Northern Climate ExChange

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NCE Update January 20, 2010

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Announcements

1. 2010 International Arctic Research Center (IARC) Summer School, May 20 - June 4, 2010, University of Alaska, Fairbanks

IARC is offering an interdisciplinary summer course: "***Arctic in a changing climate: Physical and biological linkages to permafrost***" at the University of Alaska Fairbanks, May 20 - June 4, 2010.

Graduate students and young scientists in relevant fields are encouraged to apply for participation in the summer school. Advanced undergraduate students with strong qualifications will also be considered. The application package (application form, CV, and letter of recommendation from faculty member or supervisor) should be sent electronically to: **Tohru Saito** at saito@iarc.uaf.edu.

Application deadline: February 15, 2010.

www.iarc.uaf.edu

2. National Oceanic and Atmospheric Administration, National Climatic Data Center - State of the Climate Global Analysis: 2009 Annual Report

- Global Temperatures
- Temperature Trends
- Regional Temperatures

- Global Precipitation
- Sea Ice
- NH Snow Cover Extent
- References

www.ncdc.noaa.gov

3. International Conference: Polar Climate and Environmental Change in the Last Millennium - Feb 1-3, Toruń, Poland

An International conference on "Polar Climate and Environmental Change in the Last Millennium" will be held in Toruń, Poland from February 1st to 3rd, 2010.

"The aim of the conference is to present scientific achievements and detect gaps in the historical climatology of the polar regions based on early meteorological observations, history, dendroclimatology, paleolimnology, geophysics, geomorphology, and other sources".

Download for more information.

www.zklim.umk.pl

4. Arctic Science Summit Week 2010 - Nuuk, Greenland, April 15-19,

"The International Arctic Science Committee (IASC), the Arctic Ocean Sciences Board (AOSB), the European Polar Board (EPB), the Pacific Arctic Group (PAG) and the Forum of Arctic Research Operators (FARO) announce Arctic Science Summit Week (ASSW) 2010. ASSW 2010 will take place in Nuuk, Greenland, 15-19 April 2010".

The organization of ASSW 2010 is supported by the Commission for Scientific Research in Greenland and the conference will be hosted by the Government of Greenland.

For more information go to: http://www.assw2010.org.

Deadline for registration: March 1, 2010

www.ipy.org

5. Energy Solutions Centre: Northern Energy Solutions Conference: Practical and Current Energy Solutions for the North - February 2010

The **Energy Solutions Centre** will host the **Northern Energy Solutions Conference** on February 15 - 19, 2010 at the Yukon Inn in Whitehorse Yukon. The conference will focus on practical and current Energy Solutions for commercial and institutional structures. It will also touch on transportation, residential housing and other energy issues.

The North has remote regions and different energy scenarios, weather trends and population bases, with energy issues requiring unique solutions. Together, we will learn the best practices and solutions for energy issues in

the north.

What are the solutions that can be implemented now to conserve energy, reduce costs and limit GHG emissions? Delegates from Nunavut, Northwest and Yukon Territories and some southern regions will attempt to answer this question.

Date: February 15-19, 2010
Contact: Sean MacKinnonby e-mail at sean.mackinnon@gov.yk.ca or by phone (867) 393-7067.

Website: www.yukonenergyconference.ca

www.esc.gov.yk.ca

Articles

1. Much of the early methane rise can be attributed to the spreading of northern peatlands

Kirsikka.Mattila
University of Helsinki
Viikki Science Campus
January 14, 2010

Much of the early methane rise can be attributed to the spreading of northern peatlands

The surprising increase in methane concentrations millennia ago, identified in continental glacier studies, has puzzled researchers for a long time. According to a strong theory, this would have resulted from the commencement of rice cultivation in East Asia. However, a study conducted at the University of Helsinki's Department of Environmental Sciences and the Department of Geosciences and Geography shows that the massive expanse of the northern peatlands occurred around 5000 years ago, coincident with rising atmospheric methane levels.

After water vapour and carbon dioxide, methane is the most significant greenhouse gas, resulting in about one fifth of atmospheric warming caused by humans. Methane emissions are mainly created by peatlands, animal husbandry, rice cultivation, landfill sites, fossil fuel production and biomass combustion.

