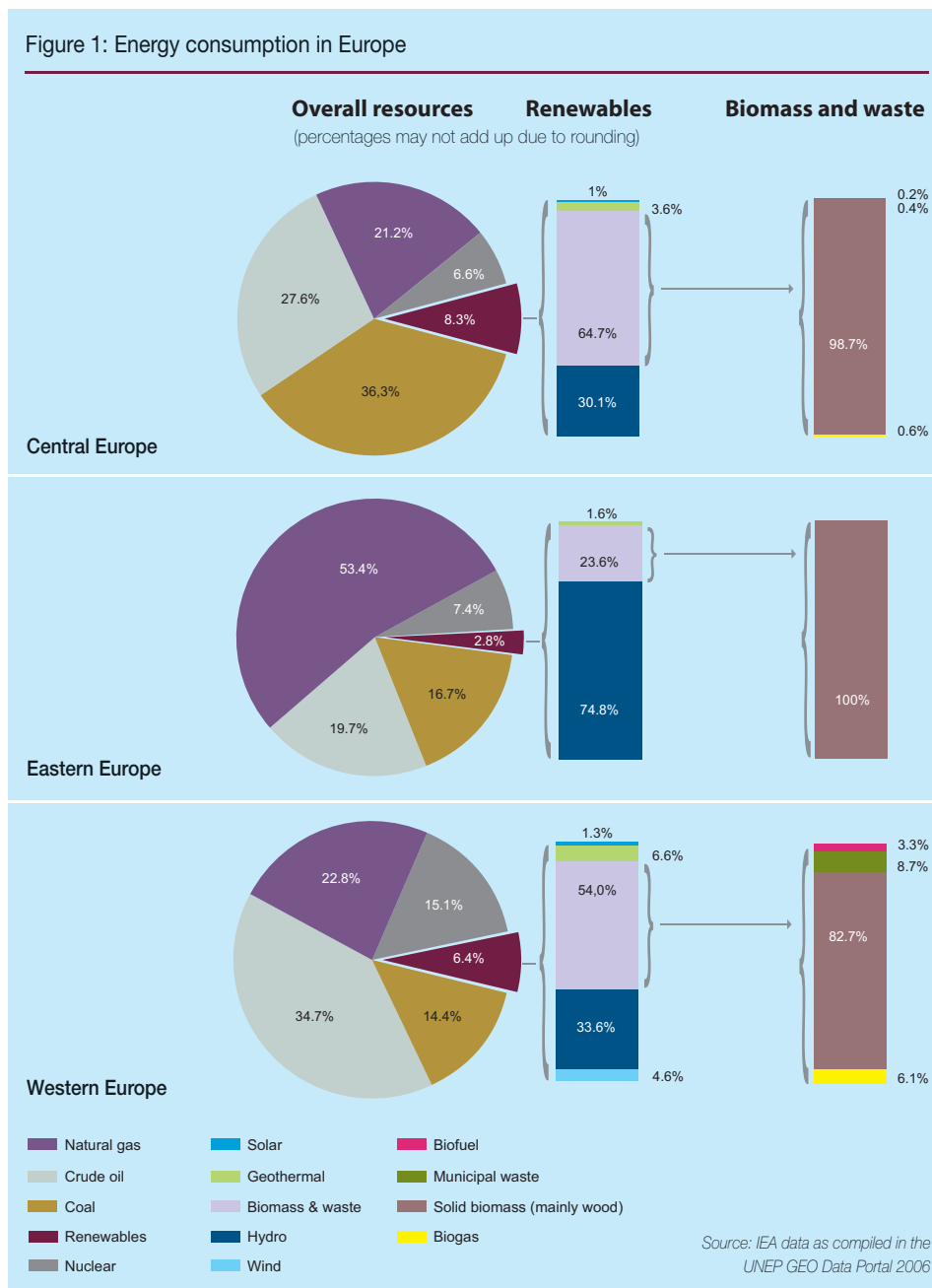
## ENERGY SECURITY

Despite clear energy efficiency improvements, the whole of Europe continues to release increasing amounts of greenhouse gases (GHGs) and air pollutants, putting serious pressure on Europe's environment, economies, and human health (EEA 2006a, EEA 2006b, Kowalski 2006). Nearly 80 per cent of the energy consumed in the European Union comes from fossil fuels, as does over 85 per cent in Central Europe and 90 per cent in Eastern Europe (Figure 1). These fuels are expected to dominate Europe's energy sources in coming decades (EC 2006a, IEA 2006a, Kowalski 2006). Fossil fuel dependence is a growing concern in Europe—perceived as responsible for problems with energy security; climate change effects such as extreme weather events and sea level rise; and other problems such as generation, oil spills, and health problems from air pollution (EEA 2006a, EEA 2006b, Kowalski 2006, WHO 2006a).

The energy security context varies considerably within Europe. The European Union (EU-25) imports 50 per cent of its energy requirements, while Russia is the world's second largest exporter of oil and the world's largest exporter of natural gas (EEA 2006b, IEA 2006b). The potential for energy resource scarcities over the long term causes some concern among analysts—more so for oil and natural gas, less so for coal and uranium. Other major concerns are soaring energy prices, power disruptions due to extreme weather events, effects of climate change and air pollution on environment and human health, and potential threats to supply—a concern heightened by Russia's early 2006 interruption of gas supplies to the Ukraine pipeline network, which also supplies several Western European countries (Box 1).

Although changes in Europe's fuel mix have slightly reduced emissions of GHGs per unit of energy produced, total GHG emissions are rising again. This is mainly caused by increasing use of coal for electricity production—a reaction to rising gas prices (EEA 2006b, EEA 2006c, Kowalski 2006). In addition, energy efficiency gains are largely offset by the continuous growth in total energy consumption, particularly in the EU-25, but also in Southeastern and Eastern Europe where consumption is rising (GEO Data Portal 2006). Energy production and consumption are major sources of GHG emissions and air pollution, but they are key to economic growth. Therefore, many European governments are in the process of revising their energy policies to better balance energy security, economic efficiency and competitiveness, and environmental acceptability by seeking to diversify the energy mix and energy supply routes among other options (Box 2).

Figure 1: Energy consumption in Europe





## Box 1: European energy security issues, objectives, and policy priorities

This box summarizes some of the major issues involved in the energy security debate and lists various objectives and policy priorities proposed by authors and institutions.

### Issues

- Continually increasing energy consumption
- Environmental degradation
- Unreliable energy supply and fluctuating prices
- Disruptions and uncertainties due to terrorism, social unrest, price disputes, and natural disasters.

### Objectives

- More efficiency in energy production and consumption
- More environmentally sound technologies
- More diversity in energy mix and supply
- Reduced vulnerability through safer energy infrastructure (pipelines, refineries, electricity networks) and better emergency preparedness
- Sufficient levels of environmental and human health protection
- Long term reliability and availability of energy at reasonable prices
- Reliable access for producers to resources, markets, and consumers to justify future investment.

### Policy priorities

- Stimulate technological innovation in energy efficiency and low carbon energy
- Promote a radical change in public attitudes towards drastic energy savings
- Tighten free credits, include more sectors in the EU Emission Trading Scheme, and expand UNFCCC projects under the Clean Development Mechanism
- Foster partnerships among energy-producing and energy-consuming countries so that supply sources and routes can be diversified and procedures agreed for sharing strategic emergency reserves
- Enable stable investment regimes through liberalized markets.

Sources: Yergin 2006, EC 2006a, EC 2006b, Howell of Guildford 2006, IEA 2006c, MNP 2006, NEA 2005, Kowalski 2006

Europe's coal reserves are abundant, readily accessible, and prices are stable, so coal remains an important fuel for electricity generation and heavy industries, despite the high levels of GHG emissions and air pollutants resulting from its use (EC 2006a, EC 2006b, Kowalski 2006). Capturing and sequestering carbon instead of emitting it to the atmosphere is seen by many as a promising technology to reduce GHG emissions and air pollution.

Opinions about the use of nuclear energy are shifting. Electricity is generated from 204 nuclear units in 19 European countries spread across the region, and uranium resources are considered adequate and widespread. Since the energy generated is carbon free and stockpiles can be maintained at reasonable costs, some countries such as the United Kingdom are reconsidering nuclear energy as a potential measure to reduce GHG emissions (NEA 2005 and 2006). Other countries such as Germany and Sweden are still phasing out nuclear energy, while others are building new units—ten are under construction in Bulgaria, Finland, Romania, Russia, and Ukraine (IAEA 2006). However, there are still serious public concerns and political debate about nuclear energy, especially over the disposal of nuclear wastes and the potential for accidents. These concerns, along with the problems of ageing of most European nuclear units, high investment costs, and long construction times, have prompted recent energy outlooks to project a slight nuclear reduction in Europe (EC 2006a, IEA 2006a).

Another promising option for diversifying Europe's energy mix is commercialization of renewable energy. Total renewable energy supply remains low in Europe, but there is considerable variation among countries. Some countries have achieved real increases and much

higher percentages of energy from renewable sources. The share of renewable energy in the EU-25's electricity generation averages at 12.8 per cent, but nine countries including Belgium, Hungary, Poland, and the UK get less than 3 per cent from renewables while Austria, Latvia, Portugal, and Sweden get 35 per cent or more of their energy from renewable sources (Eurostat in EEA 2006b). Wind energy is virtually absent in Central and Eastern Europe, while Western Europe has 69 per cent of the world's total installed capacity of wind energy (REN21 2006). Overall, wind turbines supply only 2.5 per cent of Europe's current electricity demand (IEA 2006d).

Recently, promising renewable energy policies have been established, such as the EU-25 Biomass Action Plan and subsidies in favour of renewables in Denmark, Germany, and Sweden. Some new technologies are also showing promise. Today's wind turbines produce 180 times more electricity than 20 years ago at less than half the cost per unit. The International Energy Agency (IEA) projects that the share of renewable energy sources (excluding hydropower) in the EU will grow from 5 per cent in 2004 to 19 per cent in 2030, or 24 per cent in that same year if policies currently being considered to promote renewable energy are actually and fully implemented (EC 2005, Greenpeace 2006, IEA 2006a).

Progress towards a more energy-sustainable Europe will depend on improved energy efficiency achieved through a wide variety of innovative policies and technologies. Action should focus on replacing or decommissioning ageing coal and nuclear installations and introducing radical innovations in fuel switches, energy efficiency, carbon storage, and low carbon and carbon free technologies. All options need to be considered and large investments will be required to further research, develop, and exploit viable new

## Box 2: The Baku-Tbilisi-Ceyhan oil pipeline inaugurated

In May 2006 the Baku-Tbilisi-Ceyhan (BTC) oil pipeline became operational. This 1 770 kilometre pipeline, with a capacity of 1 million barrels per day, runs from Baku, Azerbaijan through Georgia to Ceyhan on the Mediterranean coast of Turkey. The pipeline was commissioned by a consortium of 11 energy companies led by BP (formerly British Petroleum), which has a 30.1 per cent stake and operates the pipeline.

The pipeline will provide Caspian countries, Azerbaijan and Kazakhstan in particular, with adequate infrastructure for their growing oil shipments to international markets. It will advance EU efforts to diversify sources and routes of energy supplies and it will also eliminate some 350 tanker cargoes per year through the sensitive Bosphorus and Dardanelles straits that are dangerously congested by oil traffic. However, environmental concerns range from the threats to watersheds of the Borjomi National Park in Georgia (an area of mineral water springs that are a major export commodity) to the dangers posed by frequent and strong seismic activity throughout the region. The pipeline management is convinced that the environment of the three nations will be maintained through adherence to three separate environment and social impact assessments, very careful construction procedures, and community and environmental investment programmes (BP 2006).

Sources: EU 2006, BP 2006.



In Europe, woody biomass is by far the largest renewable energy source.

Source: Oed / Still Pictures



The full potential of wind energy is yet to be realized.

Source: Mike Schroeder / Still Pictures

technologies (EEA 2006b, IEA 2006a, MNP 2006). The new EU Emissions Trading Scheme (ETS) is expected to stimulate investment in emission reduction technologies (Box 3). In addition, regulatory policy tools need to be considered, such as stricter ETS credits, licensing, information campaigns, energy-efficient labelling, and improved insulation standards for buildings.

