Arctic Bulletin

No 1.08 • PUBLISHED BY THE WWF INTERNATIONAL ARCTIC PROGRAMME

Oil spill could spell disaster p. 16–17

Contents

The **Arctic Bulletin** is published quarterly by the WWF International Arctic Programme. Reproduction and quotation with appropriate credit are encouraged. Articles by non-affiliated sources do not necessarily reflect the views or policies of WWF. Send change of address and subscription queries to the address on the right. We reserve the right to edit letters for publication, and assume no responsibility for unsolicited material. Please include name, title and, address with all correspondence.

Publisher:
WWF International
Arctic Programme
PO Box 6784
St Olavs plass
N-0130 Oslo, Norway
Ph: +47 22 03 65 00
Fax: +47 22 20 06 66
Internet: www.panda.org/arctic

Programme Director:
Neil Hamilton
nhamilton@wwf.no

Editor:
Nigel Allan
nallan@wwf.no

Associate editor:
Emma Duncan

Design and production:
Film & Form/Ketill Berger
ketill.berger@eunet.no

Date of publication:
February, 2008
ISSN 1023-9081

Cover: An oil field worker is dressed for the cold. Endicott Island, Prudhoe Bay, Alaska. Photo: Bryan and Cherry Alexander/ www.arcticphoto.com

Printed at Merkur-Trykk AS on 100% recycled paper.

Editorial

Oil – a dark future for the Arctic?

As evidenced by the number of articles in this issue of the Arctic Bulletin describing the threat it poses, oil is an arctic issue that is beginning to take on larger proportions, and manifest much sooner, than most of us expected.

This threat was highlighted at the second Arctic Frontiers conference (www.arctic-frontiers.com) in Tromsø, Norway, somewhat appropriately entitled *Out of the Blue*, from which I have just returned. This conference is becoming one of the leading arctic science–policy interfaces, and this year was the venue for the launch of the Arctic Monitoring and Assessment Programme's (AMAP; a working group of the Arctic Council) *Oil and gas assessment 2007* (www.amap.no/oga) — the first really big assessment to be released since the Arctic Climate Impact Assessment in 2004.

What made this so important?

Firstly, it illustrated the fragility of the Arctic Council process, as both the lead up to and the release of the report were subject to internal disagreements about recommendations and the relative roles of the Arctic Council Senior Officials and the Working Groups. However flawed one might think the Council may be, it is a critically important venue for dialogue and interaction between almost all of the major arctic stakeholders. Making it work more effectively is important so that such disputes do not grow into significant issues for member countries and indigenous peoples.

Secondly, it brought into the open the enormous pressure that oil and gas exploitation will place on the Arctic. The Assessment outlines the dramatic impact that past oil and gas activities have had on the environment, particularly in terrestrial environments in Russia, and concludes that a great deal more oil and gas activity is expected in the Arctic — with the potential for significant risks, and major impacts. If I read it correctly, a spill frequency / volume graph in the Assessment shows that there could be a tanker spill the size of the *Exxon Valdez* spill (35,000 cubic metres) every year. To my mind that is unacceptable.

The Assessment, and many speakers at the conference itself, repeatedly made a critical point: there is simply no way that we can clean up a spill in icy waters, due to technological inadequacies, weather, poor light, and of course, ice. Arctic marine conditions contribute to an oil spill "response gap" that effectively limits the ability to clean up after an oil spill. A new peer-reviewed report commissioned by WWF and released at the Arctic Frontiers conference, *Oil spill response challenges in arctic waters* (see *Oil spill challenges in arctic waters* on page 16–17), concludes that the only way to avoid the potentially devastating environmental risks is to ensure that no more of the Arctic is opened up to oil development until the response gap is closed. WWF has therefore taken the unusual step of calling for a complete moratorium on all new oil and gas development in the Arctic marine environment, until this has occurred.

Dr NEIL HAMILTON
Director,
WWF International Arctic Programme
nhamilton@wwf.no

It is arguably unfair to criticise the Assessment for failing to address the impacts of climate change on oil and gas operations in the Arctic, or failing to make the link between arctic oil and gas and climate change. However these are no longer academic arguments. There are direct links in both cases that need to be considered. There are also direct links between oil and gas operations and the destruction of the habitat of endangered or threatened species.

An example of the latter is the proposed release by the US government of a huge area of the Chukchi Sea — over 120,000 square kilometres of prime polar bear habitat — for oil and gas exploitation, in spite of the imminent and almost certain listing of the polar bear under the US Endangered Species Act (ESA). One can only surmise why the announcement of the ESA listing has been delayed by one month, in defiance of US law, until one day after the lease sale on 6 February (see *US delays decision on polar bear protection* on page 6–7). The polar bear's existence is increasingly threatened by the impact of climate change-induced loss of sea ice. The chances for the continued survival of this icon of the Arctic will be greatly diminished if its remaining critical habitat is turned into a vast oil and gas field.

NEW WWF FACT SHEETS: CLIMATE CHANGE AND ARCTIC ECOSYSTEMS

Five new fact sheets from WWF provide an overview of the effect that climate change will have on fauna and flora in the Arctic. The fact sheets look at the impact on birds, vegetation, polar bears, fish and reindeer. One of the common effects of climate change that the fact sheet highlight is that species will try and adapt by moving to cooler climates – either north or to higher altitudes. Factors like life span, reproductive cycles, and competitive species determine whether they can move quickly enough and hold on to the new environment. However there is eventually a limit to how far species can go to escape the warming climate. They are available in English and Norwegian and can be downloaded from www.panda.org/arctic/publications

NOBEL PRIZE FOR CLIMATE CAMPAIGNERS

Nobel Peace Prize Laureates of 2007, Al Gore and the Intergovernmental Panel on Climate Change (IPCC), represented by its chairman, R. K. Pachauri, were honoured at a ceremony at the Oslo City Hall in Norway on 10 December. Al Gore and the IPCC share the prize for their efforts to build up and disseminate greater knowledge about human-caused climate change and to lay the foundations for the measures that are needed to counteract such change. R. K. Pachauri said: "Neglect in protecting our heritage of natural resources could prove extremely harmful for the human race and for all species that share common space on planet Earth." Hans Verolme, director of WWF International's Climate Change Programme, said: "The award of this Nobel Peace Prize is clear recognition for the growing global movement to stop climate change."

Oil threat off Kamchatka

Plans for exploratory drilling for oil on the Western Kamchatka shelf in the Russian Far East pose a significant threat to important fish stocks in the region.

WWF and other environmental NGOs in Russia wrote a joint letter to Russian Prime Minister, Victor Zubkov, to express

Norwegian oil spill highlights need

A shipping accident in the cold waters off Norway in December 2007 resulted in what may be the second-largest oil spill in the country's history.

The incident occurred during the transfer of crude oil from a loading buoy to a tanker near an offshore oil platform known as Statfjord A. The platform is located 370 kilometres from the Norwegian town of Bergen, a popular coastal tourist destination.

The spill of around 530,000 litres of oil once again highlights the need for shipping safety and prevention of oil spills that threaten marine environments around the globe.

Seabirds concentrating in the area at this time of year include northern fulmars and murres, though it is not yet known whether they or other wildlife species have been impacted.

Statfjord is among the largest and oldest Norwegian offshore oil fields. At the time of the accident, weather conditions were normal for this time of year, with a strong wind of 30 knots (moderate gale).

Rasmus Hansson, CEO at WWF-Norway said: "There are no guarantees against oil spills. Because of this fact, the petroleum industry must never be allowed access to coastal areas such as the Lofoten and Vesteralen archipelagos north of the Polar Circle or other vulnerable areas along the Norwegian coast."

The fragile arctic environment is particularly at risk as the often extreme conditions can make any oil spill clean

CREDIT: Igor Shpilenok/www.shpilenok.com

WWF and other NGOs are calling on the Russian government to protect important fisheries and wildlife habitats from oil drilling in Kamchatka, Russia.

concern about the extremely high risks that the planned drilling and transportation poses for the marine environment and the local fishing industry.

Alexei Knizhnikov, oil and gas environmental policy officer at WWF-Russia, said: "Currently there are no technologies in the world that can be considered efficient for cleaning up oil spills in such harsh climate and natural conditions.

"This is one of the reasons we are so sure that all areas important for fishing should be completely closed to oil exploration developments."

The Western Kamchatka shelf lies in the Sea of Okhotsk, which is ice-covered for large parts of the year.

WWF is calling for marine protected areas to be established by the end of 2008 in ecologically and economically valuable parts of the western Kamchatka shelf. Some of these areas might be multiple use zones where fishing and other sustainable activities are permitted but oil development would be prohibited.

Konstantin Zgurovsky, marine programme coordinator at WWF-Russia, said: "In our opinion areas like Western Kamchatka require special protection because of their extremely high biological productivity.

"Almost 25 percent of Russia's total national catch of fish and other marine resources come from Western Kamchatka, and the special status of such important areas should be legally recognised."

In the letter, NGOs call for the development and introduction of a law that sets priorities for sustainable use of marine biological resources in these areas, and limits other economic activities which pose a threat to the environment and to fish resources that are so important for food safety in Russia.

Konstantin Zgurovsky
Head of Marine Programme
WWF-Russia
kzgurovsky@wwf.ru

Alexey Knizhnikov
Oil and Gas Environmental Policy Officer
WWF-Russia
aknizhnikov@wwf.ru

for shipping safety in the Arctic

up almost impossible (see *Oil spill challenges in arctic waters*, page 16–17).

Tor Traasdahl
Head of Communications
WWF-Norway
ttraasdahl@wwf.no

CREDIT: Kystverket

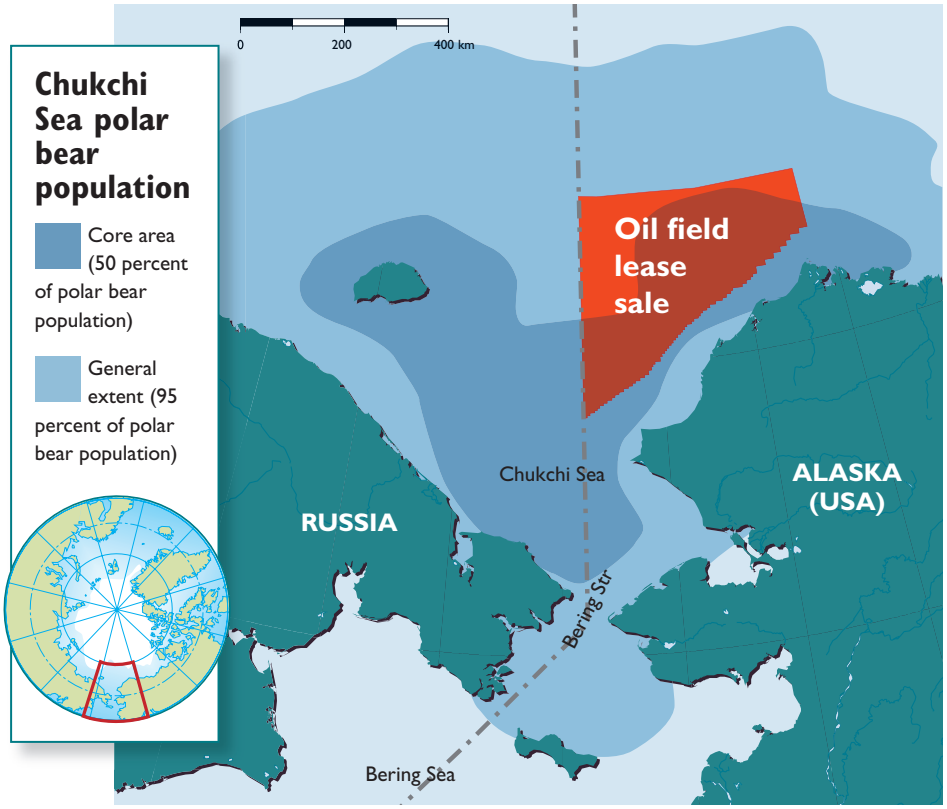
An oil spill occurred during the transfer of crude oil from a loading buoy to a tanker near an offshore oil platform known as Statfjord A (pictured), 370 kilometres from the Norwegian city of Bergen.