Northern peatlands are immense sources of methane, but previous studies have argued them to have been established almost immediately after the Ice Age ended. Consequently, they could not explain the increase of methane, dated to have commenced thousands of years later, since the methane emissions of peatlands decrease as they age. William Ruddiman, Professor Emeritus in environmental sciences at the University of Virginia, has presented a widely published theory according to which humanity started to affect the climate thousands of years ago, not just since the start of the industrial revolution. According to the theory, rice cultivation, commenced in East Asia already over 5,000 years ago, caused the declining methane amounts to again increase, which contributed to preventing the next ice age.

The timeframe of the spread of peatlands matches the increase in methane levels

The new study, conducted under the supervision of Professor Atte Korhola, explains the emergence of the peatlands in the northern hemisphere, and their development history, in a new way. The researchers compiled an extensive radiocarbon dating database concerning the bottom peat in peatlands. Based on over 3,000 dates, their statistical and location information-based analysis, it was identified that the expansion of northern peatlands significantly accelerated about 5,000 years ago. At the same time, the methane content in the atmosphere started to increase.

Peatland expansion resulted in the emergence of millions of square kilometres of young peatlands of the mineretrophic fen type, and they puffed large amounts of methane gas in to the air as the organic matter rotted. According to the study, the early increase in methane levels was mainly caused by natural reasons, and human operations are not necessarily required to explain it.

The expansion of peatlands was triggered by the climate turning moister and cooler, which caused the groundwater levels to rise, while accelerating peat build-up and growth. A similar methane peak may also emerge in the future if precipitation in the arctic areas increases as forecasted.

The study was published last week in the prestigious Quaternary Science Reviews series, and the study was conducted by Atte Korhola, Professor; Meri Ruppel, M.A.; and the docents Minna Väliranta, Tarmo Virtanen and Jan Weckström from the University of Helsinki's Environmental Change Research Unit (ECRU) and Heikki Seppä, Professor in the Department of Geosciences and Geography at the University of Helsinki.

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Original publication: Korhola, A., et al., The importance of northern peatland expansion to the late-Holocene rise of atmospheric methane, Quaternary Science Reviews (2010), doi:10.1016/j.quascirev.2009.12.010

www.notes.helsinki.fi

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2. Higher temperatures also a cause of climate change

SRON Netherlands Institute for Space Research
January 14, 2010

Higher temperatures on the earth's surface at higher latitudes cause an increase in the emission of methane, a greenhouse gas that plays an important role in global warming. Therefore higher temperatures are not just a consequence of climate change but also a cause of it, conclude climate researchers in an article published this week in Science. During their research, the researchers made use of the methane concentrations determined by SRON Netherlands Institute for Space Research on the basis of measurements from the Dutch-German space instrument SCIAMACHY (on board ESA's environmental satellite Envisat).

The team of researchers - from SRON and the University of Edinburgh - investigated the methane emissions from the world's largest methane sources: paddy fields, marshes and bogs. These wetlands can be found in both the tropics and at higher altitudes and exhibit strong variations in their emissions. The researchers discovered that fluctuations in the methane emissions in the tropics are mainly determined by variations in the groundwater level but that fluctuations in the methane emissions at high latitudes are mainly due to variations in the surface temperature. The team drew these conclusions based on satellite data about the earth's atmosphere (SCIAMACHY) and surface temperature for the period 2003-2007, and satellite measurements of variations in the gravitational field (GRACE) that were used to calculate variations in groundwater levels. An analysis of the data revealed that the total emission of the boggy areas increased by 7 percent during this period.

Future climate changes

In the *Science* article the researchers describe which regional wetlands are sensitive to fluctuations in the groundwater level and which for extremely high temperatures, with the result that they emit more methane. This will help scientists to more accurately predict future climate changes. Professor Paul Palmer from the University of Edinburgh who led the research says: "The research results underline the fact that global warming is a complex process - higher temperatures in turn speed up the warming process. Our research strengthens our conviction that satellites can accurately register changes in the emission of greenhouse gasses at specific locations on the earth. This makes it possible to accurately map the emission of greenhouse gases from a wide variety of natural and man-made sources."

Christiaan Frankenberg, SRON researcher at the time of the research and co-author of the article in Science: "The great thing about this study is that it shows that by combining different types of satellite data, you can gain new insights into the processes that can influence our climate."

Science 15 January 2010: Vol. 327. no. 5963, pp. 322 - 325 DOI: 10.1126/science.1175176
http://www.sciencemag.org/cgi/content/abstract/327/5963/322

www.sron.nl

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3. Arctic researchers frozen out of gov't funding: scientist

By Margaret Munro
Canwest News Service
January 13, 2010

Canadian researchers are being left out in the cold by the Ottawa bureaucracy that is grounding critically important Arctic expeditions, says a top polar scientist.