### Box 3: EU's Emissions Trading Scheme

The Emissions Trading Scheme (ETS) of the EU, launched in 2005, is the world's first market for buying and selling the right to emit CO<sub>2</sub>. The scheme is the EU's key instrument to fight climate change and meet its Kyoto targets; it is seen as a more business-friendly way to reduce production of GHGs than taxes. Under the scheme, EU countries have set mandatory limits on how much CO<sub>2</sub> power plants and heavy industries may emit at country level. Companies receive a quota of free carbon credits allowing them to emit CO<sub>2</sub> up to that limit. If they emit less they can sell their credit surplus, but if they exceed it they have to buy credits from others.

In April this year the carbon credit reached its highest value (around US\$40). However, when the first national emission reports were delivered in mid-April, it became clear that the allocation of credits had been too generous in the first phase of the scheme (2005-2007). Most companies had more credits than they needed, leading to a dramatic drop in carbon prices which fell below US\$13 per metric ton in May.

To enhance the effectiveness and environmental benefits of the EU Emissions Trading Scheme, the European Commission urged Member States to present tougher credit limits in their National Allocation Plans (NAP) for the second trading period (2008-2012). The Commission is also examining the need for changes in the trading scheme. Legislation has been proposed to include the aviation sector and its implications are under study. The NAPs establish emission totals for different sectors and decide how the total is divided among installations covered by the scheme. Some countries have included more installations or more GHGs, others have not. Many countries have been late in submitting their NAPs.

In August ETS prices recovered to a level nearing US\$26. In November the European Commission approved a first set of ten National Allocation Plans for the 2008-2012 trading period, provided that for nine out of the ten plans the emission allowances are reduced (only the emissions proposed by the United Kingdom were accepted). By 10 December 2006 the CO<sub>2</sub> prices had dropped to about US\$10.

Source: EEA 2006c

### URBAN AIR POLLUTION

Air quality has improved significantly in Europe over the last decades, due mainly to drastic policy measures at national and EU levels and the impact of the pan-European UNECE Convention on Long-Range Transboundary Air Pollution (EEA 2006a, EEA 2006e, EMEP 2006, UNEP 2006). In Western Europe and a significant proportion of Central Europe the air quality limit for sulphur dioxide, established by the EU, is now rarely exceeded—attributable to relatively simple measures such as switching to fuel with lower sulphur content or installing equipment in coal power stations to remove sulphur dioxide from stack emissions. However, improvements in emission trends are beginning to plateau. By 2020, sulphur emissions from international shipping on seas surrounding Europe are expected to be larger than the total land-based emissions in the EU-25 (Acidrain.org 2006). And evidence mounts that air pollution, ground-level ozone, and particulate matter (PM) continue to have serious adverse health effects (Figure 2).

Recent World Health Organization (WHO) calculations show that current levels of PM reduce life expectancy by 8.2 months in the EU-15 and 10.3 months in the 10 new member states. In the EU-25 some 348 000 premature deaths per year are attributed to PM exposure. Effects are three times higher in hot spots polluted by traffic and heating emissions than in the least polluted areas (WHO 2006a). Effects of long term exposure to air pollution on life expectancy are thought to be mostly attributable to fractions of PM smaller than 2.5 micrometres (PM<sub>2.5</sub>) (WHO 2006a). A new modelling report of the Environmental Monitoring, Evaluation, and Protection Programme (EMEP) shows that many major European cities are hotspots with daily and annual mean PM<sub>2.5</sub> concentrations that far exceed the WHO guidelines for PM, which are more stringent than the EU limits (EMEP 2006). The WHO guidelines are also exceeded in large areas outside Europe's highly populated urban areas, due to long-range transport of small particles (Figure 3). Fine

Figure 2: Population in Western and Central Europe living in urban areas where concentrations of particulate matter under 10 micrometres exceed the daily EU limit

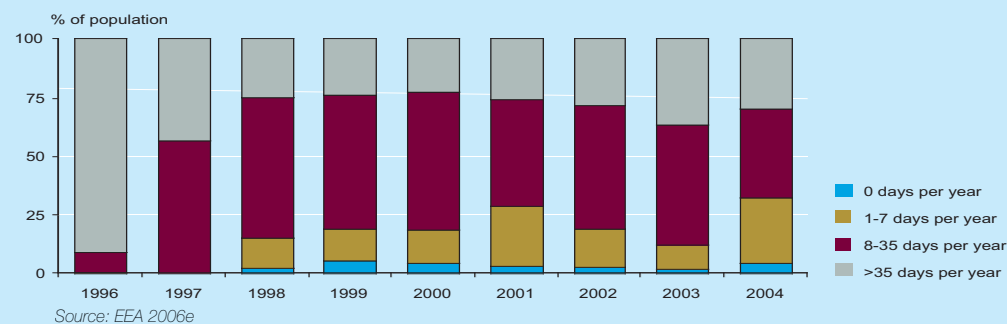
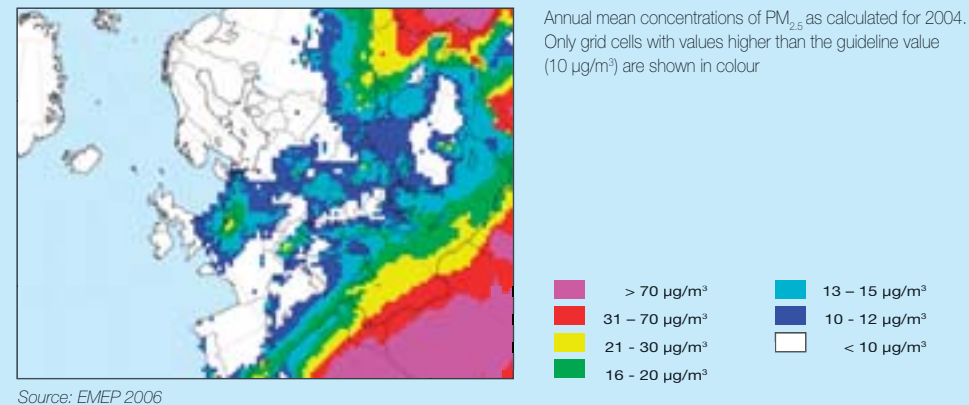


Figure 3: Areas exceeding WHO guidelines for particulate matter air pollution



#### Box 4: Desert dust from Africa travels far into Europe



The left-hand true-colour image from 19 August 2004 shows a large plume of Saharan dust (light brown) blowing northward over the Mediterranean Sea, partially obscuring the islands of Corsica, Sardinia, and Sicily. The right-hand image from 16 April 2003 shows how far north the dust can be transported. Here a long trail of dust from Africa (light brown) can be seen arcing to the northwest over southern France, stretching north over the Atlantic Ocean and across Ireland and Scotland, continuing eastward to Sweden and Norway, and then turning south to Denmark.

Source: SeaWiFS Project, NASA/Goddard Space Flight Centre, and ORBIMAGE



Street-level air pollution is still causing too many health problems

Source: argus/Still Pictures

#### CHALLENGES

Measures to improve air quality have had significant co-benefits in reducing GHGs, just as efforts to combat climate change can reduce local air pollution. The key environmental policy challenge for Europe is to develop and implement more integrated policy frameworks, in which climate change objectives largely coincide with air quality aims while achieving substantive cost savings (EEA 2006d, MNP 2006). Such integrated policies may receive more public support, as local air quality has so far been more relevant for voters than climate concerns.

More research and technology development is needed on energy supply efficiency, including more environmentally sound energy systems. Innovative technology and stronger corporate responsibility could be stimulated by introducing more stringent vehicle emission standards, raising energy prices so that they reflect the external costs of climate change and air pollution, and information campaigns to promote radical change in public attitudes towards energy consumption.

dust and other small particles can be transported over thousands of kilometres and affect people living far from the actual pollution source, as shown in satellite images (Box 4).

Until now, air quality and related health policies have focused mainly on end-of-pipe measures.

These will continue to be important, but more action is needed at local, national, and international levels to reduce air pollution at the source, for example through energy savings and low-carbon technologies in the energy and automobile industries (WHO 2006a, MNP 2006, EEA 2006d).

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# Latin America and the Caribbean

In 2006, disputes continued over nature conservation and economic development issues. While global demand for biofuels may lead to the transformation of large tracts of natural areas, innovative schemes have been initiated to reconcile economic growth with environmental concerns.

## NATURE CONSERVATION VS ECONOMIC DEVELOPMENT

Intense use and export of natural resources have dominated the economies of the Latin America and the Caribbean (LAC) region. Pressures on natural resources depend not only on national needs and consumption patterns, but also on demands from global markets.

In 1992, practically all LAC countries embraced the environmental agreements from the Rio Declaration and their subsequent protocols, aiming for the protection and sustainable management of natural capital (ECLAC 2001) (**Box 1**). However, over the last few years internal

Botnia's pulp mill under construction in Uruguay.

Source: Metsa Botnia



social and external economic pressures have forced some governments to shift their emphasis and efforts from nature conservation to large revenue-generating projects. Recent examples demonstrate how this shift can lead to conflicts between nature conservation and economic development, pitting local communities against corporate interests and sometimes one country against another.

## Pulp mills on the Uruguay River

The planned construction of two pulp mills on the banks of the Uruguay River, the natural border between Argentina and Uruguay, led to acute tension between the two countries. Two companies, the Finnish Metsa Botnia and the Empresa Nacional de Celulosa España (ENCE), were building the region's largest cellulose processing plants in Fray Bentos, Uruguay, promising to create much-needed jobs in a country still recovering from the 2002 economic crisis.

Civil opposition started in Gualaguaychú, an Argentinean town across the river. Argentineans claim that these plants will cause significant environmental and health impacts, despite the approval of Metsa Botnia's Environmental Impact Assessment (EIA) by Uruguayan environmental authorities and other reports, all concluding that the plants will be using the best available technology and that there will be no significant environmental impacts.

The conflict escalated when local Argentinians erected blockades leading to bridges linking the countries. Argentina complained to the International Court of Justice (ICJ) accusing Uruguay of violating the bilateral Treaty on the Uruguay River. The Court denied Argentina's request for the construction of the cellulose plants to be halted. In turn, Uruguay presented a claim against Argentina at the Mercado Común del Sur (MERCOSUR) tribunal and at the ICJ for the bridge blockade.

In September 2006, ENCE cancelled its project in Fray Bentos. The Metsa Botnia project continued, as did the Argentinian protests (Williams and Forstein 2006).

## Pascua-Lama: conflict over gold-mining

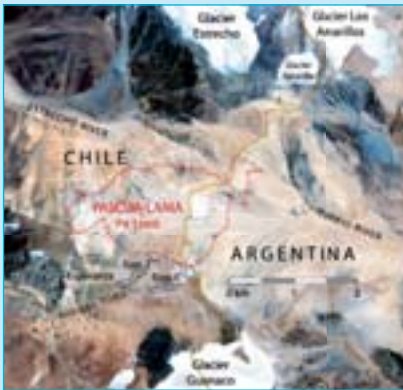
The Pascua-Lama mining project involves open-pit mining in the high Andes Mountains (**Figure 1**). Located on the Chilean-Argentinean border, approximately 150 kilometres southeast of Vallenar, Chile, Pascua-Lama has stimulated controversy and public protest in Chile and internationally (Universidad de Chile 2005). The mineral fields contain vast deposits of gold and silver, with 75 per cent of the fields in Chile and 25 per cent in Argentina. The mining and processing of ore proposed by the Barrick Gold Corporation will straddle the two countries. With a planned investment of US\$1.5 billion over an initial 20-year period, the project would create some 5 500 jobs during construction and 1 660 jobs during full production (Barrick 2006).

The fields lie close to two glaciers that feed the rivers of Chile's Huasco Province. Critics of the project claim that it will involve the removal of these glaciers, disrupting the water supply of the 70 000 farmers in the Huasco valley (Gonzalez 2006, MineWeb 2005). They say that mining operations will release cyanide and other contaminants into the valley's rivers and that the project represents only temporary economic benefits for the zone. In November 2005, a petition was presented to the Chilean government by a coalition of environmentalist groups.

