



Arctic Region Noticeably Changing

By Michael MacCracken, Chief Scientist for Climate Change Programs, Climate Institute

Changes in climate that have already taken place are manifested in the decrease in extent and thickness of Arctic sea ice, permafrost thawing, coastal erosion, changes in ice sheets and ice shelves, and altered distribution and abundance of species.

Intergovernmental Panel on Climate Change (IPCC), Third Assessment Report (2003)

Nowadays snows melt earlier in the springtime. Lakes, rivers and bogs freeze much later in the autumn. Reindeer herding become more difficult as the ice is weak and may give way... Nowadays the winters are much warmer than they used to be. Occasionally during winter time it

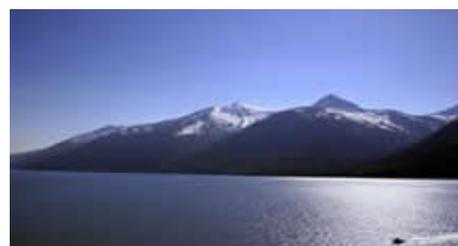
rains. We never expected this; we could not be ready for this. It is very strange... The cycle of the yearly calendar has been disturbed greatly and this affects the reindeer herding negatively for sure...

Larisa Avdeyeva, Lovozero, Russia

Over the past three years, a team of scientists from the eight Arctic nations has worked with representatives of the six indigenous peoples to summarize what has been happening in the Arctic and project ahead what the impacts of warming are likely to be. Both scientific findings and indigenous experiences agree—the Arctic is warming rapidly and the environmental consequences are widely apparent.

These results and many more are a result of the Arctic Climate Impacts

Assessment (ACIA), the results of which were first presented publicly at an international scientific symposium held from 9-12 November in Reykjavik, Iceland. ACIA was conducted under the auspices of the Arctic Council and its Arctic Science Committee. The Council was created by international treaty and has as its members Canada, Finland, Iceland, Denmark/ Greenland/Faroe Islands, Norway, Russia, Sweden, and the United States, as well as six Indigenous People's Organizations.



Endangered Islands Campaign Begins to Gather Momentum As Mauritius Conference Approaches

The upcoming January 10-14, 2005 Mauritius Conference on Sustainable Development is likely not only to be the largest gathering of island nation leaders in a decade but also the occasion in which a nascent Endangered Islands Campaign may come into full bloom. To date this initiative has evolved on very limited resources from efforts of about a dozen NGOs and private firms, a few foundations and several international organizations, particularly the Organization of American States (OAS) the World Bank and UNIDO. It has had three objectives: 1) in interested island nations to develop comprehensive approaches to

Contd.

Hurricanes of 2004

By Hugh Willoughby, International Hurricane Research Center, Florida International University, Miami Florida

As the first cold fronts of autumn push southward, 2004 takes its place in the hurricane record books. Three hurricanes —Charley, Frances, and Jeanne— struck Florida directly this year. A fourth, Ivan, whose center crossed the coastline over Gulf Shores Mississippi, caused devastation in Florida's western Panhandle. The last time three hurricanes hit the state was 1960, and before that 1896. Half a world away, Typhoon Tokage, the deadliest Japanese tropical cyclone in a decade, bashed Honshu near Tokyo in late October. A total of 10 tropical cyclones pounded Japan during 2004, tying the record number of landfalls on that nation in a single year.

Worldwide, we see the effects of climatic warming in sea-level rise,

retreat of icecaps and glaciers, poleward migration of tropical species, and the stark alternation of deluge and drought. Should we recognize the tropical cyclones of 2004 as heralds of more frequent, more intense, more costly, and more deadly cyclones on a warmer globe? Or do they reflect natural cycles, perhaps combined with simple bad luck? On the natural cycle side, meteorologists working at the National Oceanic and Atmospheric Administration (NOAA)

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ICELAND: EXAMPLE FOR A GREENER WORLD

By James W. Keller, Intern 2004

Iceland is in the early stages of a long experiment in which the entire country will serve as a laboratory for environmental action. If successful, Iceland will become the first hydrogen-powered economy on earth. Iceland's government has made this all-encompassing goal part of its official policy, buttressing the project supported by 93% Icelanders.

Dr. Bragi Arnason, a native Icelander and chemistry professor at the University of Iceland, wrote his initial paper about the hydrogen option over twenty years ago but it was met with great skepticism. Disappointed but not derailed, Arnason was encouraged by Iceland's two previous energy revolutions, hydroelectric utilization and geothermal heating, and he foresees complete hydrogen transformation as the third.

Unlike petroleum, hydrogen is infinite and pristine. Iceland is aiming to take advantage of its existing clean energy resources, geothermal and hydroelectric, to produce hydrogen and gain genuine energy independence. This is accomplished through electrolysis, or the splitting of water into its component parts of hydrogen and oxygen. Iceland's educated, environmentally conscious population strengthens its ability to accomplish this monumental enterprise. The lack of a domestic fossil fuel industry diminishes competitive pressure and allows for the channeling of precious time and resources into the hydrogen project. This should help see this transformation through, enabling Iceland to solidify its reputation as the "Bahrain of the North."

Iceland intends to convert all its personal vehicles (over 180,000) to hydrogen. Additionally, Iceland's bus fleets are expected to operate entirely on hydrogen fuel within ten years. Filling up at the world's first commercial hydrogen station, three of these buses are already on the streets of Reykjavik. Turning from car lanes to shipping routes, Iceland's entire 2,500-ship fishing fleet will also be converted, beginning in 2015. However, the fleet's first fuel cell-powered vessel demonstration project will be completed by 2006. Iceland has delineated this transformation into five phases:

PHASE I: Two-year fuel cell bus demonstration project with three hydrogen-powered buses fully operating in Reykjavik.