GLOBAL ENERGY ALERT TO AVERT MELTDOWN

The International Energy Agency's (IEA) annual report for 2007 focused on the impact of China and India on international energy markets and the need for the global community to increase cooperation with these nations. Nobuo Tanaka, executive director at IEA, said: "The Outlook demonstrates more clearly than ever that, if governments don't change their policies, oil and gas imports, coal use and greenhouse gas emissions are set to grow inexorably through to 2030 – even faster, in fact, than in [the 2006] Outlook." According to Tanaka, these trends would threaten energy security and accelerate climate change. Neil Hamilton, director at the WWF International Arctic Programme, said: "Such a future assures the melting of the arctic polar sea ice, and may have drastic consequences for both the Greenland ice sheet and the enormous carbon stores currently locked up in permafrost. Other futures are possible, and indeed necessary for the sustainable future of the planet."

CANADA KEEPS WATCH OVER ARCTIC

A Canadian satellite, the Radarsat-2 was launched into space aboard a Russian Soyuz rocket from Kazakhstan in mid December 2007. The radar satellite will primarily assist with environmental monitoring for resource management as well as monitor sea ice. But the Radarsat-2 will also help Canada to monitor traffic in arctic waters and will pass over the Canadian Arctic three times a day. Colin Carrie, parliamentary secretary to the Canadian Minister of Industry, said: "This satellite will help us vigorously protect our arctic sovereignty as international interest in the region increases." There has been increased interest in arctic territory as declining sea ice may make oil and gas and shipping routes more accessible.



Source: U.S. Department of the Interior Minerals Management Service Alaska OCS Region. Alaska Center for the Environment
Map outline: OMC – Martin Weinelt. Map design: Ketill Berger, Film & Form

US delays de

The US Fish and Wildlife Service (USFWS) announced on 7 January that it would delay by up to one month a final decision on whether to list the polar bear as threatened under the US Endangered Species Act.

Dr Sybille Klenzendorf, director of the species programme at WWF-US, said: "The delay in this important decision is frustrating. A compelling body of cutting-edge science and our projects on the ground tells us that polar bears already face a tentative future — we see no reason to postpone this decision."

Meanwhile, the US Department of Interior (DOI) has issued its Final Notice of Intent to open over 120,000 square kilometres of the pristine Chukchi Sea to oil and gas

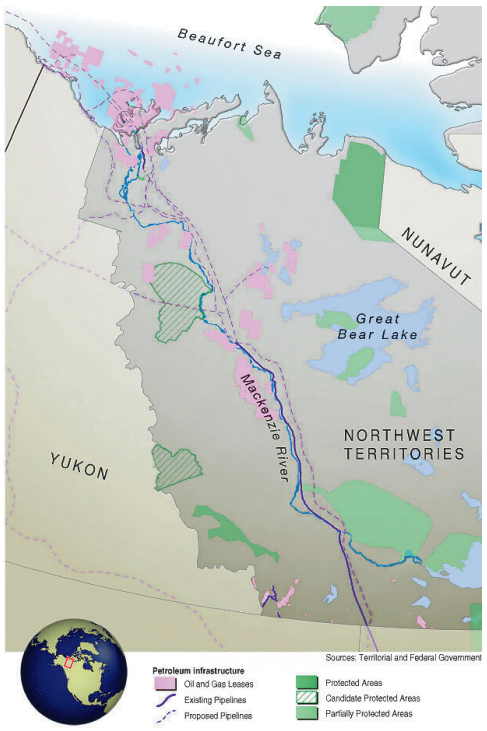
Hearings conclude for proposed gas

The final hearings into the proposed Mackenzie Gas Project (MGP) wrapped up in Inuvik, Northwest Territories (NWT), Canada in late November 2007.

After 115 days of hearings in 26 communities across the NWT, the Joint Review Panel, a seven-member body, will now write its report on the potential environmental and social impacts of a pipeline that would channel natural gas from the Beaufort Sea, down the Mackenzie Valley, and into southern Canada and the US. If it goes ahead, it will be the largest industrial project in Canadian history.

Monte Hummel, WWF-Canada's President Emeritus, and Stephen Kakfwi, former Premier of the Northwest Territories, delivered closing remarks for WWF — a fitting end to the proceedings as both men have been part of the pipeline debate since the project was first proposed in the 1970s.

Hummel and Kakfwi told the panel that preparations are still inadequate. They recommended that:



Map of current and proposed oil and gas developments in Canada's Mackenzie Valley, one of the main sites for development of fuels extraction in North America. Activities, including the development of pipelines, impact indigenous peoples as well as sensitive habitats

MAP: Hugo Ahlenius, UNEP/GRID-Arendal

1. the MGP should not be approved until all the areas currently under consideration by the Northwest Territories Protected Areas Strategy have been moved to at least five-year interim protection; and

2. all the conservation and

cision on polar bear protection

activities. The Chukchi Sea separates northwestern Alaska from northeastern Siberia and, along with the Beaufort Sea, supports an estimated one-fifth of the world's polar bear population.

If the polar bear is listed, USFWS is required to designate critical habitat for the bear, which may include the same waters contained in Chukchi Sea Lease Sale.

Margaret Williams, managing director of WWF's Kamchatka and Bering Sea Programme, said: "The polar bear's existence is increasingly threatened by the impact of climate change-induced loss of sea ice. The chances for the continued survival of this icon of the Arctic will be greatly diminished if its remaining critical habitat is turned into a vast oil and gas field."

Brendan Cummings of the Center for Biological Diversity said: "The polar bear is in need of intensive care, but with this lease sale the Bush administration is proposing to burn down the hospital."

Experts believe that two-thirds of polar bear populations could be lost by 2050. The scientific evidence is clear that polar bears are threatened by climate change-induced loss of sea ice.

Margaret Williams added: "The US, one of the leading producers of carbon emissions, should be showing leadership in protecting species that are impacted by climate change.

"WWF hopes the final USFWS decision favours a listing of polar bears as threatened, which will in turn allow for a suite of activities to be implemented. We need that to happen as soon as possible."

Trishna Gurung
Media Relations Officer, WWF-US
trishna.gurung@wwfus.org

pipeline

special management areas recommended in the Sahtu and Dehcho land use plans should similarly be provided with at least interim protection, preferably through approval of the plans themselves.

Justice Thomas Berger, former commissioner of the Mackenzie Valley Pipeline Inquiry in the late 1970s, concluded then that the pipeline should not be built until certain crucial preparations were made.

Interim protection similar to the large land withdrawal recently announced by the Canadian government (see page 8-9) would assure enough time to properly assess the value of potential conservation areas before they are exposed to the impacts of development. This is consistent with WWF's principle of 'Conservation First'.

The MGP Joint Review Panel's report is not expected before the second half of 2008.

Rob Powell
Director, Mackenzie River Basin
WWF-Canada
rpowell@wwfcanada.org

US-Russia polar bear treaty ratified

The US and Russia have ratified a bilateral agreement for the long-term conservation of the shared population of polar bears in Alaska, US and Chukotka, Russia.

The treaty unifies US and Russian management programmes that affect this shared population of bears. Notably, the treaty calls for the active involvement of native people and their organisations in future management programmes. It will also enhance such long-term joint efforts as conservation of ecosystems and important habitats, harvest allocations based on sustainability, collection of biological information, and increased consultation and cooperation with state, local, and private interests.

Margaret Williams, managing director of the WWF Bering Sea-Kamchatka Ecoregion Programme, said: "WWF is pleased that this treaty will finally go into effect and formalise the increasing cooperation between US and Russian management agencies, scientists, and native communities in an effort to conserve our shared population of polar bears,"

"With the rapid decline of arctic sea ice, now more than ever, we need to work together to ensure that polar bears have a chance to survive difficult times ahead."

CREDIT: WWF-Canon/Wim Van Passel

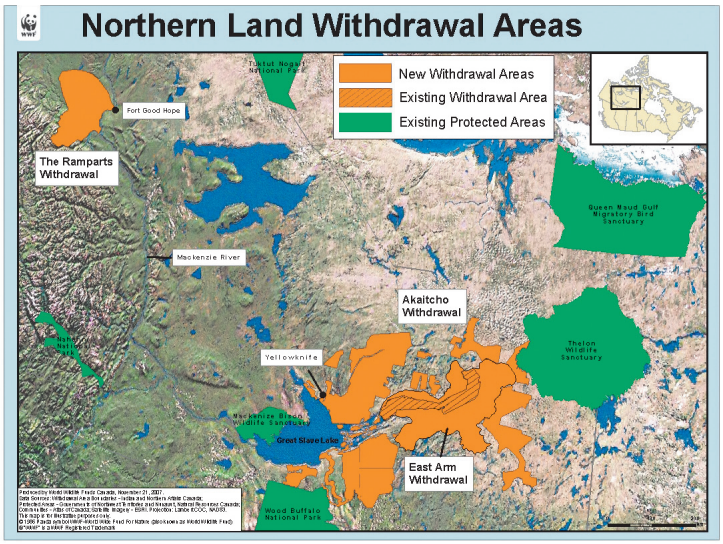
The US recently ratified a treaty with Russia on the coordinated management of the Chukchi Sea polar bear population

The US and Russia share the Chukchi Sea sub-population (around 2,000 bears), and the US also shares the southern Beaufort Sea population (around 1,500 bears) with Canada.

"While we are very pleased the treaty is coming into effect and support its goals, we urge the US government to take more courageous and bold actions to address the factor now widely recognised as the source of global climate change and resulting warming in the polar bears' arctic habitat: CO_2 emissions," Williams added.

Nigel Allan
nallan@wwf.no

Canada protects largest area ever from ind



CREDIT: WWF-Canada/Monte Hummel

Over 100,000 square kilometres of pristine wilderness in the Mackenzie River Basin in Canada's Northwest Territories (NWT) have been protected from industrial development.

This withdrawal of land and water from industrial activity, announced by the Government of Canada, was made at the request of local First Nations communities. The interim protection, for a period of four to five years, will allow local people to plan areas for permanent protection around Great Slave Lake and along a northern stretch of the Mackenzie River in the NWT.

This is excellent news for an area facing accelerating industrial activities such as the Mackenzie Gas Project (see *Hearings conclude for proposed gas pipeline* on pages 6–7) and unprecedented uranium exploration east of Great Slave Lake.

These areas are culturally significant to the First Nations who call this area home. They are also significant for the wildlife in the region, including barren-ground caribou, wolves, lynx, grizzly bears, moose, and huge populations of migratory ducks, geese, swans, shorebirds, and loons.

Monte Hummel, president emeritus of WWF-Canada, said: "This maintains options for protection on a national and international scale, and as such, goes a long way to strengthen Canada's North."