The Barrick Gold Corporation maintained that the project was environmentally sound in terms of water treatment and that only five hectares of 'ice reserves' would be directly removed by its operations. In addition to stimulating the local economy, the project would also support development projects (Torres 2006).

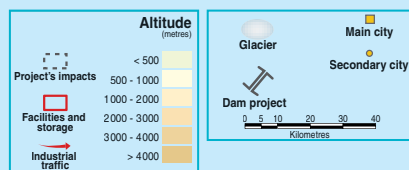
In Chile, an environmental impact assessment of the project was approved by the regional environment authority, Comisión Regional del Medio Ambiente (COREMA), in 2001. Since then, the project inspired extensive public debate, was suspended a few times, and was subject to several modifications before it was finally approved in 2006 by the Chilean national environment commission, CONAMA (Minería Chilena 2006).

Figure 1. Pascua-Lama mining project



The Pascua-Lama mining project will use open pit techniques at altitudes over 3 000 metres with facilities built at the base of vital glaciers that supply water to lowland farms as well as to Vallenar, a city of more than 40 000 inhabitants in the Atacama desert.

Source: GRID/Geneva



### Box 1: Deforestation on the retreat

After decades of rampant deforestation, reports suggest that the overall forest decline in Latin America and the Caribbean may be slowing. In 2000-2005 net forests area loss in the LAC region was running at an average of 4.74 million hectares per year—37 per cent of the global total for countries with a net loss of forest area. The vast majority of these losses occurred in South America, where Brazil alone accounted for over 70 per cent of the regional total.

However, recent studies suggest that forests are recovering in Puerto Rico and the Dominican Republic. In El Salvador, a survey of all types of forest and woodlands revealed that land with more than 25 per cent tree cover expanded from 72 per cent of the country's total area in 1992 to 93 per cent in 2001.

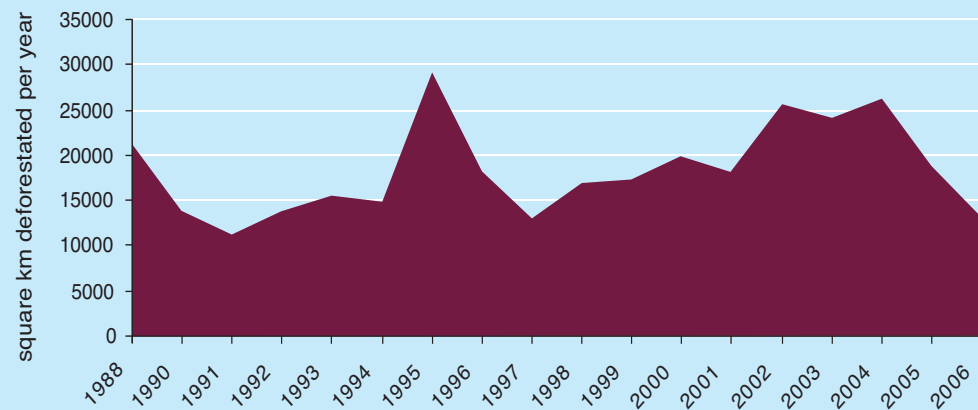
In 2004 the Brazilian government put in place the Amazonia Protection Programme, which includes measures for detailed monitoring and improved law-enforcement against illegal loggers and land developers. Thanks to the programme, deforestation in Amazonia has decreased substantially—from 2.6 million hectares in 2004 to 1.9 million hectares in 2005. Preliminary results for 2006 indicate a further reduction to 1.3 million hectares.

Until 2004, Paraguay had one of the highest deforestation rates in the world. In November of that year, the Paraguayan Congress passed the Zero Deforestation Law, prohibiting the conversion of forested areas in the Upper Parana Atlantic Forest. Implementation of the law has reduced the deforestation rate in Paraguay's Eastern Region by 85 per cent. The Zero Deforestation Law has resulted in lawsuits and convictions against landowners for punishable acts of deforestation.

In December of 2006 the governor of Brazil's Pará state signed decrees for the creation of seven new conservation areas in the Amazon, including the largest strictly protected area ever created in a tropical forest, the 4.25 million hectare Estação Ecológica Grão-Pará. The seven new protected areas total about 15 million hectares. Two are under strict protection allowing only conservation and research—these two alone may house 54 per cent of all animal and plant species found in Amazonia. The other five are designated for sustainable use, where activities such as timber and non-timber forest product extraction, ecotourism, and controlled mining will be permitted to supply the needs of local communities.

Sources: Aide and Grau 2004, Conservation International 2006a and 2006b, Derivi 2006, FAO 2006a, Forests.org 2002, GEO Data Portal 2006, Government do Pará 2006, Hecht and others 2006, INPE 2006, Laurence and others 2001, WWF 2006

### Deforestation rates in the Brazilian Amazon 1988-2006 km<sup>2</sup>



Source: INPE 2006

In its resolution, CONAMA set strict measures to eliminate, mitigate, or prevent the negative environmental impacts that the project might cause. It stresses that the glaciers must not be removed in any way and that any pollutants dumped into water courses must not exceed national emission and quality

standards. The company has also negotiated with the Huasco Valley's farmers and reached agreements on compensation related to the Valley's water supply. The Barrick Gold Corporation resumed operations in September 2006, with mining scheduled to begin in 2009.

## BIOFUELS AND THE ENVIRONMENT

In 2006 a sharp increase in oil prices once more brought attention to energy security. Several Latin American and Caribbean countries—Argentina, Bolivia, Colombia, Ecuador, Mexico, Trinidad and Tobago, and Venezuela—are net oil exporters and they benefit from high prices. However, projections show that demand for oil will continue to increase, regardless of price. This will induce further pressure for oil exploration and development, with all their environmental consequences. It will also increase the attraction of alternative energy sources (IEA 2006).

In the face of high oil prices, many developing countries have discovered a new product for their crop-

South America's Cerrado is an expansive and diverse landscape of forest, wetlands, savanna, and hills. It is a biodiversity hotspot that is shrinking in the push for sugarcane and soybean production to produce biofuels.

Source: Jacques Jangoux / Still Pictures



based economies: biofuels. In Brazil alone, projections estimate that in the next eight years the national and international combined demand for sugar cane and ethanol will grow from 354 to 553 million metric tons (Ministério da Agricultura 2006a). By 2030 the Brazilian government expects to produce about 120 million metric tons (petroleum equivalent), double the current total (Ministério da Agricultura 2006b).

Ironically, the pursuit of markets in 'environmentally sound' biofuels may lead to the destruction of large tracts of natural habitat. The area planted to sugar cane and soy (for ethanol and biodiesel, respectively) will need to increase. Governments in the region are already concerned about sugar cane plantations' severe effect on the environment (PNUMA/MARENA/OEA 2005, Guzman 2004).

In terms of biodiesel production, estimates indicate that Brazil would need 58 million hectares dedicated to soybean production to fully replace the diesel used currently. Ten million hectares of the Cerrado, one of the world's biodiversity hotspots, have already been planted to soy in the past 15 years, more than tripling the plantation area since 1990 (Kink and Machado 2005). Potentially the Cerrado has 90 million hectares available for biodiesel crops (Crestana 2005). The expansion of this agricultural frontier has already transformed 50 per cent of the Cerrado ecosystem into pasture and cash crops and taken more than 1.25 million hectares of forest between 2003 and 2004 in the state of Mato Grosso alone (Kink and Machado 2005, Schlesinger 2006). In Amazonia, the advance of soybean plantations poses an enormous threat (Fearnside 2005, Soares-Filho 2006) (See Feature Focus section).

Regional and global institutions are already weighing the potential negative impacts of biofuel development (Rios Roca 2006, FAO 2006b). Aspects under consideration include competition for land between fuel crops and food crops, excessive use of agrochemicals, concentration of production in a few large agribusiness enterprises, and lack of benefits for rural workers. These problems stimulated the Brazilian government to launch the "Social Fuel Label", a certification granted by the Ministry of Agrarian Development to biofuel producers who maintain standards that promote social inclusion and regional development.



Filling stations for cars fueled by alcohol are a common sight in Sao Paulo.

Source: Ron Gilling / Still Pictures

## CONCLUSION

Protection of natural capital continues to improve in the region of Latin America and the Caribbean (**Box 2**). However, the challenges of balancing economic development with nature conservation will continue. In the long term view they do not have to be opposite forces but may be complementary, considering that natural capital sets the limits to economic growth and human development.

The environmental dimension needs to be mainstreamed into economic and social decision making. The pursuit of sustainable development involves evaluating the true economic cost of environmental degradation in terms of ecosystem service loss and building this into taxation and pricing policies and into national accounting systems.



## Box 2 : Transforming Dominica into an organic island

The Commonwealth of Dominica is a small Caribbean island-state. Historically, Dominica relied on agriculture as the mainstay of the economy, particularly banana crop production for export. The spread of monocropping reduced crop diversity, increased vulnerability to natural disasters and fluctuations in international markets, and created dependence on food imports.

In an attempt to address effects of the declining banana industry and to diversify economically, Dominica explored the potential for a viable ecotourism industry. In 2004, the island became the first Caribbean country to obtain GreenGlobe21 certification as an ecotourism destination.

Since then, Dominicans recognized that low-impact, environmentally sound tourism could fit neatly with organic agriculture and that these two complement the concept of wellness or health maintenance. This trio could provide an ideal mix for sustainable use of Dominica's natural resources—and for a particular type of up-market holiday.

Dominica plans to embark on a 10-year programme of action to establish the country as an 'Organic Island' and wellness tourism destination, combining ecotourism, agrotourism, and health tourism opportunities into a high-end image of an unspoiled country. The concept is based on implementing organic production and marketing systems that are sustainable and that do not require excessive consumption of natural resources.

Among the main objectives of this strategic development are to:

- Establish a sound and sustainable basis for economic and social development;
- Reverse declining agricultural sector employment and increase other employment opportunities;
- Reverse the trend in decreasing agricultural revenue by establishing Dominica as a world leader in the production of organic agricultural products;
- Address pressing environmental and natural resource management issues through sustainable agricultural practices;
- Establish an agricultural export market based on products that are free from genetically modified organisms;
- Improve rural development through the establishment of improved land management practices supporting organic production.

Source: Government of Dominica 2006



Dominica wants to reposition itself as an island for ecotourism, health maintenance, and organic agriculture. Source: Schafer & Hill/Still Pictures

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# North America

2006 was a mixed year for the environment in North America. The United States set aside the world's largest Marine Protected Area. Rising public concern about climate change motivated states and provinces to move ahead on mitigation initiatives, despite their federal governments' reluctance to cap greenhouse gas emissions.

## FEDERAL GOVERNMENTS BYPASS KYOTO PROTOCOL

In per capita terms, North America emits far more carbon dioxide than any other region in the world, and in absolute terms is second only to much more populous Asia. Yet, at the end of 2006 neither the US nor the Canadian governments are engaged in the Kyoto process.

Canada ratified the Kyoto Protocol in 2002 and committed to achieve a 6 per cent cut in emissions over the 1990 level by 2012. However, between 1990 and 2004, total Canadian emissions grew by 26.6 per cent (EC 2006) (**Figure 1**). Canada's Commissioner of the Environment and Sustainable Development, part of the Office of the Auditor General, released a report urging the country intensify its efforts to combat—and to prepare for—climate change (OAG 2006). The Commissioner noted that rising emissions from booming oil sands projects in the province of Alberta will compromise efforts to reduce overall emissions. The report spelled out some of the risks from climate change, including drought in the Prairies, rising sea levels, more intense coastal storms, and increased smog levels in cities. It called for a believable, clear, and realistic plan to significantly reduce GHGs with short and long term national goals, as well as for new targets and specific time frames for achieving them.

In 2006 Canada's new Conservative federal government recognized the country's inability to achieve the Kyoto Protocol's goals and responded by discontinuing 15 Climate Change action projects, with a promise to develop a new "Made in Canada" approach (Ambrose 2006, Isaacs 2006). On 19 October, Canada

introduced its proposed new plan in the House of Commons (**Box 1**) (Conservative Party of Canada 2006).