"Many northern researchers simply can't afford to get where they need to go," says earth scientist John England, at the University of Alberta, who is urging the Harper government to intervene.

In a pointed report in the high-profile British journal Nature on Thursday, England deplores the lack of support for researchers charting the transformation underway in Canada's North, one of the most rapidly changing places on Earth.

"The capacity to support researchers in remote field sites has plummeted, making it difficult for Canadian researchers to continue crucial monitoring of the fast-changing Arctic environment, from receding glaciers to disappearing polar-bear habitat," he reports.

"Worse," says England, "the restricted logistical funds aren't distributed in partnership with money from the main granting body - the Natural Sciences and Engineering Research Council of Canada (NSERC)."

The council, with a budget of more than $1 billion a year, funds thousands of researchers across the country.

"So researchers with grant money in their pockets, and government affirmation that their research is important, often can't afford to pay for their fieldwork," says England, who speaks from personal experience.

He cancelled his own fieldwork last year so two of his PhD students could get to and from Banks Island in the western Arctic. In the end, he says, they were still saddled with a $110,000-bill for helicopter and aircraft support that rang it at $1,800 an hour.

England and his colleagues say the problem is the ongoing erosion of the federal polar continental shelf program, or PCSP, that supplies researchers with everything from snowmobiles to satellite phones, flies them to their camps in helicopters and planes equipped with ski and 'tundra' tires and oversees their safety.

"If a severe storm destroys tents, or a camp is threatened by a polar bear, the PCSP comes to the rescue," says England, who works in some of the remotest corners of the Arctic Archipelago, which is the size of Europe.

England's work on glacial history provides insight into the past and also clues of where to search for minerals. He holds a Northern Research Chair and gets generous federal research grants, most of which pay for a laser lab in Edmonton where he and his students analyze the rocks they haul home. That money is not supposed to cover the ever-increasing costs of getting around, which has been traditionally covered by

PCSP.

The PCSP's annual budget is $6.3 million, with $4 million available for logistical support. "In the past five years, factors, including a doubling of aviation-fuel costs, have rapidly eroded the PCSP's ability to fulfil its mission," says England, who notes that only a quarter of scientists got anywhere near the support they requested in 2009.

"Increasingly, this places Arctic fieldwork beyond the reach of most Canadian researchers, many of whom now talk openly about shifting their research attentions to something that can be studied farther south."

Martin Bergmann, director of PCSP that is run through Natural Resources Canada, says there is unprecedented interest in the Arctic and demand for flying time. He says 190 teams have asked for support in 2010, a 12 per cent increase over 2009.

"We've got more people wanting to go more places," says Bergmann, whose budget has not had a "bump-up" since 2003, when only 120 projects needed support.

"We definitely do have same concerns that with a fixed budget we're not going to be able to necessarily fly everybody where they want to go for as long as they want to go," says Bergmann, who will tell researchers by mid-March how much support they'll get this year.

England is calling for a national polar policy with "backbone and vision" and the power to better co-ordinate costly northern activities that are now handled by several federal agencies.

He says the current disjointed system is hampering research and leaves "many Canadian scientists feeling voiceless and chronically insecure about research support." What's needed, he says, is a streamlined, efficient system to maximize taxpayers' investments.

He said in an interview that he applauds the Harper government for taking steps in the right direction - such as the $85 million now being spent refurbishing 18 northern research facilities. But that funding is strictly for new buildings and infrastructure and cannot be used to offset the soaring cost of transporting researchers across the Canadian Arctic. The government needs to now follow through, he says, with a national polar policy that would integrate logistical support with the research granting process so that scientists can actually get into the field.

"There's a poverty of leadership," says England.

www.canada.com

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4. Scientists to research possible links in Alaska fisheries, climate change

Associated Press
Daily News Miner
January 16, 2010

ANCHORAGE, Alaska - The Federal Subsistence Board has approved research to look for possible links between climate change and fishing patterns in three regions of Alaska.

The projects will take three to four years and cost $930,000, according to the Office of Subsistence Management.

Researchers will talk to village households about their traditional harvests, historical patterns and health of the fish and any changes they've noticed over time, said Larry Buklis, fisheries division chief.

The Anchorage Daily News reports studies are planned in Bering Strait villages, Northwest Alaska and along the Yukon River.

The research is part of a monitoring plan that includes 41 projects approved by the board Tuesday in Anchorage.