Rob Powell, director of WWF's Mackenzie River Basin Programme, said: "I think the real significance of the announcement is that First Nations' wishes to put conservation first are finally being acted upon up front in the development process when conservation can still make a difference."

WWF-Canada has been engaged in supporting community-initi-

Members of The 1001: A Nature Trust commit to

Several members of The 1001: A Nature Trust committed to safeguarding the fragile arctic environment from ever increasing human-induced threats, following a 10-day field trip to the high Arctic.

In addition to pledging their support to WWF activities in the Arctic, the high-level donors offered their expertise, experience, and contacts to help influence those who can make a real difference.

The field trip, which was organised by the secretariat of The 1001: A Nature Trust at WWF International and PolarQuest, took place from 14–23 July 2007. Eleven members of The 1001 from Canada, Denmark, India, Norway, and Switzerland participated in the trip with their families. The group navigated the Svalbard archipelago, which is situated 700 kilometres north of Norway, aboard a small expedition vessel.

Accompanied by Dr Neil Hamilton, director of the WWF International Arctic Programme, and several specialists in the flora and fauna of the region, they learned about WWF activities and observed a wide range of arctic wildlife, including polar

CREDIT: Vera Simonsson/PolarQuest

Members of The 1001: A Nature Trust get up close to a glacier in Svalbard.

dustrial activity

A rainbow appears over the proposed East Arm Naional Park, Northwest Territories, Canada. This area is part of an expansive region to be given interim protection for up to five years while planning takes place for permanent protection

ated proposals for protected areas in northern Canada for over ten years. This project was developed along with other national conservation groups including the Canadian Boreal Initiative, Ducks Unlimited, and the Canadian Parks and Wilderness Society, with lead support from the US-based PEW Charitable Trusts.

Josh Laughren
Director, Communications
WWF-Canada
jlaughren@wwfcanada.org

preserving the Arctic

bears, seals, and walruses.

Jamshyd Godrej, former Chair of WWF-India and Vice-President at WWF International, and a member of The 1001: A Nature Trust since 2005, said: "To witness the effects of climate change first hand, see the threats to the Arctic, and experience the special significance of this region to global climate, was most memorable."

Established in 1971 by H.R.H. Prince Bernhard of the Netherlands and 1000 influential members of the international community, The 1001: A Nature Trust is an endowment fund that aims to help WWF finance its core activities. Members of The 1001 come from all walks of life and represent over 50 countries worldwide. The group not only supports WWF financially, but also intellectually and politically as an international network and forum for the exchange of ideas about conservation and sustainable development.

Frédérique Walthert
Manager, The 1001 A Nature Trust
WWF International
fwalthert@wwfint.org

CREDIT: Bryan & Cherry Alexander/www.arcticphoto.com

Aerial view of snow covered boreal forest in Labrador, Canada. A recent study suggests that boreal forest is the largest land reservoir of carbon in the world.

Boreal forest is world's carbon vault

Breakthrough maps released at the United Nations Conference on Climate Change meeting in Bali, Indonesia, in December 2007 illustrate the vastly important role of Canada's boreal forest as the world's largest terrestrial carbon storehouse.

Jeff Wells, senior scientist at the International Boreal Conservation Campaign (IBCC), an initiative of the Pew Environment Group, said: "The boreal forest is to carbon what Fort Knox is to gold. It's an internationally important repository for carbon, built up over thousands of years. The maps document where and how these vital carbon reserves are distributed across Canada. We should do everything we can to ensure that the carbon in this storehouse is conserved."

Making up 50 percent of the world's remaining original forests and stretching across Canada, Alaska, Russia, and Scandinavia just below the Arctic, boreal forest houses 22 percent of the total carbon stored on the world's land surface, making it the largest land reservoir of carbon. This is largely because the colder temperatures in boreal climates reduce decomposition rates, resulting in deep organic soils that are thousands of years old.

Scott Goetz, senior scientist at Woods Hole Research Centre, said: "The mapping analysis provides vital information to inform modeling of the role of boreal and arctic ecosystems and their feedbacks to the global climate system."

Canada's boreal forest stores an estimated 186 billion tonnes of carbon in its widespread forest and peatland ecosystems — the equivalent of 27 years' worth of global carbon emissions from the burning of fossil fuels.

Global Forest Watch Canada compiled the detailed analysis for the IBCC after reviewing extensive government and scientific data of the region.

The full mapping analysis available at: www.interboreal.org/globalwarming/

Source: International Boreal Conservation Campaign

Record sea ice decline opens Northwest Passage

Arctic sea ice once again set a new record in September 2007 when it shrunk to the lowest area recorded since satellite measurements began in 1979. This event was made even more significant by the European Space Agency's (ESA) announcement that the Northwest Passage — the historically impassable sea route through the Arctic Ocean along the northern coast of North America — was temporarily ice free.

Leif Toudal Pedersen from the Danish National Space Centre said: "We have seen the ice-covered area drop to just around three million square kilometres, which is about one million square kilometres less than the previous [record lows] of 2005 and 2006. There has been a reduction of the ice cover over the last 10 years of about 100,000 square kilometres per year on average, so a drop of one million square kilometres in just one year is extreme.

"The strong reduction in just one year certainly raises flags that the ice (in summer) may disappear much sooner than expected and that we urgently need to understand better the processes involved."

Arctic sea ice area is at its lowest in September, after the end of the northern summer. The ice then begins to grow again to its maximum yearly surface area the following April. However, over the last 30 years the average sea ice area has steadily declined.

The decline in arctic sea ice in recent years has outpaced the predictions of the Intergovernmental Panel on Climate Change's (IPCC) assessments, and researchers now speculate that the arctic summer may be free of sea ice much sooner than thought.

Nigel Allan
nallan@wwf.no

ARCTIC SEA ICE LOSS COMPARED TO IPCC MODELS

Arctic sea ice extent loss to September 2007 compared to IPCC modelled changes using the SRES A2 CO_2 scenario (IPCC high CO_2 scenario). September loss data from satellite observations. Data smoothed with a 4th order polynomial to smooth out the year-to-year variablility.

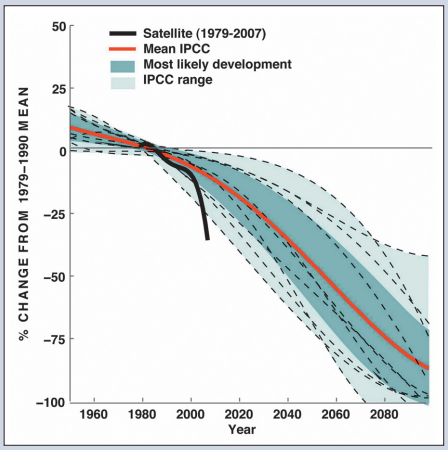


Chart courtesy Dr. Asgeir Sorteberg, Bjerkenes Centre for Climate Research and University Center at Svalbard, Norway. Date: 23 September 2007
www.carbonequity.info/images/seaice07.jpg

Norwegian company joins Climate Savers

Spitsbergen Travel in Longyearbyen, Svalbard, is the first Norwegian company to sign an agreement with the WWF Climate Savers scheme, which commits companies to reduce their greenhouse gas emissions.

Spitsbergen Travel has committed to reduce the company's CO_2 emissions by 16,867 tonnes in the period 2008–2013. This cut equals a reduction of about 2,800 tonnes per year, equivalent to the annual emissions of 6,000 cars. By 2013, Spitsbergen Travel's emissions shall be seven percent less than in 2005. The agreement also commits the company to become climate neutral by 2010.

Norway's total greenhouse gas emissions in 2006 were eight percent higher than those in 1990. This is in complete contradiction to the country's Kyoto Protocol commitment, under which Norway's emissions in the period 2008–2012 were supposed to be no more than one percent higher than those in1990.

Rasmus Hansson, CEO at WWF-Norway, said: "WWF's cooperation with industry to achieve emission reductions shows that it is possible to make fast and substantial cuts if the will is there. It is worrying that, as a country, Norway is heading in the opposite direction. With the current policies, Norway will reach record-high emissions this year."

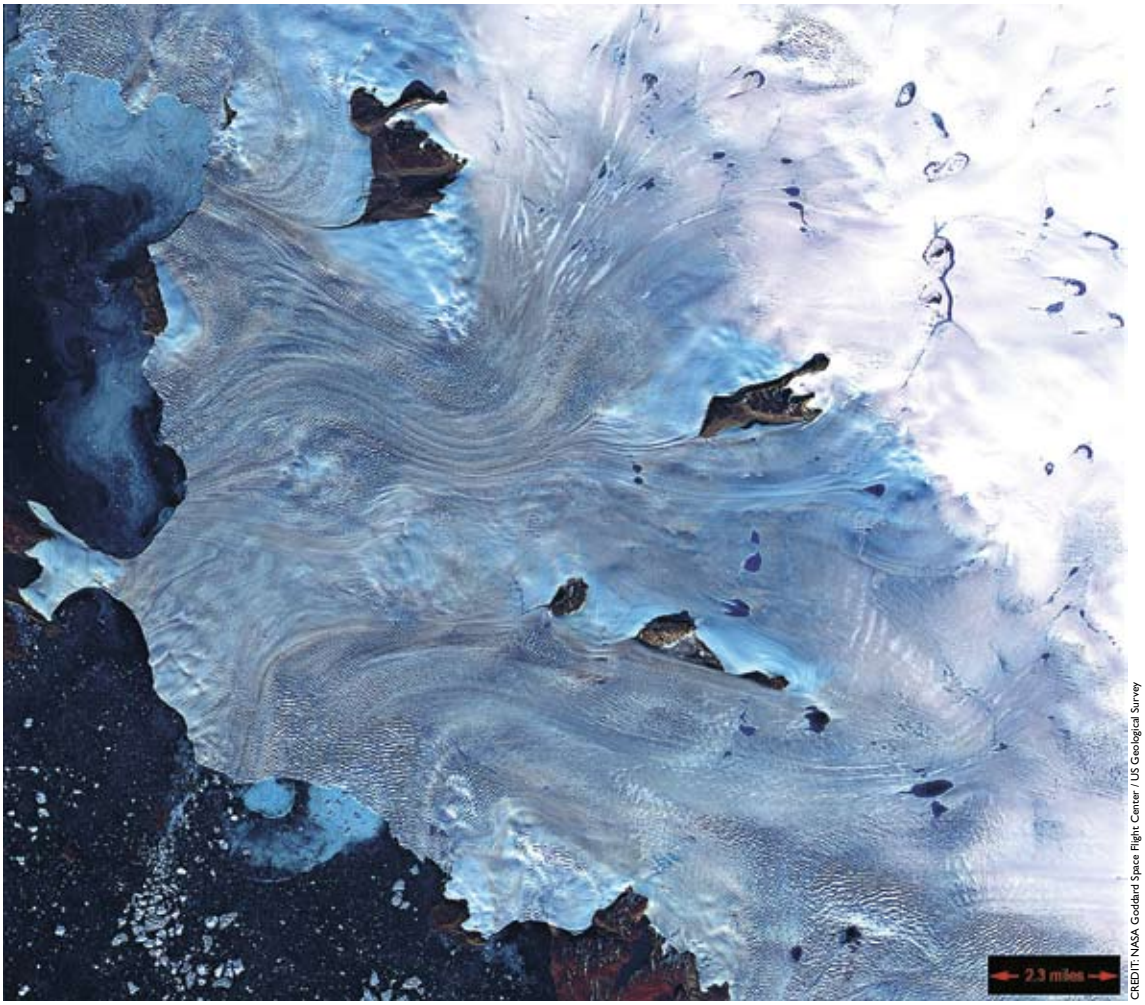
Oliver Rapf, head of WWF's business and industry engagement on climate change, challenged other players in the tourism industry, and particularly Spitsbergen Travel's parent company, Hurtigruten, to tackle their emissions and also become "Climate Savers".