In the US, total GHG emissions increased by 15.8 per cent between 1990 and 2004 (EPA 2006). Rather than impose national limits on emissions, the United States continues to support voluntary reductions, market-based approaches, and the development of new technologies. In this spirit, the United States with Australia, China, India, Japan, and the Republic of Korea founded the Asia-Pacific Partnership on Clean Development and Climate. The partnership's inaugural meeting in January 2006 established eight public-private sector Task Forces covering cleaner fossil energy, renewable energy and distributed generation, power generation and transmission, buildings and appliances, steel, aluminium, cement, and coal mining. Each task force was charged to develop an action plan identifying specific opportunities for co-operation, ambitious but realistic goals, and means of achieving them (APCDC 2006). The task forces released their plans in October 2006.

## States and Provinces Take Action

Advocating stronger action, a coalition of 12 US States and several environmental NGOs sued the US Environmental Protection Agency (EPA) for failing to regulate carbon dioxide (CO<sub>2</sub>) emissions from vehicles under the national Clean Air Act. Under the Act, the EPA must regulate emissions from mobile sources that endanger public health or welfare. In November 2006, the US Supreme Court heard arguments about whether the EPA is obliged to regulate CO<sub>2</sub> and other GHG emissions, and whether the plaintiffs have legal

## Box 1: Canada's new approach to climate change

The Conservative government proposed a new Clean Air Act as the centrepiece of Canada's green agenda. The Act will allow the setting of short, medium, and long term upper limits for emissions of air pollutants, which polluters will be compelled to respect. The aim is that these fixed targets will be at least as stringent as those in countries that are environmental leaders.

For greenhouse gas (GHG) emissions, short term targets will be set based on intensity which encourages efficiency but allows emissions to grow if output grows, an approach used in the United States Global Climate Change Initiative of 2002. There will be a longer term goal of cutting GHG emissions by 45 per cent to 65 per cent of 2003 levels by 2050. No mention is made of Canada's Kyoto commitments.

Opposition parties and environmental groups agree with a number of elements in the Act, but have been critical of the very long deferral of GHG emission limits and the lack of a compulsory timetable for cutting GHG emissions. They also note that some toxic substances are re-defined as 'air pollutants', which may weaken powers of regulation, and suggest that some of the measures are already covered in the existing Canadian Environmental Protection Act. Since the government does not command a majority of seats in Parliament, the Act may not pass into law without major revisions.

Sources: Government of Canada 2006a and 2006b, Bueckert 2006, David Suzuki Foundation 2006, Environmental Defence, Pollution Probe and Clean Air Foundation 2006, USEIA 2003).

standing to bring the case. The ruling, expected in 2007, could have significant consequences for US climate change policy (Marshall 2006, Commonwealth of Massachusetts v. Environmental Protection Agency 2006).

In the meantime, lower tiers of government continued to make progress in regulating carbon emissions in 2006 (**Box 2**).

Table 1: Carbon dioxide emissions 1990-2003 (million metric tons of CO<sub>2</sub>)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
<b>GLOBAL VALUE</b>	22210.00	22532.00	22174.00	22131.00	22538.00	22837.00	23515.00	23649.00	23285.00	23164.00	23693.00	23969.00	24849.00	26001.00
<b>Canada</b>	459.78	451.45	465.53	465.16	479.55	492.43	505.47	517.07	527.82	542.72	565.68	558.97	567.79	586.07
<b>United States of America</b>	5009.55	4969.26	5062.01	5177.35	5268.05	5319.38	5500.17	5579.98	5607.16	5677.97	5858.20	5744.78	5796.76	5841.50

Source: UNEP Geo Data Portal 2006 based on UNFCCC-CDIAC 2005.

## Box 2: States and Provinces continue to lead in curbing GHG emissions

The State of California, the 12th largest carbon emitter in the world, passed a landmark climate change bill in 2006. The legislation limits the State's emissions to 1990 levels by 2020, representing an estimated 25 per cent overall reduction from current levels. It also establishes a mandatory reduction reporting system and sets up a 'cap and trade' program allowing businesses to buy and sell emission rights (Office of the Governor 2006).

Canada's Provinces of Newfoundland and Labrador, Quebec, and Manitoba are committed to implementing the Kyoto Protocol regardless of the federal government's stance. To help finance its efforts to meet Kyoto targets, Quebec announced it will introduce a carbon tax on all fossil fuels sold in bulk to retailers.

Sources: CBC 2006, Gouvernement du Québec 2006.

Public interest and knowledge about climate change grew over the past year. Signs that the US government acknowledges human-induced climate change stimulated media attention on the issue, accompanied by decreasing coverage of scientific scepticism. In a significant indicator of culture shift, a coalition of 86 evangelical Christian leaders advocated urgent action on climate change by government, business, individuals, and churches, committing to influence their congregations to limit GHGs (ECI 2006). Former US Vice-President Al Gore's cautionary documentary about climate change, *An Inconvenient Truth*, released in May 2006, became an unexpected box office hit (Svetkey 2006).

## NEW MARINE PROTECTED AREAS CREATED

In 2006, the United States took an historic step in creating the world's largest contiguous marine protected area in the Hawaiian Islands (Box 3).

2006 also saw the creation of a new network of marine reserves off California's central coast. This network encompasses 29 Marine Protected Areas (MPAs) representing over 52 800 hectares of marine habitat. About 8 per cent will be out-of-bounds to all fishing, while the rest will permit restricted fishing (DFG 2006a, Scheer 2006a). The MPAs will help in efforts to restore depleted fish stocks and to protect coastal marine habitat and biological diversity from the impacts of coastal development, water pollution, and other human activities (DFG 2006b).

A landmark US federal rule banned bottom trawling for fish in over 95.83 million hectares of sensitive ocean habitat extending into the Gulf of Alaska and surrounding Alaska's Aleutian Islands, a chain that reaches 2 200 km westwards from the Alaska Peninsula (NURP 2004, Oceana 2006).

Bottom trawling in Alaska generally involves dragging large weighted nets across the sea-floor to harvest commercial fish species such as Pacific cod and black rockfish. It devastates sensitive marine life, including slow growing cold-water corals and sponges (Enticknap 2002). An estimated 453 600 kilograms of corals and sponges are lost as by-catch in Alaskan waters every year (Roberts and Hirshfield 2004).



Source: Robert Stone, NOAA Fisheries

The common pink bubblegum coral (*Paragorgia arborea*) near the coast of Alaska's Tanaga Island.

These cold-water deep-sea corals provide important habitat for fish and other marine life. The ban, prompted by pressure from conservationists and scientists, is the most extensive of its kind in the United States (Roberts and Hirshfield 2004, Oceana 2006).

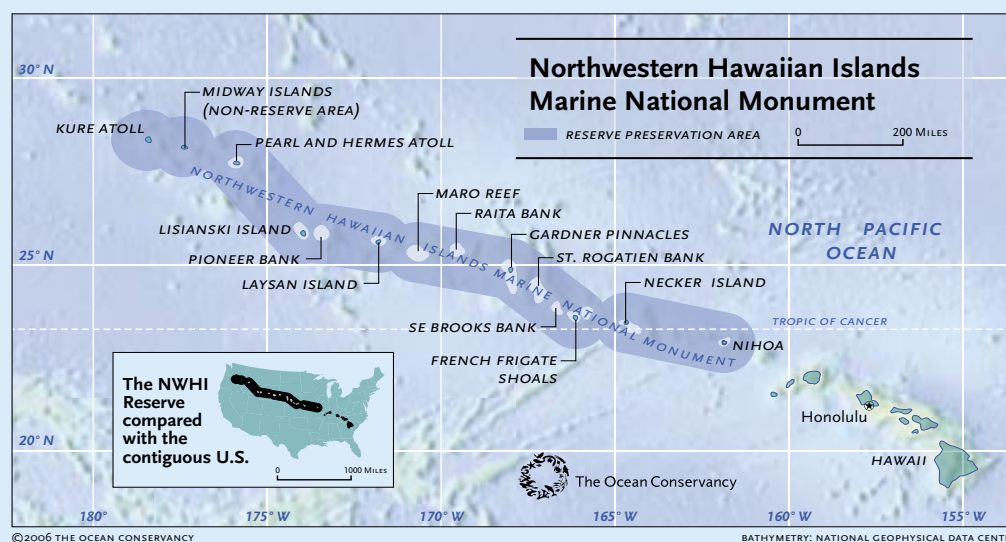
Leading up to United Nations negotiations on international efforts to ban or control unregulated bottom trawling, the US government called for an end to such destructive fishing practices (The White House 2006). Canada opposed an international moratorium and proposed creation of regional fisheries management organizations for unregulated ocean areas, with powers to identify and protect vulnerable habitats (DFO 2006). In November the UN Review Conference on the Fish Stocks Agreement decided against a moratorium, in favour of closer monitoring of the impacts and subsequent restricting of activities that damage sensitive marine areas (Mittelstaedt 2006).

## Box 3: The Northwestern Hawaiian Islands Marine National Monument

On June 15, 2006, US President George W. Bush created the world's largest marine conservation area off the coast of the northern Hawaiian Islands. The Northwestern Hawaiian Islands Marine National Monument covers nearly 36 million hectares of US waters, including 1.16 million hectares of coral reef ecosystem. The archipelago provides habitat to more than 7 000 marine species of which a quarter are endemic. It is home to nearly 1 400 Hawaiian Monk Seals—almost the entire world population of this critically endangered species—and to about 90 per cent of the threatened Hawaiian Island Green Sea Turtle population. The designation puts the area under immediate and permanent protection. Unauthorized ships, illegal recreational and commercial activity, resource extraction, and waste dumping will be prohibited and commercial fishing will be phased out over a five-year period.

Sources: NOAA 2006a, The White House 2006a.

Source: Northwestern Hawaiian Islands Marine National Monument, Map © The Ocean Conservancy; Bathymetry: National Geophysical Data Center







Bottom trawl roller-gear Source: © OCEANA / David Hall

## PRESSURES GROW ON PARKS AND PUBLIC LANDS

On land, by contrast, several years have gone by with little US action to set aside more parks, while protected areas in both Canada and the US face numerous and growing threats to their ecological integrity and beauty (Defenders of Wildlife 2005, Tourtellot 2005, NRDC 2005, NPCA 2006a, Bass and Beamish 2006, USDA 2006a). For example, the US has proposed selling more than 121 400 hectares of public lands in 35 states to fund rural schools and roads (USDA 2006b). Furthermore, it passed legislation allowing the construction of energy transfer corridors to supply electricity from 11 Western states to population centres in the Southwest. These energy transfer corridors will likely cross national parks and other public lands (DOE 2006, Scheer 2006b).

Mining operations and oil and gas development are already allowed on and near protected areas in both Canada and the United States. A recent study estimates that these industries actively operate in 35 per cent of 1 855 parks and other public lands in 13

Western states of the US and expects the trend to increase (**Figure 1**) (EWG 2005).

Mining and energy industries also threaten Canadian Parks. A 2002 study showed that mining occurred inside or within 10 kilometres of almost half of Canada's National Parks (MAC and CNF 2002). In 2006, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) World Heritage Sites Committee reported that open-pit mining near Jasper National Park threatens grizzly bear habitat (World Heritage Committee 2006). Untimely water withdrawals from the Athabasca River for oil sands surface mining

operations affect fish populations and threaten the sustainability of the Athabasca River and the Peace-Athabasca Delta (**Box 4**). The river enters Lake Athabasca in Wood Buffalo National Park, a UNESCO World Heritage site, and the delta is one of the most important waterfowl nesting and staging areas in North America (Woynillowicz 2006).

Other commercial interests are increasingly encroaching on Canada's parks. In 2006, the British Columbia government eased the way for private resort development within 12 provincial parks, including Mount Assiniboine Provincial Park, part of the Canadian

### Box 4: Mining the Athabasca oil sands near Fort McMurray Alberta, 1974 and 2004

In 1967 The Great Canadian Oil Sands Company began construction at its Mildred Lake site. In 1974 they were joined by the Syncrude Corporation in the same area (light grey area in the center of 1974 Landsat image, left). By 2004 the mining operations had expanded to cover an area roughly 30 km by 20 km (2004 ASTER image, right). Syncrude operates a second mine, the Aurora, approximately 30 km to the north of Mildred Lake (visible near the top of the 2004 image).