Buklis said this is the first time the board has specifically targeted climate change and what it means for subsistence fishing in Alaska.

www.newsminer.com

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5. Invading trees will cause warming over Arctic Region

By Robert Sanders
UC Berkeley
Redorbit
January 14, 2010

Contrary to scientists' predictions that, as the Earth warms, the movement of trees into the Arctic will have only a local warming effect, University of California, Berkeley, scientists modeling this scenario have found that replacing tundra with trees will melt sea ice and greatly enhance warming over the entire Arctic region.

Because trees are darker than the bare tundra, scientists previously have suggested that the northward expansion of trees might result in more absorption of sunlight and a consequent local warming.

But UC Berkeley graduate student Abigail L. Swann, along with Inez Fung, professor of earth and planetary science and of environmental science, policy and management, doubted this local scenario because, while broad-leaved trees are dark, they also transpire a lot of water, and water vapor is a greenhouse gas that is well-mixed throughout the Arctic.

Taking account of this in a standard model of global warming, the researchers discovered that, while broad-leaved trees do absorb some additional sunlight, the water vapor they pump into the atmosphere causes a more widespread warming.

"Broad-leaved deciduous trees are not as dark as evergreen trees and so are generally assumed to be less important. But broad-leaved trees transpire a lot more water through their leaves and are actually able to change the water vapor content and increase the greenhouse effect. As the air warms, it can hold more water vapor, and the greenhouse effect increases further," Swann said. "So, broad-leaved trees end up warming the entire Arctic."

More importantly, the researchers' model predicts that the increased water vapor would melt more sea ice, resulting in more absorption of sunlight by the open ocean and dumping more water vapor into the atmosphere. This positive feedback will warm the land even more and encourage faster, more efficient tree growth and perhaps a faster expansion of trees into the Arctic.

All told, the model predicts an additional 1 degree Celsius increase in temperature over the Arctic as a result of this effect. Global warming already is predicted to increase temperatures in the Arctic between 5 and 7 degrees Celsius within the next 100 years.

The analysis was reported Jan. 7 in the online Early Edition of the journal Proceedings of the National Academy of Sciences.

In judging the impact of vegetation on global warming, most scientists have focused on the albedo, or reflectivity, of vegetation, Swann said. The new study shows that water transpiration can have a large effect as well, especially in "closed" environments like the Arctic, where there is greater confinement of atmospheric gases. Swann suggests that the greenhouse consequences of transpiration will be much less in the mid-latitudes and tropics, or at least harder to pin down.

"We are trying to identify the physical processes that are going to be important with these changes, and this is an interaction that wasn't really looked at before," Swann said. "Counter to assumptions, it's not just a change in the color of the surface vegetation that affects warming."

Previous studies have shown that needle-leaved trees, because they are much darker than bare tundra, will absorb more light and increase warming. But needle-leaved trees transpire much less water than broad-leaved deciduous trees, so the UC Berkeley researchers expect transpiration to only slightly increase this warming effect.

If past episodes of warming are any indication, however, broad-leaved deciduous trees will expand their range more quickly into northern regions than will needle-leaved trees.

"Alaska is already getting shrubbier," Fung said. "We hypothesize that there are 'pioneers,' like shrubs and deciduous trees, that modify the climate until it is comfortable, and then the whole clan moves in."

Co-authors with Swann and Fung are Samuel Levis and Gordon B. Bonan of the National Center for Atmospheric Research in Boulder, Col., and Scott C. Doney of the Department of Marine Chemistry and Geochemistry at the Woods Hole Oceanographic Institution in Massachusetts.

The work was funded by the National Science Foundation.

Abstract

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6. Northern forests do not benefit from lengthening growing season.

Kirsikka.Mattila
University of Helsinki
Viikki Science Campus
January 12, 2010

Forests in northern areas are stunted, verging on the edge of survival. It has been anticipated that climate change improves their growth conditions. A study published last week in *Forest Ecology and Management* journal shows that due to their genetic characteristics trees are unable to properly benefit from the lengthening growing season. Furthermore, the researchers were surprised to find that the mortality of established trees considerably promotes the adaptation of forests to the changing environment.

In cooperation with colleagues at the Universities of Oulu and Potsdam, Anna Kuparinen, Docent at the University of Helsinki's Faculty of Biological and Environmental Sciences, simulated forest growth from southern to northern Finland. A meteorological dispersal model was applied to describe the spread of pollen and seeds in the atmosphere. Above all, the results illustrate the slowness of the adaptation process.