WWF's Climate Savers was founded in 1999 and currently comprises 14 major companies that are working to reduce their collective CO_2 emissions by over 10 million tonnes by 2010.

Nokia, the Finnish multinational mobile phone manufacturer also recently signed on to the Climate Savers scheme.

More information on Climate Savers: www.panda.org/climate-business

Tor Traasdahl
Head of Communications
WWF-Norway
ttraasdahl@wwf.no



CREDIT: NASA Goddard Space Flight Center / US Geological Survey

Glaciers surround Baffin Bay on the West coast of Greenland.

Record Greenland ice melt

The total area of surface melt on the Greenland ice sheet in 2007 broke the previous summer melt record, set in 2005, by 10 percent. The maximum melt extent in 2007 was 685,000 square kilometres, making it the largest melt ever recorded since satellite measurements began in 1979, according to a University of Colorado at Boulder (CU-Boulder) climate scientist.

Speaking at a meeting of the American Geophysical Union in December, Professor Konrad Steffen, director of the Cooperative Institute for Research in Environmental Sciences at CU-Boulder, said that melting increased by about 30 percent for the western part of Greenland from 1979 to 2006.

Although the Greenland ice sheet has been thickening at higher elevations due to increases in snowfall, the gain is more than offset by an accelerating mass loss, primarily from rapidly thinning and accelerating outlet glaciers.

Steffen said: "The amount of ice lost by Greenland over the last year is the equivalent of two times all the ice in the Alps, or a layer of water more than 800 metres deep covering Washington, D.C."

The Jacobshavn Glacier on the west coast of the ice sheet, a major outlet glacier draining roughly eight percent of the Greenland ice sheet, has sped up nearly twofold in the last decade. Nearby glaciers showed an increase in flow velocities of up to 50 percent during the summer melt period as a result of melt water draining to the ice-sheet bed.

Steffen said: "The more lubrication there is under the ice, the faster that ice moves to the coast. Those glaciers with floating ice 'tongues' also will increase in iceberg production."

Steffen said the ice loss trend in Greenland is somewhat similar to the trend of arctic sea ice in recent decades. In October, CU-Boulder's National Snow and Ice Data Center reported the 2007 arctic sea-ice extent had plummeted to the lowest levels since satellite measurements began in 1979, and was 39 percent below the long-term average tracked from 1979 to 2007.

Air temperatures on the Greenland ice sheet have increased by about 3.8 degrees Celsius since 1991, primarily a result of the build-up of greenhouse gases in Earth's atmosphere.

See *Greenland's ice giant: window to the past with an unknown future* on page 18–19.

Source: University of Colorado at Boulder

Think twice before ordering fish 'n chips

The "catch of the day" may be gone tomorrow: illegal harvesting of cod and Alaskan pollock from the Barents and Bering Seas threatens the long-term viability of fish stocks. WWF's Mark Burnett **reports on new recommendations to eliminate illegal, unreported, and unregulated fishing in the Arctic.**

CREDIT: Robyn Mackenzie/www.stockxpert.com

A report commissioned by the WWF International Arctic Programme to be published in April 2008 recommends concrete actions that governments, international organisations, the seafood industry, retailers, and seafood consumers can take to stop illegal, unreported, and unregulated (IUU) fishing in arctic waters.

The report focuses on Northeast Arctic cod and Alaskan pollock stocks in the Barents and Bering Seas — among the most productive marine areas in the world, supporting large whitefish stocks and valuable commercial fisheries, and where IUU fishing is one of the most serious and immediate environmental threats.

Illegal fishing in the Arctic is a global problem due to the long international supply chain for Barents Sea cod and Bering Sea pollock. Many countries are involved in the unlawful trade. For example, a Russian boat may catch Barents cod in Norwegian waters, and then land the fish in another European port before onward transport to China for processing. Frozen cod fillets are shipped from China for retail sale in Brazil, Spain, Portugal, and other European countries. Solving this transnational crime problem depends largely on stimulating consumer demand for seafood that is certified as environmentally sustainable through all stages of the supply chain — from sea to plate.

Treating IUU fishing as transnational crime means that governments should start dealing with it in the same way that they approach cross-border crime issues such as drug trafficking, illegal immigration, money laundering, terrorism financing and trafficking in persons. Governments already have effective interagency and international structures in place for handling such issues so that approaching IUU fishing within these existing frameworks has the potential to solve the problem. Best practices in responding to those threats (such as information sharing among government agencies and international law enforcement coordination) should be applied to responding to IUU fishing.

Experience has shown that retailers can play an important role in helping to create demand for sustainable seafood. Several European and US supermarket chains are working to raise consumer awareness of fish sustainability issues

The big fish stocks of the Arctic

Alaskan pollock

Alaskan pollock (also known as walleye pollock) is a member of the cod family. It is the largest fish resource in the world in terms of human consumption, with more than three million tonnes caught each year in the North Pacific from the Bering Sea to the Sea of Okhotsk. Alaskan pollock is commonly used in the fast food industry and in processed, frozen convenience foods such as breaded "fish fingers". It is commonly used in the US for "imitation crabmeat".

Atlantic cod

The Northeast Atlantic and Barents regions together contain the world's largest population of Atlantic cod. By far the largest part of this population is the Northeast Arctic Atlantic cod, (as it is termed by the International Council for the Exploration of the Sea (ICES)), which is found in the Barents Sea. In 2006, ICES estimated the stock size at about 500,000 metric tonnes. As cod stocks elsewhere have dwindled, cod from the Barents Sea has become the key supply for the major markets, especially in the European Union. Fresh and frozen products, including fillets used for the ever-popular "fish 'n chips", and other forms of processed cod are most important in North America and Northern Europe, whereas dried and salted cod products dominate consumption in Southern Europe and Brazil.

Where did that fish come from?

and to promote sustainable seafood. For example, a growing number of supermarkets are stocking fish products bearing the MSC-certified logo — a global environmental standard for sustainable and well-managed fisheries established by the independent, non-profit organisation Marine Stewardship Council. MSC is one of the ways that retailers can help fight IUU fishing while at the same time increasing market share by attracting customers who are inclined to support environmental stewardship through their seafood purchases.

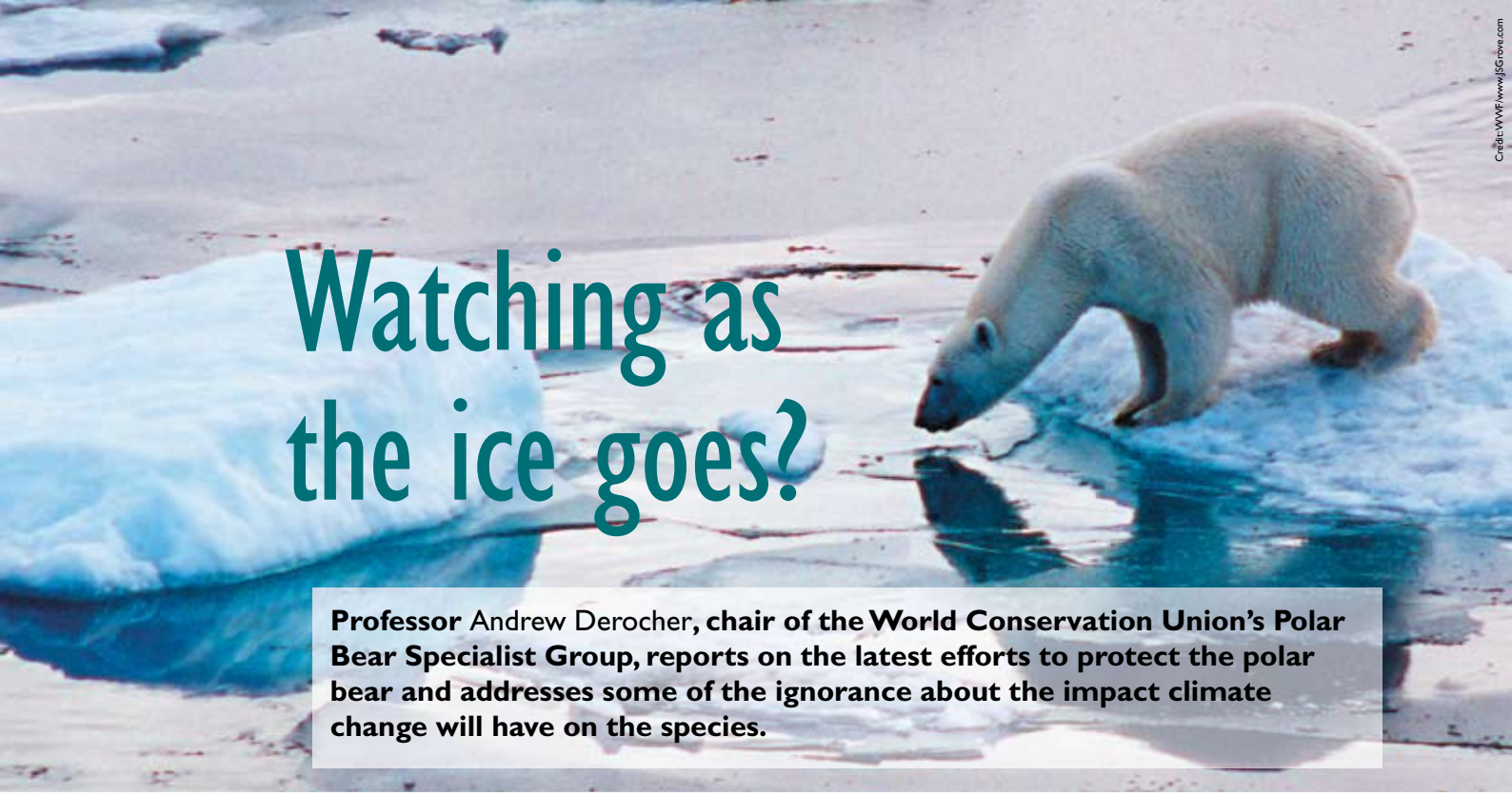
WWF recommends that seafood companies, industry associations, international organisations, and governments consider ways to reveal and publicise bad actors in the fisheries industry. Companies should not trade with known IUU fishing vessels and they should have information about illegal vessels. Industry trade groups in partnership with governments and non-governmental organisations (NGOs) should create and maintain a database of fishing vessels. Port states and the seafood industry can work together to trace the fish supply chain. Governments seeking to improve their nation's global market share of seafood products should create new regulations that define traceability criteria such as labeling and documentation standards.

WWF's report identifies several opportunities within reach, including: vigorous government enforcement of fisheries management legislation; a well-informed seafood consuming public; and a responsible seafood industry that acts in concert with other stakeholders to put cheaters out of business. Recent initiatives by the European Fish Processors and Export/Import Association (AIPCE-CEP) and the Northeast Atlantic Fisheries Council (NEAFC) are positive signs in the international fight against IUU fishing in arctic waters.

Consumer demand can also drive the seafood industry to supply legal fish — so think twice before ordering fish 'n chips or buying fish sticks. Ask your server if the restaurant's fish is MSC-certified (or otherwise guaranteed to come from sustainable sources). Check fish packaging for eco-labeling and if you can't find it, ask the store manager to locate and stock sustainable seafood. Arctic fish will thank you.