Source: UNEP/GRID Sioux Falls, from U.S Geological Survey data

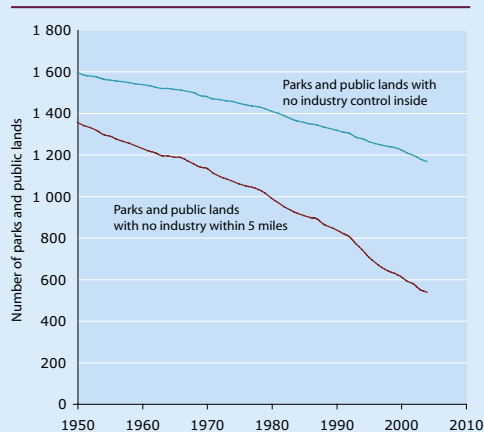


Source: UNEP/GRID Sioux Falls, from U.S Geological Survey data



The Syncrude mine in Alberta's Athabasca oil sands.

Figure 1: Industry access to US parks and public lands



Note: Number of US parks and public lands that remain free of operating mines and active oil and gas wells controlled by industry inside or within eight kilometres of boundary

Source: EWG 2005

Metadata: government land use data from the Bureau of Land Management (2004)

Rocky Mountain UNESCO World Heritage Site (BC Parks 2006). In addition, in 2006 the Quebec government planned to sell public land in the Parc National du Mont-Orford, created in 1938 and one of its oldest provincial parks; public outcry led to a compromise that keeps the land under development in public hands (MRC de Memphrémagog 2006).

Finally, exurban expansion (clusters of low density housing in the countryside) is threatening adjacent protected areas in both countries. The results of all these pressures include habitat fragmentation, biodiversity loss, and air pollution. Fragmentation creates remnant, isolated wilderness patches of varying size that constrain wildlife

movements and that may not be able to support viable populations of certain wildlife species (Forrest and others 2004, Bass and Beamish 2006, NPCA 2006b).

## CONCLUSION

North American states, provinces, and cities are moving forward on regulations to reduce emissions, producing concrete results while also exerting political pressure on federal governments that aren't party to the Kyoto Protocol (the US) or deny its relevance (Canada). North America needs to set firm short term targets and time frames to reduce GHG emissions and to invest more heavily in energy conservation and renewables.

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Source: Catherine McMullen/UNEP

Exurban expansion fragments habitats along Lake Ontario's Hay Bay.

# West Asia

2006 saw progress in environmental management, with particular success in reducing the use of ozone-depleting substances. However, the region still faces critical challenges related to the environmental effects of armed conflicts, safe management of chemicals, and conservation of forests and woodlands.



Clouds of smoke from Jiyeh power station in Lebanon

Source: Ali Hashisho/Reuters/The Big Picture

## ENVIRONMENT AND CONFLICT

In Iraq and the Occupied Palestinian Territory (OPT) violence and frequent hostilities continue to intensify environmental degradation, as well as water and sanitation problems (UNICEF 2006). While the environmental situations in Iraq and OPT remain worrisome, the environmental implications of the Israeli-Lebanese conflict in July and August raised major headlines in 2006.

In Lebanon, the destruction of power utilities, fuel depots, factories, and buildings posed risks to local populations, relief workers, and the environment (**Box 1**). Clouds of burning fuel containing toxic polyaromatic hydrocarbons, asbestos particles, dioxins, and dust were emitted into the atmosphere; while liquid chemicals, including chlorine and polychlorinated biphenyls, were released into soil and aquatic ecosystems. This has raised concern over possible effects on human health and long term damage to the environment. Water pollution also became an issue, as heavy bombing

damaged the infrastructure of water supplies as well as wastewater and sewage systems.

A number of wildfires occurred during the hostilities, damaging vegetation and wildlife habitats. About 6 680 hectares of forest and grazing lands were destroyed in northern Israel (Julian 2006, Puljak 2006). Similarly, on the Lebanese side, there was growing alarm over forest fires and destruction of woodland habitats (Fattah 2006). With the help of the Food and Agriculture Organization of the United Nations, the Lebanese Government is still assessing the extent of damage to forests and woodlands (Asmar 2006). An international team of experts, led by UNEP and working in close cooperation with Lebanese authorities, is starting an assessment of the overall environmental damage in Lebanon caused by the recent conflict (UNEP 2006a).

In one month of conflict, more than a million people were displaced from south Lebanon, the southern suburbs of Beirut, and Northern Israel—putting pressure on

### Box 1: The oil spill along the Lebanese-Syrian coast on 21 July and 3 August; 2006, Radar Satellite Data



Source: DLR 2006

The bombing of the Jiyeh power station on 13 and 15 July 2006 caused between 10 000 and 15 000 tonnes of heavy fuel oil to spill into the Mediterranean Sea (MOE 2006a). The oil polluted 150 km of the Lebanese coastline area and reached as far as the Syrian coast of Tartus (Cyprus Oceanographic Centre 2006a and 2006b, REMPEC 2006). Two weeks after the spill, 80 per cent of the oil still remained in the coastal waters of Lebanon as thin floating sheets, about 20 per cent had evaporated, and 0.1 per cent remained along the beaches (Cyprus Oceanographic Centre 2006a and 2006b).

The oil spill was described as the 'worst environmental disaster' in Lebanon's history and it will have significant impacts on its economy and biodiversity (OCHA-UNEP 2006). The fuel oil contains toxic chemicals, with potentially serious implications for human health, fishery resources, and other marine biota (MOE 2006a). Oil on the beaches of Palm Islands Nature Reserve (off the coast of Tripoli) threatens loggerhead turtles, monk seals, and fish stocks as well as migratory birds (IUCN 2006). Full scientific data is not yet available. However, a comprehensive environmental damage assessment is underway that should reveal possible long term pollution effects of the spill.

In response to the Lebanese government's call for support, an international assistance action plan was formulated to address the problem (MOE 2006c, REMPEC 2006, UNEP 2006b). As of September 2006, 400 tonnes of oil had been recovered from various sites during ongoing national clean-up operations (MOE 2006b). While the clean-up may take 6 to 12 months, the harmful impacts of the spill could last much longer. The initial clean-up operation is estimated to cost about US\$60 million and more funds may be needed in 2007 (MOE 2006c). Regional cooperation is vitally important in capacity-building for monitoring and assessing the environmental effects of oil pollution as well as proper remediation. Emergency measures and coordination of activities among agencies and affected states are needed to effectively control oil pollution and limit its damage to the marine and coastal environment.

The two images show how oil dispersed after the spill, moving along the coasts of Lebanon and reaching the southern coast of Syria between 21 July – 3 August 2006. The dark colour along the coastline illustrates the area extent covered by the oil-spill (DLR 2006).

Sources: DLR 2006, MOE 2006a, Cyprus Oceanographic Centre 2006a and 2006b, REMPEC 2006





Oil spill clean-up efforts in coastal area north of Jiyeh, Lebanon.

Source: Hassan Partow/UNEP

the environment and natural resources. Many Lebanese returnees lacked safe drinking water and sanitation. An International Red Cross Committee survey in affected villages found that 55 per cent of households reported cases of diarrhoea (IRC 2006). Tens of thousands of unexploded ordnance, including cluster bombs, pose a continuing threat, resulting in death and injury on a daily basis (UNHCR 2006). Even when these are collected and detonated under controlled circumstances, they can be a source of chemical pollution.

In Iraq, non-violent death rates have increased in the last two years (2005 and 2006) which may reflect deterioration in health services and environmental health threats (Burnham and others 2006). Several years after the ending of major wars, unexploded ordnance and landmines in Iraq are still killing civilians and hampering reconstruction (UNAMI 2005).

Recurrent conflicts have led to considerable political and socio-economic instability in the region. They not only affect the environment directly, but they also drain resources away from conservation and constrain the effective management of natural capital (ESCWA 2005). For instance, the total cost of damages incurred from conflict in the Gaza strip is estimated at US\$46 million during July and August alone (UNDP 2006). Once peace and stability have been established in the region, resources may be devoted effectively to rebuilding physical infrastructure.

## MANAGEMENT OF CHEMICALS

Chemicals in West Asian countries are mainly imported for use in agriculture, industry, pharmaceutical, and other economic sectors. The petrochemical industry is expanding within the Gulf Cooperation Council (GCC)

countries. For example, ethylene production has tripled in GCC countries since 1990 and is expected to double again by 2010 (EMCC 2006). In the Mashriq countries highly polluting industries like mining, cement production, and tanneries continue to operate inefficiently, polluting air, water, and soil resources.

The use of chemicals, especially agrochemicals, is rapidly rising in the region. For example, insecticide use doubled in Syria between 2002 and 2004, when it reached 1.4 million metric tons (Hajjar 2005). The heavy application of these chemicals and the discharge of wastes into soil and aquatic ecosystems present significant hazards to human health and to the environment. Applications of agrochemicals and irrigation with sewage water have increased nitrate in wells in the Gaza strip to levels exceeding the World Health Organization's safe guideline values (UNEP 2003a, Miski and Shawaf 2003, EMWATER 2005).

There are no reliable data on the amount of hazardous waste generated in the region, but some crude estimates indicate that per capita levels could be comparable to those of industrialized countries. So far only a few GCC countries have constructed treatment, disposal, and incineration facilities. Chemical and industrial waste is a problem in Iraq, where remaining stockpiles of hazardous and obsolete chemicals threaten public health and the environment (UNEP 2005). Radioactive materials such as depleted uranium from ammunition are believed to cause clusters of cancer cases and genetic defects recently reported in Basra city, Iraq (Hirschfield 2005, Burnham and others 2006).

There are signs of progress. In 2006 the region hosted the International Conference on Chemicals Management (ICCM) in Dubai, United Arab Emirates,

which adopted a Strategic Approach to International Chemicals Management (SAICM) (UNEP 2006c). Prior to the conference, political support for SAICM in the region was demonstrated in the Cairo declaration, in which the sound management of chemicals and hazardous wastes strategy was adopted as a national and regional priority (UNEP 2006d). Recently, seven countries nominated national focal points to the SAICM Secretariat, indicating their commitment to implement ICCM decisions (UNEP 2006e). Moreover, a genuine effort is underway by countries in the region to develop an integrated regional strategy on chemical and waste management (UNEP 2006f).

Most countries in West Asia are parties to the major international agreements on chemicals: the Basel, Rotterdam, and Stockholm Conventions as well as the Montréal Protocol and related regional conventions. Compliance, however, has been modest in some cases, due to a number of factors including illegal shipments of chemicals. Nevertheless, some progress has been achieved towards control and safe handling of chemicals. The phasing out of ozone-depleting substances is a success story in its own right (**Box 2**).

Laws and regulations need to be updated and strictly enforced by governments, to control the use of chemicals and to reduce associated pollution risks. The key policy challenges to achieving more sound management of chemicals are:

- strengthening coordination mechanisms between institutions at the national level;
- preparing national chemical safety profiles; and
- raising public awareness.



Open dumping of hazardous sodium cyanide in Al-Qadissiya, Iraq.

Source: UNEP/Post Conflict Branch

## Box 2: Consumption of ozone-depleting substances slashed

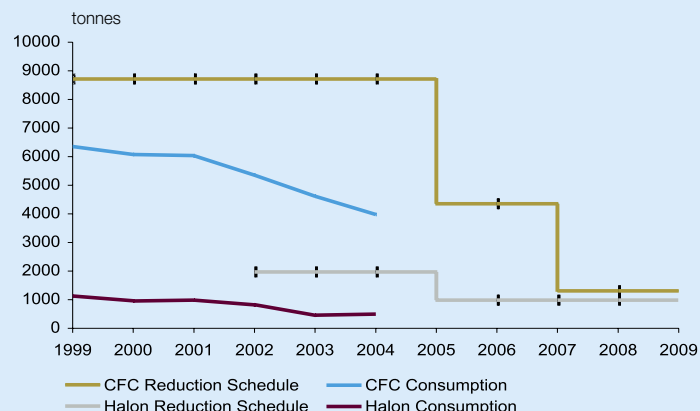
Protection of the ozone layer, and implementation of relevant international treaties, have been given a high level of attention by key governmental and private sector stakeholders in the region. Since 1999 most West Asian countries have made significant progress in phasing out ozone-depleting substances (ODS). The Regional Ozone Network has promoted compliance with the control measures spelled out in the Montreal Protocol through the Compliance Assistance Programme (CAP) of the United Nations Environment Programme.