Generally, trees stop growing before the frosts and this cessation of growth has been programmed in their genotype. Therefore, trees are unable to effectively follow the increasing environmental growing season. Instead, they cease growth as dictated by their genotype. It is estimated that after hundred years from now northern forests will substantially lag behind the speed of growth that would be enabled by their environment.

Evolution is promoted by the mortality of established trees

The researchers assumed that demographic characteristics of the trees would have a notable impact on their adaptability. Tree species differ for example so that birch matures at a considerably younger age than

pine, and birch seeds spread more effectively than pine seeds. However, the results showed that these differences had only minor impacts. Instead, the mortality of established trees played a large role in the evolutionary adaptation.

The existing trees in northern forests will survive in a warmer climate better than before but, at the same time, they prevent genetically better adapted individuals from becoming more common. In a dense stand, old trees cast a shadow and prevent new seedlings from establishing. In this way, younger seedlings, which would be more suitable to warmer conditions, cannot easily progress beyond the sapling state.

A question closely related to environmental changes is, whether humans should help the populations to adapt? For forests, possible means of human aid include thinning and planting southern seeds to more northern locations.

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7. U.N. climate chiefs apologize for glacier error

By Matthew Knight
CNN
January 20, 2010

The U.N.'s leading panel on climate change has apologized for misleading data published in a 2007 report that warned Himalayan glaciers could melt by 2035.

In a statement released Wednesday, the Intergovernmental Panel on Climate Change (IPCC) said estimates relating to the rate of recession of the Himalayan glaciers in its Fourth Assessment Report were "poorly substantiated" adding that "well-established standards of evidence were not applied properly."

Despite the admission, the IPCC reiterated its concern about the dangers melting glaciers present in a region that is home to more than one-sixth of the world's population.

"Widespread mass losses from glaciers and reductions in snow cover over recent decades are projected to accelerate throughout the 21st century, reducing water availability, hydropower potential, and changing seasonality of flows in regions supplied by meltwater from major mountain ranges (e.g. Hindu-Kush, Himalaya, Andes)..."

"The chair, vice-chairs, and co-chairs of the IPCC," the statement continued, "regrets the poor application of IPCC procedures..."

The apology follows a growing storm of controversy which initially forced the IPCC to concede that data relating to the Himalayan glacier melt included in the 2007 report was not backed up by sufficient scientific data.

Speaking at the World Future Energy Summit in Abu Dhabi Wednesday, the IPCC chairman, Rajendra Pachauri admitted errors had been made but said it was not an excuse to question the legitimacy of all global warming science.

"Theoretically, let's say we slipped up on one number, I don't think it takes anything away from the overwhelming scientific evidence of what's happening with the climate of this earth," he said, according to Agence France-Presse.

The controversy centers on a paragraph in Chapter 10 of the 2007 report which states: "Glaciers in the Himalaya are receding faster than in any other part of the world, and if the present rate continues, the likelihood of them disappearing by the year 2035 and perhaps sooner is very high if the Earth keeps warming at the current rate. Its total area will likely shrink from the present 500,000 to 100,000 square kilometers by the year 2035. "

But is has recently emerged that the IPCC statement on Himalayan glaciers, which was based on information from a 2005 report by the World Wildlife Fund, was in turn gleaned from an article that appeared in the popular UK science journal, The New Scientist in June 1999.

In the article, "Flooded Out," Indian glaciologist Syed Hasnain speculates that the Himalayan glaciers could vanish within 40 years as a result of global warming.

A glacier expert interviewed by CNN explained that the data published was flawed.

Michael Zemp from the World Glacier Monitoring Service said: "There are simply no observations available to make these sorts of statements."

Zemp says that the figures quoted in the report are not possible because 500,000 square kilometers is estimated to be the total surface area of all mountain glaciers worldwide.

"The other thing is that the report says the glaciers are receding faster than anywhere else in the world. We simply do not have the glacier change measurements. The Himalayas are among those regions with the fewest available data," Zemp said.

In defense of the IPCC, Zemp says "you can take any report and find a mistake in it but it's up to the next IPCC report to correct it."

Zemp also believes that the errors shouldn't shake people's belief in climate science.

"Glaciers are the best proof that climate change is happening. This is happening on a global scale. They can translate very small changes in the climate into a visible signal," he said.

www.cnn.com

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8. Climate conditions in 2050 crucial to avoid harmful impacts in 2010

National Center for Atmospheric Research (NCAR) and
University Corporation for Atmospheric Research (UCAR) News Center
January 11, 2010

BOULDER-While governments around the world continue to explore strategies for reducing greenhouse gas emissions, a new study suggests policymakers should focus on what needs to be achieved in the next 40 years in order to keep long-term options viable for avoiding dangerous levels of warming.