The full report will be published in April 2008 and can be downloaded from the WWF International Arctic Programme website: www.panda.org/arctic/publications

Mark Burnett
Barents Sea Officer
WWF International Arctic Programme
mburnett@wwf.no



Watching as the ice goes?

Professor Andrew Derocher**, chair of the World Conservation Union's Polar Bear Specialist Group, reports on the latest efforts to protect the polar bear and addresses some of the ignorance about the impact climate change will have on the species.**

A polar bear on pack ice. Recent reports concluded that a future reduction of sea ice in the Arctic could result in a loss of two-thirds of the world's polar bear population by 2050.

More than ever, the world is watching the Arctic and one of its most famous inhabitants: the polar bear.

The conservation concern for polar bears in the 1960s and 1970s centred on their harvest as well as unease over whether new technologies were putting the bears at risk. This was for good reason. The introduction of high powered rifles, motorised ships, snowmobiles, aircraft, and self-killing guns (a box with a gun inside where a string is tied to a bait on one end and the trigger on the other), combined with the rapid increase in documented harvest, put scientists and managers to work.

In 1973, the International Agreement on the Polar Bear was completed by the five nations with polar bears living in their jurisdiction. The Agreement, while non-binding, resulted in a variety of responses, from a tightening of harvest regulations and quotas in Canada to an outright ban on harvest in Norway. Russia had already acted in 1956 to protect its dwindling stocks and for the most part, harvest there is still limited.

Harvest is no longer considered a major threat to polar bears although some subpopulations still require a reduction in the total kill down to sustainable levels.

Changes in the Arctic seascape brought the signatory nations back together this past summer for the first time since 1981, with polar bears now being scrutinised like never before.

The most recent concern about polar bears stems from a simple reality: their arctic sea ice habitat is rapidly diminishing. The loss of sea ice is attributed to climate warming and the climate warming is attributed to human activities. The fate of polar bears is nothing more, and nothing less, than a habitat loss issue.

The scientific assessments of sea ice trends in the Arctic are definitive: the ice is melting at an alarming rate. The summer melt of 2007 plunged arctic sea ice to the lowest levels seen since satellite measurements began in 1979. After centuries of waiting, the Northwest Passage opened (see *Record sea ice decline opens Northwest Passage* on page 10). While a cause for celebration for international shipping companies, the open water is further evidence of habitat loss for polar bears.

The projections from climate models paint an even grimmer future for sea ice and polar bears. An ice-free Arctic Ocean in the summer is likely well before the middle of this century. Many polar bears retreat northward in summer to remain on the polar pack ice to await the cooling temperatures of autumn so they can return southward to the productive continental shelf areas. An ice-free Arctic Ocean may mean north-bound bears will drown far from land as the ice melts.

Concerns were already growing about polar bears and climate warming in the early 1990s. The symptoms of climate warming affects on polar bears are rapidly increasing, with numerous published accounts of drowning, cannibalism, unusual hunting behaviour, changes in prey species, shifting denning areas, altered distributions, more human-bear interactions, reduced body condition, decline in body length, lower survival rates, lower reproductive rates, and population decline.

Those demanding proof that climate change is affecting polar bears are determined to delay action on climate change until the last wild bear dies. Those proposing that polar bears will miraculously adapt to a life on land demonstrate a lack of understanding of ecology and evolution. Polar bears evolved from their grizzly/brown bear ancestor with changes that include the teeth, claws, fur, colour, skull shape, number of cubs, number of mammary glands, physiology, habitat, behaviour, and, most obviously, diet.

Undoing 200,000 years of evolution for species with a long generation time cannot occur in a span of 100 years or less, which is what is needed for the bears to adapt to the rapid loss of sea ice. The differences in the ecology of polar bears and grizzlies is stunning: northern grizzly bears spend the winter in the relative luxury of their dens while polar bears (except pregnant females) roam the sea ice in search of their fat, rich prey: seals. While polar bears use land in parts of their range, it is only a refuge until the sea ice returns.

To assume that polar bears will adapt to a terrestrial lifestyle is

wishful (and ignorant) thinking: the simple principle of ecology that no two species can occupy the same ecological space (niche) would preclude it. We already have an Arctic terrestrial bear: the grizzly. Reflecting the meagre terrestrial resources at high latitudes, arctic grizzlies are tiny compared to polar bears. The marine ecosystem is rich in fat and polar bears rely on the blubber of seals to amass a thick layer of fat to tide them over periods when their prey is unavailable. Thinking that berries, seaweed, and the odd fish will suffice is fanciful. Specialised species are vulnerable to extinction and polar bears are as specialised as predators get.

In 2005, the IUCN/SSC Polar Bear Specialist Group recommended polar bears be classed as "Vulnerable", which was adopted under the Red List system. This designation was based on evidence that a 30 percent or more decline would occur in three generations of polar bears (about 36–48 years).

Then in January 2007, on the heels of mounting evidence, the US Fish and Wildlife Service proposed listing the polar bear as a threatened species under the US Endangered Species Act. Projected loss of sea ice due to global warming was believed to be jeopardising polar bears throughout their range. This proposal sparked a firestorm of activity by US polar bear researchers which culminated in nine reports (see: www.usgs.gov/newsroom/special/polar_bears/) that examined various datasets important for assessing the status of polar bears. The summary of the research made a grim prediction: future reduction of sea ice in the Arctic could result in a loss of two-thirds of the world's polar bear population by 2050.

Polar bears in the Canadian Arctic Archipelago may persist until the end of the century, although at reduced numbers. With meager resources, moving much more slowly, with much less political resolve and weaker legislation, the Committee on the Status of Endangered Wildlife in Canada is reviewing the status of polar bears as well. Sometime in 2008 we may hear Canada's view on the status of polar bears. Canada's record suggests that listing species under the Species at Risk Act is less likely for both northern and marine species. How a northern marine bear will fair is unclear.

Some advocates of polar bear sport hunting have suggested the importance of the economic return to northern communities should preclude listing in any jurisdiction. While polar bear sport hunting is not currently a conservation concern, all scientists and managers agree that the harvest must be sustainable. Managing polar bears in a changing climate will be challenging and will require a conservative approach.

The decision to list or not list polar bears under the US Endangered Species Act was due to be announced on 9 January 2008, but was then postponed (see *US delays decision on polar bear protection* on page 6–7). These legal maneuverings and policy positions won't immediately affect a polar bear's main goal on the day the decision is finally made: finding a seal to eat will trump any meeting.

But perhaps deep in the core of humanity lies a wish to preserve those things most wild, and while the polar bears prowl what's left of their sea ice domain, a few humans might make a move to say "enough is enough": we owe it to future generations to change our behaviour.

Andrew E. Derocher
Professor, Department of Biological Sciences
University of Alberta, Edmonton, Canada
Chair, IUCN/SSC Polar Bear Specialist Group

Hearing the voices of all parties

Alvin Fiddler, Harvey Lemelin, David Peerla, and Brian Walmark
argue that the Cree people of northern Ontario and Quebec in Canada have a right to be included in the discussions pertaining to the management of polar bears (*wabusk*).

Two polar bear subpopulations, the Western Hudson Bay, located on the western edge of Ontario, and the Southern Hudson Bay, located in the James and Hudson Bays of Ontario, Quebec, and Nunavut, are found in the traditional territory of the Cree people in Northern Canada. But despite this, the Cree remain largely excluded from ongoing discussions regarding the management of these two populations.

Current research indicates that the Western Hudson Bay polar bear population is declining. The Southern Hudson Bay population is relatively stable at around 1,000 polar bears, although declining sea ice quality, compounded by increasing precipitation (i.e. springtime rains), may be affecting this population as well. Recent research by Marty Obbard of the Ontario Ministry of Natural Resources indicates that they are showing similar signs of stress to those of the Western Hudson Bay population when their numbers began to decline.

Concerns over the health of polar bears in both populations, but more specifically with the Western Hudson Bay population, have been voiced by numerous individuals including researchers, environmental groups, and aboriginal people.

The debates over polar bear management in North America are often presented as a struggle between conservationist strategies (i.e. re-listing polar bears as a threatened species) and protectionist strategies (i.e. protecting traditional rights of Inuit people to harvest polar bears). A quick analysis of recent newspaper and magazine articles in Canada covering the subject revealed that none mentioned the role of Cree people in polar bear management.

This is somewhat surprising considering the proximity of a number of Cree communities in Quebec, Ontario, and Manitoba to polar bear habitat. What is even more disturbing is that the Cree are an aboriginal people with recognised constitutional and treaty rights. Many of these rights are recognised, at least on paper, in wildlife management policies and management plans such as the Polar Bear Provincial Park Management Plan.

While Cree interactions with *wabusk* (Cree for polar bear) are not as well documented as Inuit interactions with these animals, the significance of *wabusk* to the Cree is nevertheless quite important, and ➤ 16

15 ➤ has been noted in both oral and written traditions. For example, *wabusk* is an important socio-cultural symbol in certain Cree cultural ceremonies, and is also perceived as an important icon of ecosystem wellbeing.

The importance of *wabusk* continues today, with a small, tightly regulated aboriginal harvest of polar bears by the Cree in Ontario and Quebec. The current annual quota for the Southern Hudson Bay population in Ontario and Quebec is 90 animals, 30 of which are allocated to Ontario, and 60 to Quebec. Nunavut also set a quota of 25 polar bears on the Belcher Islands, which are also part of the Southern Hudson Bay population. Northern Cree communities in Ontario harvest around 13 polar bears annually (note there are no Inuit communities in Ontario), while in Quebec, about 38 polar bears are harvested each year by aboriginal peoples. In Quebec, no distinction is made between Cree and Inuit harvests.

The current quota of 90 for Ontario and Quebec animals was suggested in the 1970s by researchers from the Ontario Ministry of Natural Resources. The quota is reviewed by the Ontario Ministry of Natural Resources in Ontario and presented to the IUCN/SCC Polar Bear Specialist Group.

The number of polar bears harvested in Ontario and Quebec is well under the established quota of 90. Despite this, the latest document produced by the IUCN/SSC Polar Bear Specialist Group suggested that the total harvest of the Western and Southern Hudson Bay polar bear populations may be beyond a sustainable harvest. The hunting quotas set by the Nunavut government have been a major concern for a number of parties involved in polar bear management. However, discussions with Cree community elders and leaders in Northern Ontario did not indicate that any of these concerns have been brought to their attention.

Furthermore, while concerns over consumptive activities, whether they be traditional harvest or conservation hunting (sustainable hunting that contributes to the social and economic well-being of local communities), dominate policy discussions, two communities (Weenusk First Nation at Peawanuck and the Fort Severn First Nation in Ontario) also offer visitors opportunities to view polar bears in their natural environments. The omission of non-consumptive forms of wildlife tourism (i.e. polar bear viewing) in management debates highlights yet another limitation of current policy discussions.

Negotiations over polar bear management strategies continue in North America, however the Cree remain largely peripheral to or excluded from these discussions. Paradoxically, past wildlife management strategies have demonstrated the injustices and relative ineffectiveness of excluding local peoples from wildlife management.

The engagement of the Cree in polar bear management discussions should occur sooner rather than later given the provincial government of Manitoba's recent listing of polar bears as a threatened species in this Canadian province, and the proposed action by the US government to list the polar bear on the US Endangered Species List. Should polar bears be listed in the USA, then some people have suggested that the Canadian government will have no choice but to follow suit and list polar bears as threatened or perhaps even endangered in Canada through the Species at Risk Act. These proposed changes would affect traditional practices, and require that polar bear conservation management plans be implemented. While this presents an opportunity to engage the Cree in polar bear management discussions, the current exclusionary practices suggest that this is unlikely.