As of October 2006, only 70 per cent of the parties had reported their official 2005 data to the Ozone Secretariat. However, countries have already reduced consumption by more than the 50 per cent required by the Protocol. Among the reporting countries, total chlorofluorocarbon (CFC) consumption in 2005 was 1 519 tonnes in ozone-depleting potential (ODP), compared to the 1995-1997 baseline of 4 590 ODP tonnes—an average reduction of 67 per cent ranging from a low of 57 per cent in Bahrain to a high of 91 per cent in Jordan. Halon consumption reported for 2005 was 126 ODP tonnes, compared to the baseline of 693 ODP tonnes—an average reduction of 82 per cent with most countries achieving a complete elimination. The remaining countries, although they have not yet officially reported, have followed a similar trend.

In addition to national efforts, the GCC Secretariat in cooperation with CAP approved regional guidelines aimed at strengthening regulations and improving cooperation to ensure a sustainable phase out of ODS.

Source: CAP/UNEP-ROWA 2006

## Status of total consumption of ODS in West Asian countries.



Note: 2005 data are not included.

## THE FUTURE OF FORESTS AND FOREST POLICY IN WEST ASIA

The forests and woodlands of West Asia cover 43 million hectares (FAO 2006). Dense forests are mainly found in Mashriq countries while open stands are scattered in wadis and high mountains of the Arabian Peninsula. Most of these forests are state owned and

managed for multiple purposes including protection services (FAO 2006).

Forest resources in the region are under severe pressure due to water shortage, increasing demand for agricultural land, and accelerated urbanization. There have been no major changes in the total extent of forest areas in the last five years (FAO 2006), but degradation

of forest quality is widespread, due to clearing, illicit cuttings, overgrazing, fires, and tourism. For instance, a single major fire in Syria in 2004 destroyed nearly 0.4 per cent of the total forest area in the country (Jbawi 2006). In the Arabian Peninsula, hundreds of hectares of Juniper forests are experiencing die-back (Asiri 2006, PME 2005) (Box 3).

## Box 3: The dying juniper of the Arabian Peninsula



Urban development encroaching on Juniper forests, Saudi Arabia

Source: Mohammad S. Abido

The forests of West Asia cover 1.4 per cent of the total area of the region, while other wooded lands account for 10.2 per cent. Over 70 per cent of the forest area is in the Arabian Peninsula. The Juniper (*Juniperis spp.*)—the only coniferous species native to the peninsula—grows in the northern mountains of Oman, the Asir Mountains of Saudi Arabia, and the northwestern mountains of Yemen. Juniper foliage condenses fog into water that drips off the trees during relatively humid periods, creating a microclimate that sustains the growth of other species. The forest has a significant role in supporting rich fauna and flora as well as providing local people with products and services. The woodland of southwestern Arabia is home to a number of threatened endemic birds (Jennings and others 1988, Newton and Newton 1996, Birdlife International 2003). The region is home to many raptors and provides a flyway for migratory birds. As well, the critically endangered Arabian leopard (*Panthera pardus*) and the rare Arabian wolf (*Canis lupus*) are believed to frequent the woodlands. Juniper is the major woody component of agroforestry in the region and is used in traditional medicine.

The Juniper forests of the Arabian Peninsula, especially those at lower altitudes, are now showing signs of decline, with gradual reduction of growth and vigour in trees and progressive death of twigs and branches. These signs are associated with a high rate of tree mortality and poor natural regeneration. In Saudi Arabia, extensive decline has been reported in the last two decades in the Asir National Park (450 000 hectares) and in the Raidah National Park (900 hectares).

The exact cause of the Juniper's dieback is yet to be identified. However, the poor regeneration of the species has been attributed to the infestation of berries by a tortricid moth as well as to human disturbance, overgrazing, atmospheric pollution, drought spells, and continuing climate change. The clearing of juniper forests for agriculture, roadways, housing, and recreation has altered natural watershed drainage systems in many locations. These activities—along with overcutting, overgrazing, and fuelwood and charcoal making—have created microclimates unfavourable for tree growth. The Juniper die-back phenomenon is a serious problem for the affected countries of the region, because it is a silent form of resource degradation that may worsen desertification. New initiatives to overcome the dieback problem are urgently needed.

Sources: FAO 2006, Gardner and Fisher 1996, Fisher and Gardner 1998, Fisher 2005, Herzog 1998, PME 2005 and 2006, Collette 1989, Jennings and others 1988, Newton and Newton 1996, Birdlife International 2003, Balle and Groombridge 1996, WWF 2001, Hajar and others 1991, NCWCD 2003, Yoshikawa and Yamamoto 2005, Asiri 2006, IUCN 2002, Sigi and others 2005

Countries are now updating forest laws and establishing national policies and strategies for forest management. These policies and strategies need to be harmonized with national plans for biodiversity conservation, combating desertification, and rural poverty alleviation. A framework for the development of new policies must ensure long term conservation and sustainable use of woodlands. This entails defining the socio-economic values and environmental services of forests and woodlands, setting targets and defining

indicators for measuring progress, periodically updating forestry laws and regulations, building institutional capacity, and ensuring effective participation of local communities.

## CONCLUSION

Frequent conflicts have significantly affected the environment in West Asia. Sustainable development and a healthy environment cannot be fully achieved without peace and security in the region. Although important

achievements have been made in certain aspects of chemical management—such as initiating national policy frameworks, building data bases, and regulating the use of certain chemicals—the region still faces challenges to fully implement SAICM and to properly manage and conserve its precious natural forests and woodlands.

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# Polar

Observations and new research showed that climate change continued to accelerate, with global consequences. Combined with increasing development pressures, this gives a new sense of urgency to improving international cooperation and governance in the Polar Regions.



Antarctic Ice. Source: Ben Holt Sr/NASA

## MELTING ICE

Studies from 2006 provided new information about the rates at which warming temperatures are causing the earth's great storehouses of ice to melt and break apart. There are still uncertainties about what will happen with ice sheets in the long term and how quickly global sea levels will rise.

The volume of the Antarctic ice sheet shrank at an annual rate of  $152 \pm 80$  cubic kilometres between 2002 and 2005, according to the first mass balance estimate of the entire ice sheet (Velicogna and Wahr 2006). This

would have produced enough meltwater to account for 13 per cent of the sea level rise observed during that period. The volume of the Greenland ice sheet shrank at an annual rate of  $101 \pm 16$  cubic kilometres between 2003 and 2005, according to estimates derived from the same satellite-based methodology (Luthcke and others 2006). Both the Antarctic and the Greenland ice sheets are gaining mass in some areas from increased snowfall while losing ice in other areas from melting and iceberg calving. The rate of ice loss is increasing because glaciers in Greenland and Antarctica are flowing faster (Kerr 2006). For example, Greenland's fastest glacier, Kangerdlugssuaq, increased its speed from 6 km per year in 2000 to 13 km per year in 2005 (Rignot and Kanagaratnam 2006).

Arctic sea ice cover in September 2006 averaged 590 million hectares, the second lowest of the 29 year record of satellite measurements (NSIDC 2006). This continues the pattern of sharply decreasing Arctic sea ice cover, which is now shrinking at the rate of 8.6 per cent per decade. If this rate continues the Arctic Ocean will be ice-free in summer by 2060. Changing Arctic sea ice conditions are opening shipping routes, leading to disputes over borders and jurisdiction, including the waters of the Northwest Passage (Box 1) (Figure 1).

Figure 1: Arctic shipping



As the amount of ice in the Arctic shrinks, sea routes will open up to increased traffic.

Source: UNEP/GRID-Arendal

The ecological impacts of these changing ice conditions include threats to animals such as the polar bear and changes in fish stocks and marine mammals, with economic and social consequences for Arctic residents (ACIA 2005).

## INTERNATIONAL COOPERATION AND GOVERNANCE IN A CHANGING WORLD

These changing ice conditions, along with an increase in commercial fishing, Antarctic economic activity, and Arctic oil and gas development are producing additional challenges for international cooperation and governance (Box 2).

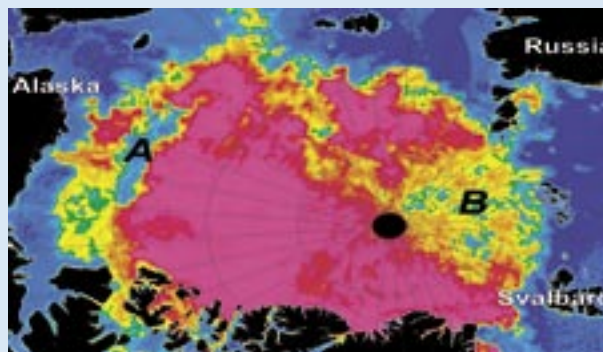
Both the Arctic and the Antarctic have formal means for nations to share information and cooperate on man-

### Box 1: Holes in the year-round ice

In late summer 2006 two large areas of open water appeared in regions of the Arctic Ocean that are normally frozen all year round (See Figure). One of these openings, in the Beaufort Sea north of Alaska (A), was a large polynya (a lake-like region of open water surrounded by ice) larger than Ireland. Another unusual open ice area was registered on the European side of the Arctic Ocean (B), a region of fragmented ice and open water the size of the British Isles. At its maximum in late August, a ship could have passed from Svalbard or northern Russia through what is normally pack ice to reach the North Pole without difficulty.

Open water and ice break-up of this magnitude in what is normally permanently-frozen ice have not been observed before. Neither of these unusual events can be directly attributed to climate change and the specific causes are not clear. Unusual wind patterns, thinner ice, and warmer waters rising to the surface may be involved.

Sources: ESA 2006, NSIDC 2006



The image, from 24 August 2006, was produced from microwave radiometer measurements from NASA's Aqua satellite. Pink indicates solid ice cover; yellow, green and orange indicate broken ice; and blue indicates open water.

Source: Polar View/DTU (Leif Toudal Pedersen)

agement and conservation. But they have developed very different cooperative mechanisms. The Antarctic is governed by an international multilateral regime, the Antarctic Treaty System, whose core is the 1959 Antarctic Treaty, currently including 45 state parties. There is no such international regime for the Arctic, but in 1996 the Arctic Council was established as a forum for cooperation, made up of the eight nations around the Arctic Ocean and six Indigenous Peoples' Organizations.

In addition to these regional mechanisms, many multilateral environmental agreements (MEAs) play important roles in polar cooperation and governance. A case in point is the story of stratospheric ozone (**Box 3**). This example shows that nations can agree to take strong actions to solve environmental problems. It also shows the importance of international cooperation in research and monitoring of ecosystems and their interactions with human activities and in measuring the effectiveness of instruments such as the Montreal Protocol.

2006 saw significant advances in polar science cooperation, in the preparations for the International Polar Year (IPY) 2007-2008. This burst of research, education, and outreach aims to improve understanding and awareness of major issues facing the Polar Regions and the world, especially climate change (IPY 2006).

### The Antarctic

In 2006 representatives of the Antarctic Treaty states committed themselves to improve the effectiveness of the Antarctic Treaty System and to increase coordination among its components. As part of the Edinburgh Declaration of the 29<sup>th</sup> Antarctic Treaty Consultative Meeting (ATCM) held in June, it was recommended that nations champion the importance of the Polar Regions in international forums and that there be increased collaboration with the Arctic Council (ATCM 2006). These

### Box 2: The changing Arctic: Responding to global demands for oil and gas

With increasing global demand for secure energy supplies, there is competition for rights related to large-scale Arctic projects on land and in the seas. There are many uncertainties related to market forces and political factors, as disputes arise over boundaries, shipping routes, and ownership of sea bed resources. All of this is taking place in the context of rapid environmental change, and ecological and societal impacts are becoming increasingly difficult to predict.