The study is the first of its kind to use a detailed energy system model to analyze the relationship between mid-century targets and the likelihood of achieving long-term outcomes.

"Setting mid-century targets can help preserve long-term policy options while managing the risks and costs that come with long-term goals," says co-lead author Brian O'Neill, a scientist at the National Center for Atmospheric Research (NCAR).

The study, conducted with co-authors at the International Institute for Applied Systems Analysis (IIASA) in Austria and the Energy Research Centre of the Netherlands, is being published today in the Proceedings of the National Academy of Sciences. It was funded by IIASA, a European Young Investigator Award to O'Neill,

and the National Science Foundation, NCAR's sponsor.

The researchers used a computer simulation known as an integrated assessment model to represent interactions between the energy sector and the climate system. They began with "business as usual" scenarios, developed for the Intergovernmental Panel on Climate Change's 2000 report, that project future greenhouse gas emissions in the absence of climate policy. They then analyzed the implications of restricting emissions in 2050, using a range of levels.

The team focused on how emissions levels in 2050 would affect the feasibility of meeting end-of-century temperature targets of either 2 or 3 degrees Celsius (about 3.5 degrees or 5.5 degrees Fahrenheit, respectively) above the pre-industrial average.

Mid-century thresholds

The study identifies critical mid-century thresholds that, if surpassed, would make particular long-term goals unachievable with current energy technologies.

For example, the scientists examined what would need to be done by 2050 in order to preserve the possibility of better-than-even odds of meeting the end-of-century temperature target of 2 degrees Celsius of warming advocated by many governments.

One "business as usual" scenario showed that global emissions would need to be reduced by about 20 percent below 2000 levels by mid-century to preserve the option of hitting the target. In a second case, in which demand for energy and land grow more rapidly, the reductions by 2050 would need to be much steeper: 50 percent. The researchers concluded that achieving such reductions is barely feasible with known energy sources.

"Our simulations show that in some cases, even if we do everything possible to reduce emissions between now and 2050, we'd only have even odds of hitting the 2 degree target-and then only if we also did everything possible over the second half of the century too," says co-author and IIASA scientist Keywan Riahi.

The research team made a number of assumptions about the energy sector, such as how quickly the world could switch to low- or zero-carbon sources to achieve emission targets. Only current technologies that have proven themselves at least in the demonstration stage, such as nuclear fission, biomass, wind power, and carbon capture and storage, were considered. Geoengineering, nuclear fusion, and other technologies that have not been demonstrated as viable ways to produce energy or reduce emissions were excluded from the study.

The 2-degree goal

Research shows that average global temperatures have warmed by close to 1 degree C (almost 1.8 degrees F) since the pre-industrial era. Much of the warming is due to increased emissions of greenhouse gases, predominantly carbon dioxide, due to human activities. Many governments have advocated limiting global temperature to no more than 1 additional degree Celsius in order to avoid more serious effects of climate change.

During the recent international negotiations in Copenhagen, many nations recognized the case for limiting long-term warming to 2 degrees Celsius above pre-industrial levels, but they did not agree to a mid-century emissions target.

"Even if you agree on a long-term goal, without limiting emissions sufficiently over the next several decades, you may find you're unable to achieve it. There's a risk that potentially desirable options will no longer be technologically feasible, or will be prohibitively expensive to achieve," O'Neill says.

On the other hand, "Our research suggests that, provided we adopt an effective long-term strategy, our emissions can be higher in 2050 than some proposals have advocated while still holding to 2 degrees Celsius in the long run," he adds.

Cautions

The researchers caution that this is just one study looking at the technological feasibility of mid- and end-of-century emissions targets. O'Neill says that more feasibility studies should be undertaken to start "bounding the problem" of emissions mitigation.

"We need to know whether our current and planned actions for the coming decades will produce long-term climate change we can live with," he says. "Mid-century targets are a good way to do that."

About the article

Title: **"*Mitigation implications of mid-century targets that preserve long-term climate policy options*"**
Authors: Brian C. O'Neill, Keywan Riahi, and Ilkka Keppo
Publication: *Proceedings of the National Academy of Sciences*

Abstract

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The next Update from the Northern Climate ExChange will be sent out ***Wednesday, January 27, 2010***