The marginalisation of the Cree, a people with aboriginal and treaty rights, also highlights the inability — or the reluctance — of current participants to acknowledge and properly engage all aboriginal peoples in these dialogues and decisions. Unfortunately, this only serves to illustrate how wildlife management is largely addressed through parochial lenses, with little if any socio-political insight. It also fails to incorporate Indigenous knowledge, another important form of understanding in polar bear management.

Alvin Fiddler
Deputy Grand Chief, Nishnawbe Aski Nation

Harvey Lemelin,
Associate Professor, School of Outdoor Recreation, Parks and Tourism
Lakehead University

David Peerla
Advisor, Nishnawbe Aski Nation

Brian Walmark
Director , Keewaytinook Okimakanak Research Institute (KORI)

Oil spill cha

Demanding conditions such as extreme cold temperatures and reduced visibility may lead to a disastrous oil spill in the Arctic — but our current systems to respond to oil spills are not up to the task. Asle Ronning**, petroleum and energy officer at WWF-Norway, reports.**

A new report commissioned by WWF, *Oil spill response challenges in arctic waters*, highlights the limitations of today's capacity to fight oil spills in arctic waters. Under many circumstances there will be an unacceptably wide gap between the risk of a spill and the possibility of an effective response.

As the petroleum industry expands fast into arctic and subarctic areas, as petroleum-related shipping in the region increases, and as all arctic nations move in to get a slice of the perceived oil and gas resources under the sea ice, questions of how to fight oil spills under arctic conditions become highly relevant. The report published by WWF uses the concept of "response gap" to address the lack of effective response possibilities.

Marine oil spills may result from all phases of petroleum development: from well blowouts, leaks from underwater pipelines, releases from on-land tanks or pipelines, and releases from vessels transporting oil or gas or otherwise being part of the petroleum activity. Arctic conditions, characterised by factors such as extreme cold temperatures, ice, darkness, and otherwise reduced visibility for parts of the year, add to the risk of accidents. These same factors will in most cases also restrict the possibilities for an efficient oil spill response.

Oil spill techniques currently available include *mechanical recovery* with oil booms and skimming devices from vessels or land; *chemical dispersants* sprayed

llenges in arctic waters

CREDIT: Bryan & Cherry Alexander/www.arcticphoto.com

Tugs manoeuvre an oil tanker near Valdez. Prince William Sound, Alaska.

from aircraft or vessels; and *in-situ burning* where the spilled oil is ignited and burned on the sea surface. All these techniques were developed for use in temperate waters, and face serious obstacles in arctic waters.

Use of oil booms, for instance, can be impossible in the presence of floating sea ice. In open waters, operation of oil booms will be restricted by freezing sea spray which can cause the boom to tear or sink. Low visibility due to fog or darkness in winter will make oil boom operations, which can be very complicated even in temperate waters, extremely difficult. Strong winds and high waves can make it even more challenging.

In-situ burning and use of dispersants will similarly not be adequate under many conditions, due to their dependence on aerial monitoring and visibility. Low temperatures, ice, wind, and waves will also restrict the operational possibilities for these methods. In addition, oil spill response operations require logistics, surveillance, and trained operators. Such resources will most likely be limited under arctic conditions characterised by long distances and poor infrastructure.

Oil spill response operations are highly complex and problems with one small part may cause the whole operation to fail. Most available information on how spill response technologies work under arctic conditions is based on laboratory or small-scale field trials that focus on individual technologies. As the report authors point out: "…a laboratory test that demonstrates a skimmer will not clog until ice concentrations exceed 40 percent in a test tank under controlled conditions does not mean that mechanical recovery will be feasible, safe, or effective in such ice concentrations. … [The] upper limit of a single piece of equipment or an individual technology does not guarantee that the response *system* required to deploy that technique will have the same functionality."

Given the many challenges to efficient oil spill response in the Arctic, the report calls for an analysis of the response gap for any given petroleum operation, and the determining of an acceptable threshold for the response gap for specific operations or locations. Where the existence or magnitude of a response gap is found to create an unacceptable level of risk, the proposed operation should not be allowed and instead, "no-go zones" or closure limits should be established.

Climate change adds to the uncertainties of petroleum operations in the Arctic. Long- and short-term changes in ice distribution and sea currents will make future conditions less predictable. A production facility located in multi-year pack ice in 2007 could face seasonal ice conditions within a decade.

The impact of climate change on the environment can heighten the risk posed by possible oil spills even more, by making ecosystems more fragile and vulnerable. This makes it even more important to assess the real risks involved in petroleum development in the Arctic.

The report was developed by the Alaska based Nuka Research and Planning Group LLC and published by WWF. Download the report at: www.panda.org/arctic/publications/oilspillresponse

Asle Ronning
Petroleum and Energy Officer
WWF-Norway
aronning@wwf.no

Greenland's ice giant: window to

The deep ice covering Greenland reveals the story of Earth's climate over the past 100,000 years and the connection between greenhouse gases and temperature. Jacqueline Flückiger **from the school of environmental physics at the Swiss Federal Institute of Technology in Zürich, Switzerland explains.**

Greenland is covered by a giant sheet of ice up to 3,200 metres deep. It consists of layers of snow that have been compressed into ice by their own weight over tens of thousands of years.

Under its own pressure the ice deforms and slowly flows from the center of the ice sheet to its margins, where the ice melts or is discharged into the sea. These layers of ancient snow are a unique archive in which a wealth of information about the climate history of our planet is preserved.

Drilling vertically into the ice is like traveling back in time. Since the 1960s scientists have recovered several ice cores over 3,000 metres in length, reaching back in time up to 105,000 years.

Enclosed in the ice is information on past temperatures, volcanic eruptions, dust in the atmosphere, solar variability, and chemical impurities. Small air bubbles even preserve ancient air, which can be analyzed to determine past atmospheric concentrations of greenhouse gases.

The ice also reveals an inverse relationship between greenhouse gas concentrations and temperature. These have varied in parallel on glacial-interglacial time scales, with lower greenhouse gas concentrations during the cold ice ages and higher concentrations during warm interglacial epochs. Most notably they reveal that today's atmospheric levels of greenhouse gases by far exceed those of the past as measured in ice cores.

The Greenland ice archive is additionally famous for the very abrupt climatic events it has recorded during glacial times. The cold climate of the last glacial ice age was punctuated by 25 warm events, so-called Dansgaard-Oeschger events. The temperature in Greenland rose by about 10°C within a few decades during these events, staying warm for a few hundred to a thousand years before decreasing rapidly back to cold levels. These events are related to an increase of the Atlantic meridional overturning circulation, a large-scale ocean current which transports warm waters at the ocean's surface to the north. Release of this heat in the North Atlantic leads to warm air temperatures. Conversely a strong reduction of this ocean circulation, as occurred at the end of each Dansgaard-Oeschger event, leads to colder temperatures.

Changes to the Greenland ice sheet occur over very long time scales, and for the last few thousand years the giant has been in a more or less stable state. But evidence

the past with an unknown future

over the last three decades indicates that the giant may now be changing.

What is disturbing the ice sheet from its stable state? Emissions of greenhouse gases such as CO_2 due to human activities have led to warming over the whole globe. The global average temperature has risen by 0.7°C since preindustrial times; the local temperature increase in Greenland has been even larger. Rising temperatures do not leave an ice sheet unaffected.

Satellite data and surveys in the field show us that the giant has started to respond. Over the last few decades, the area over which summer melting is taking place has increased (see *Record sea ice decline opens Northwest Passage* on page 10), the melting season is starting earlier and lasting longer than before, melt rates are rising, and the movement of some of the big outlet glaciers that transport large amounts of ice to the sea is accelerating.

The highest melt rates were measured in summer 2007 in concert with the anomalous low sea ice cover in the Arctic Ocean in the same year (see *Record Greenland ice melt* on page 11). Even though snowfall in the interior of Greenland has increased recently, the ice sheet is nevertheless losing more ice than it is gaining each year, implying that the giant is losing mass. So what does the future hold for the Greenland ice sheet? Are the observed trends likely to continue into the future?

Atmospheric greenhouse gas concentrations and temperature are projected to continue to rise over the next century. With an ongoing warming and an increased loss of mass for the ice giant, several critical feedback mechanisms will come into play. The loss of mass will eventually lead to a thinning of the ice sheet. This will expose the interior of the ice sheet to warmer temperatures, leading to even more melting. Also, the ice sheet will grow more slowly as a larger fraction of precipitation will fall as rain rather than snow.

Both effects are positive feedback mechanisms leading to even larger mass loss. But this is not the whole story. Comprehensive climate and ice sheet models suggest that there is a temperature threshold beyond which the Greenland ice sheet will eventually disappear — a threshold that could be crossed before the end of this century. The complete melting of the ice giant would take hundreds of years, but would lead to a global sea level rise of 7 metres, flooding large coastal areas where hundreds of millions of people live today.

Is it time then to move to higher ground? Not necessarily, but the international political community is urged to come up with a new global climate treaty within the next few years that sets ambitious targets for greenhouse gas reductions for all countries, in order to prevent dangerous climate change in the future. We know enough about the science to make decisions, now it's time to act.

Jacqueline Flückiger
Environmental Physics
ETH Zürich, Switzerland
jacqueline.flueckiger@env.ethz.ch

Researchers at the NorthGRIP ice core drilling camp in Greenland succeeded in penetrating the ice sheet to a depth of 3,085 metres

CREDIT: Department of Geophysics, Niels Bohr Institute, University of Copenhagen

Why the Arctic holds the key for huma

Martin Sommerkorn, **senior climate scientist with the WWF International Arctic Programme, explains the nature and state of arctic tipping points.**

The International Panel on Climate Change's (IPCC) report of 2007 has made it clear beyond a doubt that humans have already emitted enough greenhouse gases into the atmosphere to gradually warm our planet by several degrees over the coming decades.

Far less prominent in the public domain, however, is the increasing scientific evidence that warmer surface temperatures will cause abrupt changes to the Earth's climate system.

Such abrupt changes come from biogeochemical feedbacks to the climate system — that is, climate-induced changes to important components of the carbon cycle, and radiation balance, of ecosystems. Several of these important components, or tipping points, have been identified in the Arctic —a region that is warming faster and more intensively than the rest of the globe.

Almost all arctic tipping points have a positive feedback effect which will result in accelerating rates of climate change. The degree of these feedbacks to the global climate will decide whether humankind will shortly be exposed to climate change of magnitudes that endanger the very functioning and appearance of our planet as we know it — and hence the basis of human welfare. At the moment the outlook is dire.

The Arctic Council's Arctic Climate Impact Assessment, the UN Environment Programme's *Global outlook for ice and snow* report, and the WWF International Arctic Programme's report *2°C is too much* have demonstrated how the unique features of arctic ecosystems hold key positions in the Earth's climate system, are very vulnerable to warming, and are already changing their behaviour. The most important of these features are snow and ice cover on land and seas, and the presence and state of huge carbon reservoirs.

Recent research — mostly published past the deadline to be included in the IPCC's Fourth Assessment Report, published in early 2007 — has shown that one of the arctic tipping points, arctic sea ice, has very likely tipped already, and that others are in instable states.