Some events of 2006:

- Construction continued on the first European export facility for liquefied natural gas, Snøhvit, in the Barents Sea north of Hammerfest, Norway. Export is scheduled to begin in late 2007, sending 70 shipments per year to Europe and the US.
- A public hearing into the construction of the Mackenzie Valley Pipeline began. This proposed 1 200 kilometre natural gas pipeline system would connect northern Canadian onshore gas fields with North American markets.
- In March, one million litres of crude oil spilled onto the Alaskan tundra, the largest leak in the history of Alaska's Arctic production. In August, BP temporarily halted production in Prudhoe Bay following another much smaller leak.
- In September, the Russian Ministry of Natural Resources suspended the permits of the developers of the Sakhalin oil and gas project in the Russian Far East, citing non-compliance with environmental regulations. The estimated US\$22 billion project includes offshore drilling platforms and pipelines. Opponents say the project threatens fish and the last population of western grey whales. Onshore infrastructure includes two 800 kilometre pipelines that cross more than 1 000 watercourses and swamps as well as seismic faults, roads, and railways.
- Gazprom, the Russian state-controlled oil company, announced in October that it will be the sole developer of the giant Shtokman gas field in the Barents Sea, 500 kilometres north of the port city of Murmansk. At the same time the Russian government declared that it was dropping plans to ship liquefied natural gas to the US, in favour of a pipeline to European markets.

Sources: BP 2006, JSC Gazprom 2006, MGP 2006, Roach 2006, Sakhalin Energy 2006a, Sakhalin Energy 2006b, Statoil 2006

recommendations come at a time when the 'Question of Antarctica' has been removed as a regular agenda item before the UN General Assembly (**Box 4**).

At the 2006 ATCM, New Zealand introduced a working paper proposing stronger links between the ATCM and the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), a separate decision-making body. The Antarctic Treaty Consultative parties agreed that there is a need for close synergy and cooperation, especially on Antarctic marine protected areas. CCAMLR stressed the importance of developing a strategic approach to marine protected areas and a harmonized regime to protect the Antarctic marine environment across the Antarctic Treaty System. CCAMLR has initiated a process called bioregionalism, seen as the first stage of a strategic approach to decide where marine protected areas are most appropriate.

The growth of tourism and bioprospecting (collecting biological material for commercial purposes) also has implications for international governance. A resolution was proposed at the 2006 ATCM to limit landings of large tourist vessels, but no consensus was reached; discussion of the issue was deferred until the 2007 ATCM. Three information papers on the topic of bioprospecting were tabled by France, Argentina, and UNEP. However, no substantive discussion took place; parties were urged to continue providing updates on their activities in this field. The meeting considered a third emerging issue: the risk of an increase in alien species of plants, animals, and microbes colonizing the region.

### The Arctic

In the Arctic, accelerating changes in sea ice and glaciers, along with the growing pressure to develop

### Box 3: Ozone hole reaches record size

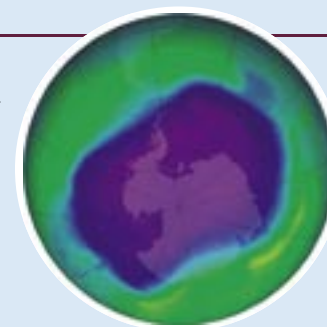
The thinning of the protective ozone layer in the earth's atmosphere was discovered by Antarctic researchers in the early 1980s. The 1987 Montreal Protocol has been successful in reducing global emissions of substances that deplete the ozone layer, such as chlorofluorocarbons.

Despite the progress made, in September 2006 the ozone hole over the Antarctic was the largest on record. This was partly due to particularly cold temperatures in the stratosphere, but also due to the stability of these chemicals—it takes about 40 years for ozone-depleting substances to break down. The ozone layer is expected to recover, but it is now predicted to return to its pre-1980s condition around 2060-2070, more than 70 years after the international community agreed to take action and 15 years later than earlier predictions. This illustrates both the effectiveness of coordinated international action on global environmental issues and the need to take action quickly on issues like climate change where improvements happen slowly and changes to the atmosphere have far-reaching global effects.

Sources: NASA 2006, WMO/UNEP 2006

Antarctic ozone hole  
24 September 2006.

Source: NASA



the Arctic's vast oil and gas and other resources, raise questions about the adequacy of current governance regimes, especially for the marine environment. Can Arctic countries, within existing international mechanisms, strike the difficult balance between promoting economic development and securing vulnerable Arctic environments? In 2006 this topic was examined through several forums and initiatives (Arctic Centre 2006, UNEP/GRID-Arendal 2006a and 2006b, SCPAR 2006a, Huebert and Yeager 2006). Two sets of issues were under discussion: first, how existing treaties relevant to the Arctic can be made more effective and comprehensive in their coverage of Arctic issues and second, the pros and cons of establishing a binding legal regime for the Arctic marine environment.

In August, at its biennial conference in Kiruna, Sweden, the Conference of Parliamentarians of the Arctic Region called on governments in the Arctic and institutions of the European Union to "initiate, as a matter of urgency, an audit of existing legal regimes that impact the Arctic and to continue the discussion about strengthening or adding to them where necessary" (SCPAR 2006a). The Parliamentarians also proposed that the United Nations should review UN treaties relevant to the Arctic as soon as possible. The recommendation to audit existing legal regimes was presented to the Arctic Council ministerial meeting in Salekhard, Russia in October (SCPAR 2006b).

In September, in Lahti, Finland, the Nordic Council (the forum for parliamentary cooperation among Nordic countries) recommended that their Council of Ministers should consolidate legal research pertaining to Arctic waters and, together with the Arctic Council, aim to create a comprehensive legal system for the Arctic (UNEP/GRID-Arendal 2006b).

Measures proposed and discussed in 2006 for improving the effectiveness of international governance in the Arctic included:

1. Strengthen the Arctic Council to give it more decision-making power.
2. Develop a new Arctic marine treaty, a framework convention, or a regional agreement through the Law of the Sea.
3. Strengthen the Arctic focus and coordination of MEA implementation through joint planning, common reporting, and more extensive stakeholder involvement and outreach.
4. Strengthen and develop new mechanisms to address Arctic priorities such as global regulation of new persistent organic pollutants and mercury.

The work of the Arctic Council currently includes activities related to MEA implementation, especially with respect to pollution (Arctic Council 2006, Huebert and Yeager 2006, Stokke 2006, UNEP/GRID-Arendal 2006b). However there is no consensus among the Arctic states on any expansion of its role, especially in dealing with climate change. Some member states favour a more active policy and decision-oriented role, while others see the Council as restricted to sharing information and cooperating on projects. The Arctic Council has been particularly successful in producing comprehensive Arctic assessments on climate (ACIA 2005), human development (AHDR 2004), and pollution issues (AMAP 2002); it is now working on assessments of Arctic marine shipping and of oil and gas development. At the biennial ministerial Council meeting in October, ministers requested the Council to begin work on an assessment of Arctic biodiversity (Arctic Council 2006).



Representatives of indigenous peoples and organizations at the October Arctic Council ministerial meeting in Salekhard, Russian Federation

Source: Clive Tesar/Indigenous Peoples' Secretariat of the Arctic Council

## ILLEGAL, UNREPORTED AND UNREGULATED FISHING

Illegal, unreported and unregulated (IUU) fishing is a global concern—reducing the resilience of marine ecosystems and making them more vulnerable to environmental change in a time of accelerating loss of marine biodiversity and fisheries resources (Worm and others 2006, Berkes and others 2006). While marine ecosystems become more vulnerable, commercial fisheries are expanding in both Polar regions.

Management regimes exist for both regions. In the Antarctic, fisheries are regulated by the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). The dominant fisheries are for krill (with a catch of about 127 000 tonnes for the 2005/06 season) and toothfish (about 14 000 tonnes) (CCAMLR 2006). Arctic fisheries policies are governed by national and regional bodies according to the jurisdictions of the Arctic Ocean, the North Atlantic and Pacific Oceans, and the northern seas. But the management regimes are weakened by inadequate tools for enforcement and because fishing and damage to habitat and marine life occurs outside of their reporting systems or jurisdictions.

In the Antarctic, IUU fishing is not just a threat to fish and krill stocks but also to albatrosses and petrels, which get caught on long-line fishing hooks (Gandini and Frere 2006). Policy responses have included setting up a catch documentation scheme and improved reporting and inspection measures, but the effectiveness of these measures is compromised by issues of jurisdiction. For example, southern bluefin tuna are harvested within the CCAMLR area, authorized by the Commission for the Conservation of Southern Bluefin Tuna rather than by the

### Box 4: The 'Question of Antarctica'

The 'Question of Antarctica' was brought before the UN General Assembly in 15 of the years since 1983. This arose from the concerns of many developing countries about management of Antarctica, regarding issues such as the fragility of the Antarctic and its importance in the global biosphere; the ability of Antarctic Treaty parties to manage Antarctica on behalf of the global community; contested Antarctic territorial claims; the 'two-tiered' character of the Antarctic Treaty in which Consultative Parties make policy decisions and non-Consultative Parties play a lesser role; and development of a mineral regime, seen by developing countries as an instrument to secure mineral resources solely for Antarctic Treaty parties. In response to these concerns, Malaysia led an argument at the General Assembly that Antarctica should be designated as a Common Heritage of Mankind.

Recently the debate over Antarctica has been tempered by reforms, including the abandonment of the mineral regime in 1989, adoption of the Protocol on Environmental Protection in 1991, and an expansion of the Antarctic Treaty membership from 12 original signatories to 45 countries today. In 2005, at Malaysia's request, the 'Question of Antarctica' was removed from the agenda of the General Assembly's 2008 session and replaced with a direction to keep a watchful eye on the situation. This is likely a signal that Antarctic Treaty states have made progress on the concerns expressed in the 1980s. Some suggest that it may be a step backward in global governance: a global concern as important as Antarctica will no longer be discussed periodically in a global forum.

Sources: Joyner 1998, UN (various years)



CCAMLR (Hemmings 2006). In November, the CCAMLR adopted a significant measure requiring members to take steps against nationals suspected of involvement in IUU activities at any stage of the fisheries supply chain. This is the first time any regional fisheries management organization has adopted such a comprehensive and binding mechanism in the fight against IUU fishing (EC 2006).

IUU fishing is also a problem for Northeast Arctic cod and was the focus of the 11th Conference of North Atlantic Fisheries Ministers in June. The Northeast Arctic cod is threatened by IUU fishing in the Barents Sea: an estimated 137 000 tonnes were fished illegally in 2005, equal to 30 per cent of the total legal fishery for this important fish stock. Governments agreed at the conference on the need for international measures to tackle IUU fishing (FKD 2006a). In November the North East Atlantic Fisheries Commission followed through by adopting binding rules, entering into force in May 2007, including the denial of entry at ports to vessels involved with IUU fishing or transport—effectively prohibiting the landing of illegally-caught fish in the European Union, Russia, Iceland, the Faeroe Islands, Greenland, and Norway (FKD 2006b).

## CONCLUSIONS

A host of new issues and challenges are emerging in the Arctic due to pressures from climate change and ongoing development. Currently there are good mechanisms sharing information, producing comprehensive assessments, and cooperating on science. However, the time has arrived to consider the needs and options for improving international governance, especially in the Arctic marine environment.

Although Antarctica has strong protection through an international protocol designating it as a 'natural reserve, devoted to peace and science', the management regime for this protocol needs support to ensure that expanding commercial activities do not undermine this ideal.

There was progress in both regions in 2006 in addressing illegal, unreported and unregulated fishing, including the adoption of binding rules and improvements in surveillance and enforcement through regional fisheries management organizations. In the context of a growing commercial fishing industry in the Polar Regions, continued emphasis on resolution of IUU issues is critical.