Arctic sea ice, ice sheets and glaciers, and seasonal snow cover on land reflect up to 90 percent of sunlight back to space. This is one important reason why the Arctic remains so cold, and the Earth has its overall temperature. Reductions to the extent and duration of arctic snow and ice significantly increase the amount of sunlight absorbed by the Earth and provide substantial positive feedback to climate warming. Across the Arctic, snow duration, sea ice cover, and the extent of glaciated areas are currently undergoing rapid decline due to global warming.

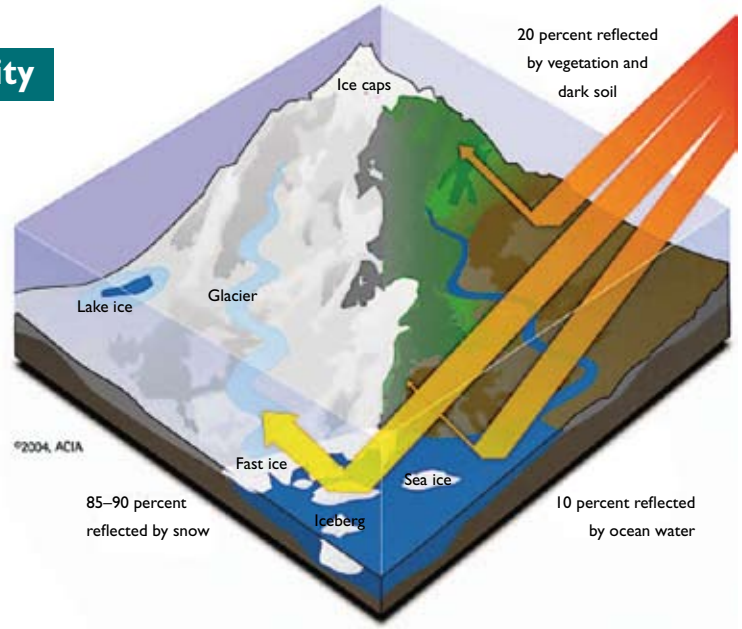
Previous projections forecasted an ice-free summer Arctic Ocean before 2100. However, in 2007 the summer thawing of arctic sea ice broke all records and advanced dramatically further than predicted, leaving the dark ocean water to absorb even more heat (see article *Record sea ice decline opens Northwest Passage* on page 10). Even sea-ice scientists were shocked by the decline, and now believe that this is strong evidence that the arctic sea ice system has very likely moved past its tipping point, and that summer sea ice could be gone completely by as early as 2013. The impacts of such a substantial loss of reflective surface on the Arctic Ocean and atmosphere — as well as on the global climate system — will be enormous, and possibly of a similar magnitude to those stemming from anthropogenic CO_2 emissions.

Permafrost-affected soils in arctic tundra and northern boreal forests store approximately the same amount of carbon as currently contained in the atmosphere. Climate warming will benefit soil microbial activity through warmer temperatures and through improved drainage caused by thawing permafrost. This will see the carbon previously locked up in soil organic matter being partially released to the atmosphere as either CO_2 or methane, providing a powerful positive feedback to the warming itself. In wet tundra, soil organic material will increasingly be transformed to methane in thermokarst lakes (lakes created by thawing permafrost). There is already evidence for both these processes — increased decomposition of soil organic matter and formation of thermokarst lakes — occurring at increased rates.

Vast, but poorly quantified, frozen methane hydrates (clathrates) are present at shallow depths in on-shore and sub-sea permafrost. Rising temperatures could easily initiate the disintegration of these

Surface Reflectivity

Sea ice covered with snow reflects about 85–90 percent of sunlight, while ocean water reflects just 10 percent. Thus, as sea ice melts, revealing more and more of the ocean beneath, the increasing absorption of solar radiation adds to global warming, which causes more melting, which inturn causes more warming, and so on …



n welfare

hydrates, thereby releasing methane to the atmosphere. Not much is known about the vulnerability of arctic clathrates to increased atmospheric temperatures. However, if such methane releases do occur, their impact on the climate would be very large, dwarfing the effects of anthropogenic emissions by several orders of magnitude. There is now good evidence that the historic melting of clathrates significantly contributed to past climate change.

Thus, the integrity of arctic ecosystems and global climate change are closely linked through cold temperatures on arctic land and seas. The main global policy response for keeping the Arctic cold is mitigating climate change by drastically reducing greenhouse gas emissions. However, the latest emission figures tell us that we are currently trailing catastrophically behind even the IPCC's worst-case emission scenario.

On top of this, there is increasing awareness in the scientific community that our understanding of the functioning of key arctic systems like sea ice and ice-sheet dynamics lags behind the changes that have already occurred. This seriously flaws not only the changes forecasted for these systems, but also the recommendations drawn from the forecasted changes. It is therefore becoming increasingly clear that the CO_2 emission scenarios that shape current policies and target a two degree Celsius atmospheric warming because it would avoid "dangerous climate change" are fundamentally incorrect — and are in fact leading to exactly that.

Thus, the latest events and insights tell us that there is far less time left to act than previously thought — and that we have to reduce emissions by more than we previously thought in order to live in a world similar to the one we know and on which we depend.

See graphic *Potential tipping points in the Arctic* on back page

Dr Martin Sommerkorn
Senior Climate Change Officer
WWF International Arctic Programme
msommerkorn@wwf.no

Grasping the scale of change

John Ashton, the UK government's special representative on climate change, spoke with the WWF International Arctic Programme's Nigel Allan about the security implications and politics of climate change at an arctic and international level.

John Ashton

Nigel Allan: *The United Nations Climate Change Conference held in Bali in December 2007 was supposed to provide us with a roadmap for a successor to the Kyoto Protocol. Do you think it has put us on the path to achieving a good outcome for this, and has the world started to "grasp the scale of what we need to do"?*

John Ashton: Bali was certainly an important moment because it marked the end of what diplomats and journalists sometimes call "talks about talks". We've been arguing for the last few years about the process we want after the first cycle of Kyoto commitments ends in 2012, and finally out of Bali we have agreement on a process to hammer out a post-2012 agreement. It was hard fought, and it wasn't inevitable that we would get agreement at Bali, so it is a step forward.

Having said that, I don't think the world does yet understand what is required for a successful transition to a global low-carbon economy. Most of the players in the debate still see this as an issue alongside many of the other issues they have to deal with, and economically as something which can be pursued, if you like, incrementally rather than transformationally — whereas the reality is we need a very urgent and highly transformational approach that effectively takes carbon out of the world energy system by the middle of this century. We know that the macroeconomic cost of this is affordable, Nicholas Stern and others have done the analysis that consolidates that conclusion.

Also, the international agreement that we will hopefully make at the 2009 Climate Change Conference, to be held in Copenhagen, will not be a substitute for the enormous effort that needs to be made in all the world's large economies. The agreement is only a means to an end: what we really need is a global low-carbon economy, and that has to start with rapid progress towards low carbon in the key economies.

NA: *You regularly highlight the security issue of climate change. What in your opinion are the security implications for the countries within the arctic region?*

JA: Climate change impacts are being felt sooner and in a more tangible way in the Arctic than in many other parts of the world, and also therefore in a more disruptive way — particularly to the liveli-

➤ 22

21 ➤ hoods of the people that depend on existing ecosystems in the Arctic. You have the possibility of a major change in the opening up of the Northwest Passage as a major international shipping lane, which is already being treated as a highly strategic matter of security by those countries that have a particular interest in this. I see, for example, Canada making major investments in new naval facilities in the Canadian Arctic. And then of course there is the intensification of debate and of staking of claims over possible mineral resources in the Arctic, which may become easier to access as the ice melts. So you have a complex web of possible security entanglements in the Arctic arising from climate change.

The problems arising from climate change — which is the most tangible and most immediate example of a range of problems which will force the world to think about security in a new way in this century —can only be solved on the basis of collective security, and not using the traditional tools of security policies. There isn't any hard power solution to climate change so we have to make soft power work, we have no alternative. So investing

I don't think the world does yet understand what is required for a successful transition to a global low-carbon economy.

in the soft power, investing in the political diplomacy of climate change, is a security investment. That is really the point I have been trying to make. We have a security interest in getting that right.

NA: *Given the rush for arctic resources, do you think that arctic nations and others can be reasonably counted on to collaborate in way that will allow the Arctic to adapt to climatic change?*

JA: I think to talk about the Arctic adapting to climate change is really to hold out a false prospect. It is pretty clear already that in a few decades the Arctic is going to be an extremely different place, with major consequences for arctic flora, fauna, and ecosystems, and major consequences for the people who live there. I also think there are to some extent illusory hopes that a warmer world will have benefits for arctic peoples, but I suspect that the net effect will be significantly damaging rather than beneficial. Certainly it will be a picture of change rather than constancy, and change is always much harder to live with even if the summers are sometimes warmer.

So the issue is: to what extent can a global response to climate change head off even more destabilising consequences such as the complete collapse of the Greenland ice sheet for example — if that isn't already inevitable.

I am not close to the work of the Arctic Council but I think it is a model of the kind of cross-cultural cooperation which climate change demands. I think it is extremely healthy that those countries with interests in the Arctic are getting around the same table and trying to work out together how to handle those interests. Can the Arctic Council be a major voice in the response to climate change? I think it could be a more significant voice than it currently is. I think more could be done to draw attention to the stake that arctic countries have in climate change. It would be a welcome thing globally as we try and grapple with what will be one of the biggest diplomatic projects ever-attempted following Bali: trying to get an agreement in place when negotiations conclude at the 2009 UN Climate Change Conference, to be held in Copenhagen. I think that discussion would benefit from a stronger common voice from those countries that have arctic interests.

NA: *You say: "There's no such thing as a stable climate for one country or one continent unless the climate is stable for everybody" and this is clearly as much the case for the Arctic as anywhere. Do you think enough attention is being paid to the implications of a melting Arctic for the rest of the world?*

JA: Well I think that is the corollary of the discussion that we just had. I think the rest of the world will take it more seriously if they hear a stronger voice from arctic countries.

Let me make two comments about the impact of climate change that strike me more and more as the debate goes on. I think so far there has been far too much emphasis on the first order impacts, what you might call the direct impacts, and for understandable reasons because those are easier to forecast and quantify. But I strongly suspect that the impacts that will be most tangible and most destabilising in the end will be those impacts that arise from the way in which climate

I think there are to some extent illusory hopes that a warmer world will have benefits for arctic peoples, but I suspect that the net effect will be significantly damaging rather than beneficial.

change interacts with the other stressors that we are dealing with.

We live in a single interdependent global economy, we live in a single global information state, and those interactions are going to be extremely complex — nonlinear, very dynamic. Look at, for example, the way in which food price inflation — partly driven by climate shocks like the Australian drought — is currently causing big political problems and social problems for a number of countries.

Now if you get a great deal of social and political stress resulting from the impact of climate change in the Arctic, it will not only be a matter of interest for arctic countries. It is going to have knock-on effects in the global economy. Most of these effects will be very difficult to predict at the moment, although you can see where some of the issues are going to arise — such as the growing interest in the possibility of extracting minerals, and, going with that, possibly intensifying disputes about who has the right to these minerals and indeed about whether it's right to extract minerals form a fragile environment. So there is going to be a complex interplay of issues and I think it is in the world's interest to be as aware as possible of the arctic dimensions of the choices that are made. But I think it is partly the role of arctic countries to create that awareness.

Forthcoming arctic meetings & events

Arctic Council events

ACAP Working Group Meeting
WHERE: Moscow, Russia • WHEN: 4 – 5 March • MORE INFO: acap.arctic-council.org/

Senior Arctic Officials Meeting
WHERE: Svolvær, Norway • WHEN: 23 – 24 April • MORE INFO: www.arctic-council.org

EPPR Working Group Meeting
WHERE: Luleå, Sweden • WHEN: 19 – 21 August • MORE INFO: eppr.arctic-council.org

Conferences and workshops

The 38th Annual International Arctic Workshop
WHERE: Boulder, Colorado • WHEN: 5 – 7 March • MORE INFO: instaar.colorado.edu/AW

23rd International Polar Meeting – German Society of Polar Research
WHERE: Muenster, Germany • WHEN: 10 – 14 March • MORE INFO: www.uni-muenster.de/Polartagung/en

Arctic Science Summit Week 2008
WHERE: Syktyvkar, Russia • WHEN: 26 March – 2 April • MORE INFO: www.assw2008.org

Arctic Palaeoclimate and its Extremes (APEX) Second International Conference
WHERE: Durham, UK • WHEN: 1 – 4 April • MORE INFO: www.apex.geo.su.se

Second Workshop on Sustaining Arctic Observing Networks
WHERE: Edmonton, Alberta, Canada • WHEN: 9 – 11 April • MORE INFO: www.arcticobserving.org

Resilience 2008: Resilience, Adaptation and Transformation in Turbulent Times
WHERE: Stockholm, Sweden • WHEN: 14 – 17 April • MORE INFO: resilience2008.org

NATO-Russia Advance Research Workshop: Influence of Climate Change on Arctic and Subarctic Changing Conditions
WHERE: Liege, Belgium • WHEN: 5 – 10 May •
MORE INFO: modb.oce.ulg.ac.be/backup/colloquium/NATO-RussiaARW/2008.html

Arctic System Model Workshop
WHERE: Boulder, Colorado • WHEN: 19 – 21 May •
MORE INFO: www.iarc.uaf.edu/workshops/2008/arctic_system_model_08

North by Degree: An International Conference on Arctic Exploration
WHERE: Philadelphia, Pennsylvania, USA • WHEN: 22 – 24 May • MORE INFO: www.ansp.org/research/Arctic

Canadian Science Writers' Association (CSWA) IPY Convention
WHERE: Whitehorse, Yukon, Canada May • WHEN: 24 – 26 May • MORE INFO: www.sciencewriters.ca/

"Understanding the Role of Permafrost in a Rapidly Warming Climate" Summer Course for K-12 Teachers
WHERE: Fairbanks, Alaska May • WHEN: 25 – 27 June • MORE INFO: www.nicop.org/courses.html

9th International Conference on Permafrost
WHERE: Fairbanks, Alaska May • WHEN: 29 June – 3 July • MORE INFO: www.nicop.org/

For more on these events and other meetings, please visit:
http://www.arcus.org/Calendar/upcomingEvents.shtml • www.iasc.no/SAM/samtext.htm

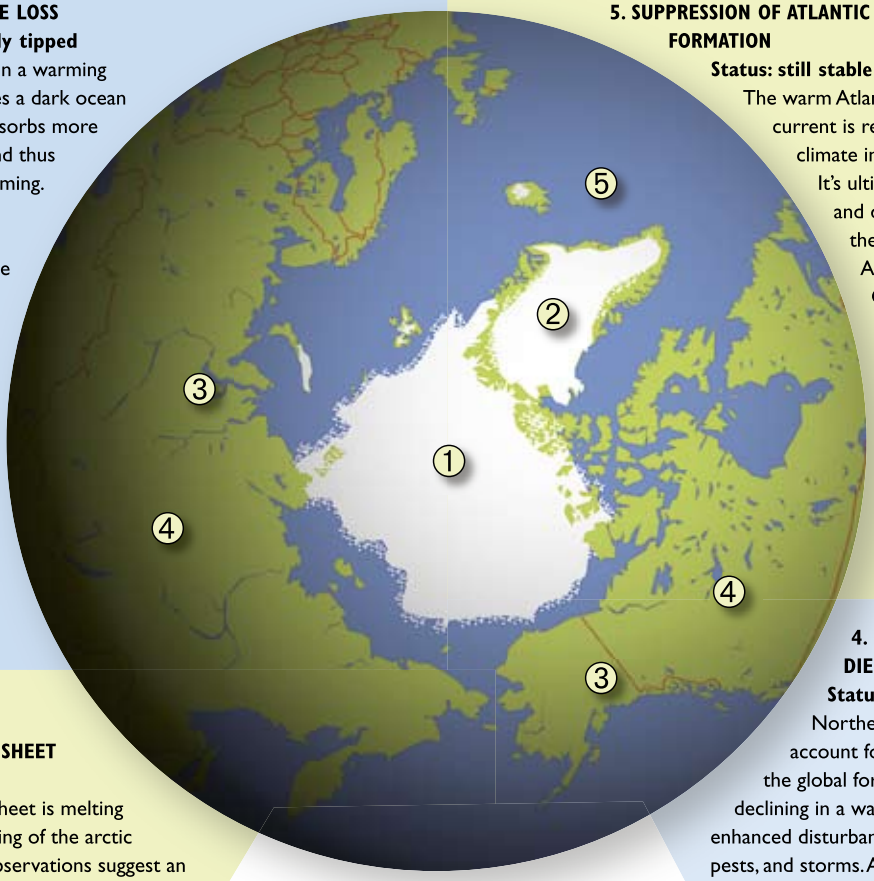
New WWF staff in the Arctic

■ **Dr Martin Sommerkorn** has joined the WWF International Arctic Programme as Senior Climate Change Officer to lead WWF's work on arctic climate change and importantly the enormous and vulnerable carbon pools. Martin is an outstanding senior research scientist with interests in the functional controls of carbon cycling in high-latitude ecosystems. He has travelled extensively in the Arctic, and has worked in Alaska, Greenland, Svalbard, Siberia, as well as the sub-Arctic and Antarctic. He joins us after five years at the Macaulay Land Use Research Institute in Scotland.

■ **Mark Burnett** assumed the position of Barents Sea Officer in the Arctic Programme in June 2007. Mark graduated from the Georgetown University School of Foreign Service with a Bachelor of Science degree in Foreign Service in 1996. Previously, he has worked for the US Department of State as a foreign service officer and was posted at US embassies in Kazakhstan, Russia and the UK. Mark studied Russian language and culture at the Foreign Service Institute in Arlington, Virginia, and has held research assistant internships at the Carnegie Corporation, Centre for Strategic and International Studies (CSIS), and the National Gallery of Art in Washington, DC.

Potential tipping points in the Arctic

1. ARCTIC SEA ICE LOSS
Status: very likely tipped
As sea ice melts in a warming climate, it exposes a dark ocean surface, which absorbs more solar radiation and thus amplifies the warming. Over the last 30 years the area covered by sea ice has decreased significantly. This is bad news for the entire sea ice food web, from the plankton right up to the polar bear.
■ Time Frame: ~ 100 yr.



2. MELTING OF GREENLAND ICE SHEET
Status: in limbo
Greenland's ice sheet is melting due to the warming of the arctic region. Recent observations suggest an accelerated destabilisation also due to melt-water lubrication effects. The complete collapse of the Greenland ice sheet would cause a global sea level rise of 7 m.
■ Time Frame: Unknown due to highly non-linear processes. Current estimates: 300–1000 yr.

3. METHANE ESCAPE FROM THAWING PERMAFROST REGIONS AND CONTINENTAL SHELVES
Status: still stable
Huge amounts of methane, a highly potent greenhouse gas, could be released by global warming. Terrestric methane will emanate from thawing permafrost areas in Siberia and Northern America. 'Methane ice' off many coasts might be activated by changing ocean temperatures and currents.
■ Time Frame: 1000 yr.

4. BOREAL FOREST DIEBACK
Status: still stable
Northern boreal forests account for almost one third of the global forest inventory. They are declining in a warming climate because of enhanced disturbance stress through fires, pests, and storms. At the same time, their regenerative capabilities are diminished by temperature and water stress as well as direct human interference (logging, fragmentation, etc.). The dieback would trigger massive release of CO_2, which in turn enhances climate change as well as significant losses in biodiversity.
■ Time Frame: 50–100 yr.

5. SUPPRESSION OF ATLANTIC DEEP WATER FORMATION
Status: still stable
The warm Atlantic surface ocean current is responsible for the benign climate in Northwestern Europe. It's ultimately driven by cold and dense water sinking to the bottom of the North Atlantic off the coasts of Greenland and Labrador. A warming climate leads to an increased freshwater flow into the ocean, thus decreasing the water's density and slowing down the deep water formation.
■ Time Frame: 100–500 yr.

Source: H.J. Schellnhuber/Potsdam Institute for Climate Impact Research, Martin Sommerkorn WWF International Arctic Programme. Map outline: OMC – Martin Weinelt. Design: Kastil Berger Film & Form

WWF ARCTIC OFFICES AND CONTACTS

WWF INTERNATIONAL ARCTIC PROGRAMME
Kristian Augusts gate 7a,
P.O. Box 6784 St. Olavs plass, N-0130 Oslo, Norway
Ph.: +47 22 03 65 00
Fax: +47 22 20 06 66
www.panda.org/arctic
Contact: Dr Neil Hamilton

WWF-CANADA
245 Eglinton Ave.,
East Suite 410
Toronto, Ontario M4P 3J1
Canada
Ph.: +1416 489 8800
Fax: +1416 489 3611
www.wwf.ca
Contact: Peter J Ewins

WWF-DENMARK
Ryesgade 3F
DK 2200 Copenhagen N,
Denmark
Ph.: +45 35 36 36 35
Fax: +45 35 39 20 62
www.wwf.dk
Contact: Anne-Marie Bjerg

WWF-FINLAND
Lintulahdenkatu 10
SF-00500 Helsinki, Finland
Ph.: +358 9 7740 100
Fax: +358 9 7740 2139
www.wwf.fi
Contact: Jari Luukkonen

WWF-NORWAY
Kristian Augusts gate 7a
P.O. Box 6784 St.
Olavsplass
N-0130 Oslo, Norway
Ph.: +47 22 03 65 00
Fax: +47 22 20 06 66
www.wwf.no
Contact: Rasmus Hansson

WWF-SWEDEN
Ulriksdals Slott
S-171 71 Solna, Sweden
Ph.: +46 862 47 400
Fax: +46 885 13 29
www.wwf.se
Contact: Lars Kristoferson

WWF-US
1250 24th St. NW
Washington,
DC, 20037 USA
Ph: +1 202 293 4800
Fax: +1 202 861 8378
www.worldwildlife.org
Contact: Randall Snodgrass & Margaret Williams

WWF-RUSSIA
Contact: Viktor Nikiforov

■ *mail within Russia:*
P.O. Box 55
125319 Moscow, Russia
Ph: +7 095 7270939
Fax: +7 095 7270938
www.wwf.ru

■ *mail from Europe:*
WWF Russian
Programme Office
Account No. WWF 232
P.O. Box 289 Weybridge
Surrey KT 13 8WJ, UK

■ *mail from the US:*
WWF Russian
Programme Office
Acount No. WWF 232
208 East 51st Street
Suite 295
New York, NY 10022, USA

WWF is the world's largest and most experienced independent conservation organisation, with almost five million supporters and a global network active in 90 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature. WWF continues to be known as World Wildlife Fund in Canada and the United States of America.

WWF