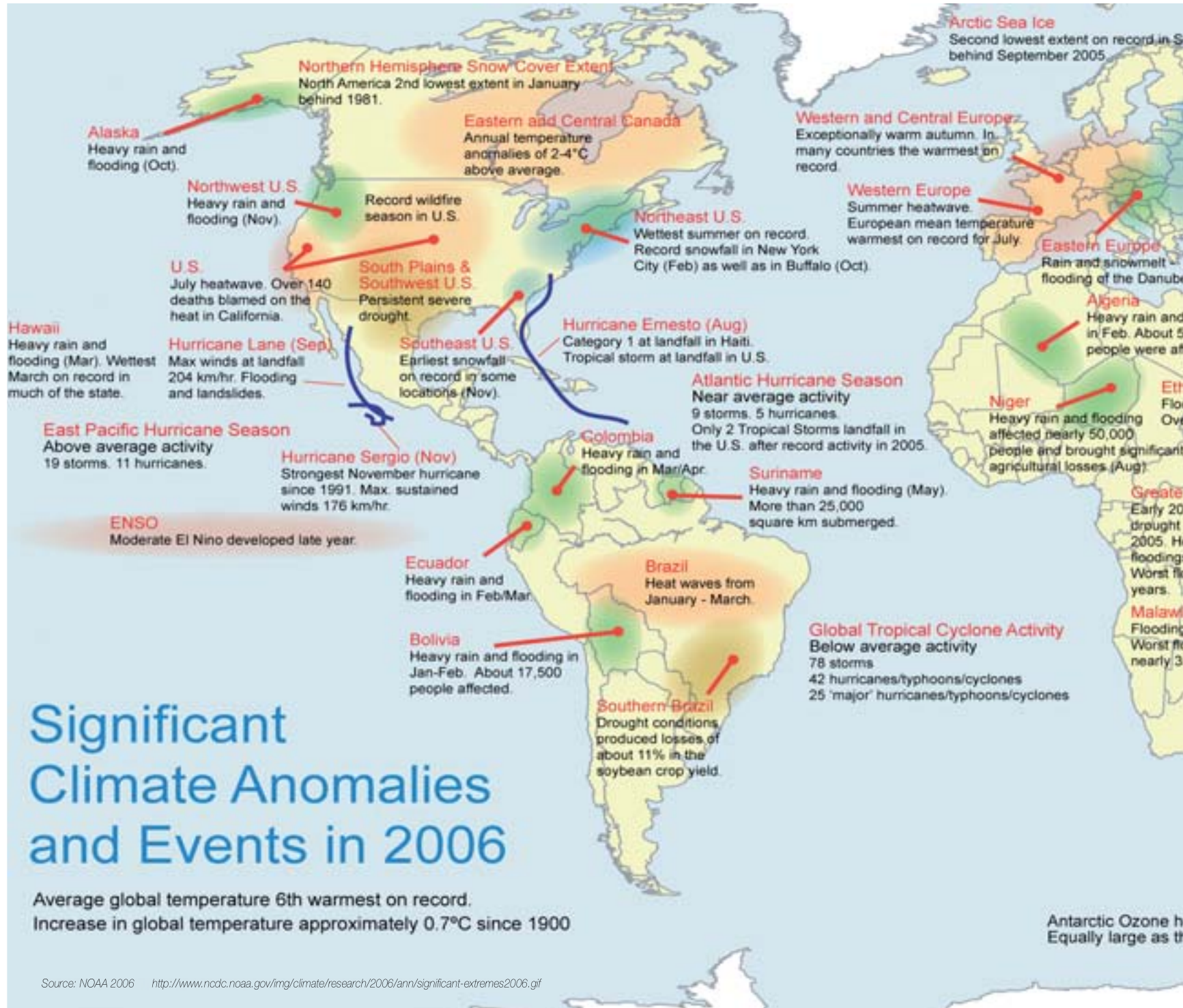
Seabird by-catch is a problem associated with illegal, unreported and unregulated fishing.

Source: Graham Robertson/Australian Antarctic Division

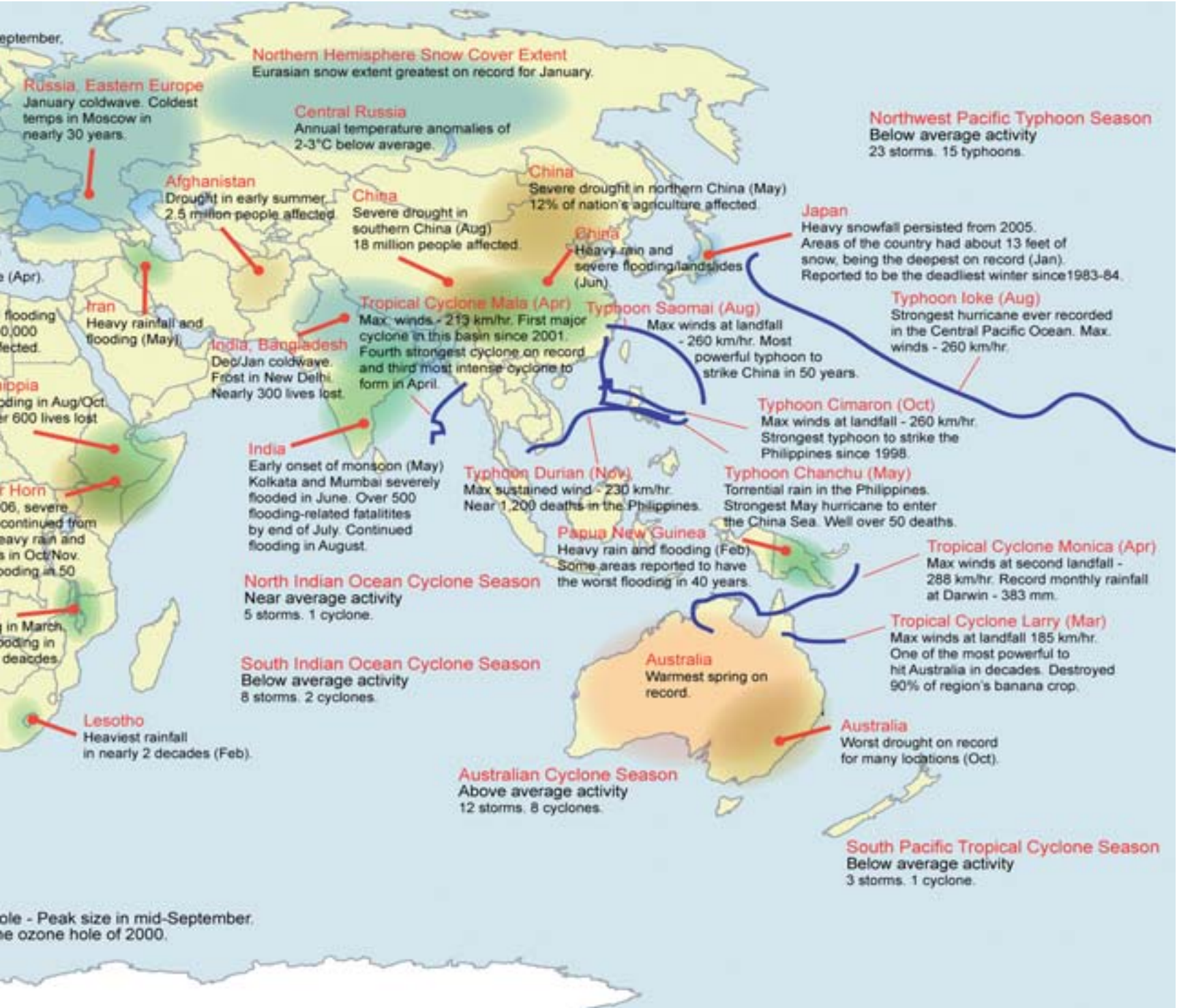
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# 2006 Ongoing trends









## 2007 Ongoing trends

In the tropical Pacific—the section of the ocean between 23 degrees North and 23 degrees South—trade winds blow from east to west. The winds push sun-warmed surface water away from the South American coast that then accumulates in a deep pool of warm water east of Indonesia. Along

the South American coast, cold water from the deep rises to the surface like a conveyor, replacing the warm water. As a result, tropical waters in the eastern Pacific are usually cooler than those of the western Pacific.

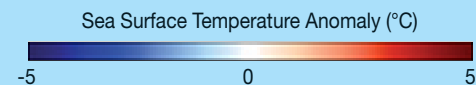
But every few years, the trade winds grow weak and warm water is no longer pushed west. The

western Pacific cools, while the eastern Pacific warms. This distinctive reversal in the Pacific's temperature pattern is called El Niño. The last strong El Niño occurred in 1998 while 2002/3 saw a moderate event that puzzled researchers with its unpredictability (NASA 2006a, NASA 2003).

### El Niño Chills the Western Pacific Ocean

Satellite measurements of sea surface temperatures in the tropical Pacific revealed a clear El Niño pattern in November 2006 as seen in the image to the right. Warmer-than-average sea surface temperatures, shown in red, stretch away from the South American coast, while cooler surface temperatures, shown in blue, concentrate around Indonesia and Australia (NASA 2006a).

November 2006



At the end of 2006, East Africa suffered unusually heavy rainfall. Floods swept across the region, affecting up to 1.5 million people in Somalia, Ethiopia, Kenya, and parts of surrounding countries. At the same time, Indonesia and Australia fought back widespread fires, fueled in part by unusually dry conditions. Parts of Australia have been experiencing a

severe drought since 2002 and the cumulative effect of the current El Niño weather is enhancing the dry spell.

These changes in the atmosphere and the ocean set off a string of unusual weather patterns around the globe that move from east to west over a period of 9 to 24 months. Besides the drought in Australia and Indonesia and the high rainfall in East Africa, the El Niño is

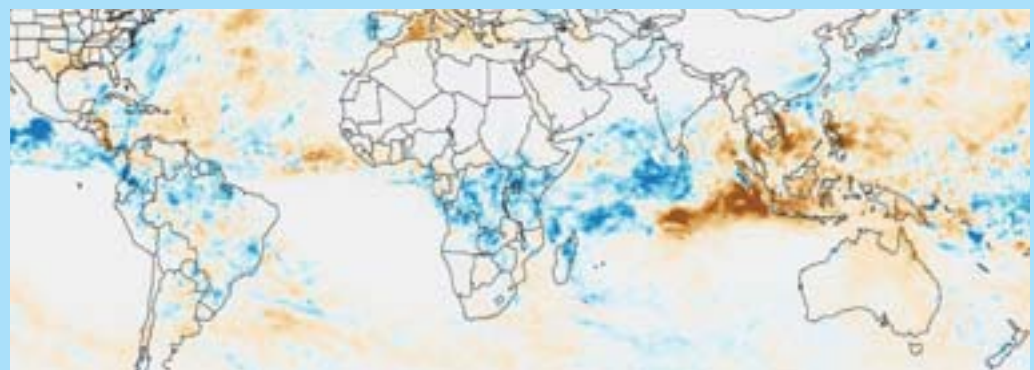
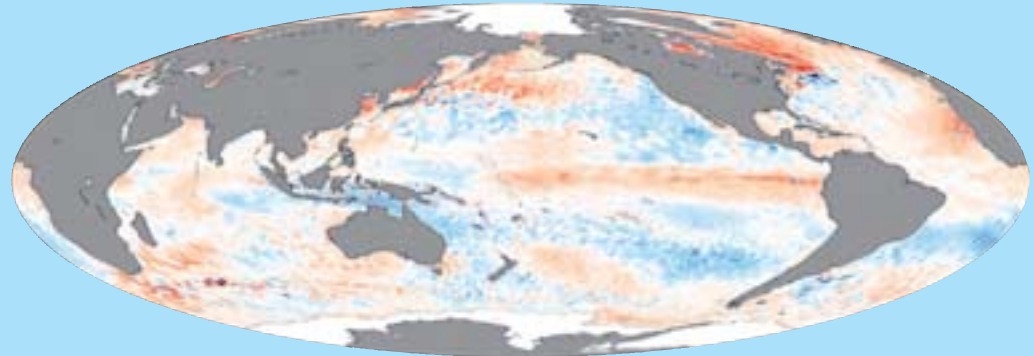
expected to eventually bring a low hurricane season to the Atlantic and heavy rainfall to the west coasts of the Americas (IRI 2006).

With the warming trends currently underway, and the last moderate-to-strong El Niño producing the global record-breaking weather of 1998, 2007 will likely be a year of very high temperatures.

### El Niño and Rainfall

Measurements taken by the Tropical Rainfall Measuring Mission satellite provide data for the image of the Indian Ocean region. Areas of dark brown over Indonesia and Southeast Asia show that these regions received much less rain than normal during November 2006, while blue over East Africa reveals higher-than-average rainfall totals. Australia is light brown, indicating shortages of a few millimeters per day (NASA 2006b).

November 2006



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