PHASE II: Gradual replacement of Reykjavik's bus fleet and other bus fleets with PEM (Proton Exchange Membrane) hydrogen fuel cell buses.

PHASE III: Introduction of PEM hydrogen fuel cell cars for private transportation.

PHASE IV: PEM hydrogen fuel cell vessel demonstration project. Research vessel will run on hydrogen bound in methanol.

PHASE V: Gradual replacement of the entire Icelandic fishing fleet with PEM hydrogen fuel cell powered ships.

In 1998, Icelandic New Energy Ltd. was formed to spearhead this hydrogen transformation. It consists of a consortium of Icelandic companies and institutions, namely Reykjavik Energy Company, the National Power Company, Sudurnes Regional Heating Company, the University of Iceland, Iceland's fertilizer plant, Aflvaki, the New Business Venture Fund, The Technological Institute of Iceland and the Government of Iceland. The large, international corporations of Daimler-Chrysler, Norsk Hydro and Shell also joined as founding members and contribute to financial, technological and scientific requirements. The European Union has also been a major supporter, contributing over \$3 million to Iceland's hydrogen enterprise through its Ecological City Transport project. Assistance rendered from these corporations and government entities enhances Iceland's capability to achieve its national goals.

Reasoning behind the companies' involvement is simple: "Fossil fuel resources will run out, and those who have invested in alternative energy research and development will be in a very favorable position." By participating in the embryonic stages of hydrogen technology they are acquiring market niche. Their participation is serving as a catalyst for waking up onlookers who deem the problem too complex and the solution too expensive.

Obviously, Iceland is making a large national commitment to its hydrogen transformation. Since this has not yet been undertaken in large-scale operations, the research and development of effective storage methods, construction of infrastructure and vehicle replacement is likely to be quite expensive. Although the elevated production of hydrogen worldwide will inevitably decrease costs, beginning this large project at such high initial costs will be challenging. To alleviate costs and increase awareness, the Icelandic parliament has passed a bill that exempts all zero-emission vehicles from paying road taxes.

Several nations are striving to emulate Iceland's ambitious example: Tokyo, Hamburg, and major cities in Belgium, England, the Netherlands, Spain and Sweden have opened or are planning to open hydrogen stations, and Canada has also expressed deep interest in offering hydrogen to consumers.

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Arctic Region Noticeably Changing

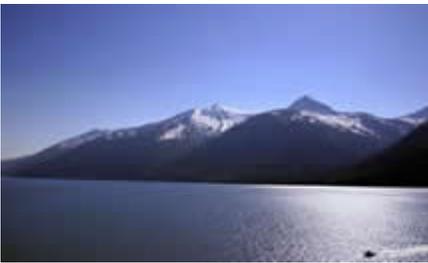
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tions representing the Aleut, Athabaskan, Gwich'in, Saami, and other indigenous peoples of the Arctic.

While the major focus of the assessment is on the potential impacts of future changes in climate, the ACIA began with an analysis of how the present climate is changing. Warming over northern land areas, particularly Siberia and northwestern North America has been much greater than elsewhere in the world, and this is to be expected given the melting back of snow and ice cover that is amplifying the warming in these regions. The changes are compatible with model simulations of changes due to human modification of the concentration of greenhouse gases during the 20th century, leading quite directly to the projections that the Arctic will warm by several times as much during the 21st century as it did during the 20th century. The amplified warming in the Arctic, in turn, directly contributes to overall global warming, as well as causing changes in the Arctic that create impacts over the rest of the globe; accelerated sea level rise due to melting of mountain glaciers and ice sheets being the most important example. Thus, not only the people of the Arctic have an interest in what is happening there.

The results of five climate models were drawn upon to derive projections of future climatic change. Each model was run using two emissions scenarios, one near the mid-range of IPCC estimates, and one indicating somewhat lower than average emissions. That these relatively modest emissions scenarios caused the Arctic to warm by roughly 3 to 6°C over the 21st century indicates why there is so much concern about human-induced warming in this region.

Relying on these scenarios of plausible change, ACIA's team evaluated what the projected warming would mean for the region. The analyses indicate that the natural environment will be very strongly impacted, with substantial shifts in vegetation zones that cause significant reduction of tundra regions where many birds go for summer breeding. As permafrost melts and these vegetation



and these vegetation shifts occur, forest ecosystems will be particularly vulnerable to fire and pests. Wildlife will also be significantly affected, especially those animals like the polar bear and walrus that depend on sea ice reaching near land at various times during the year and caribou that depend on frozen rivers and open tundra regions in the course of their annual migrations. Marine fisheries will also be altered, for many depend on events going on at the edge of the sea ice.

People in the Arctic are also likely to experience serious impacts. Many indigenous communities were located along the coast so they could hunt for food on land and sea ice as well as from the open waters. Not only will their harvesting of food be hindered as wildlife populations are affected, but the retreating sea ice is already starting to expose their coastal communities to greater erosion from winter storms and higher sea levels;

already a few long-established villages are having to plan very expensive relocations. As the environment of the Indigenous



Peoples of the Arctic changes, their cultural heritage is threatened, with the extensive natural knowledge that has been developed over many generations no longer being useful or valid. Shifting to a social structure based on products brought in from

afar and sold rather than gathered has the potential to seriously disrupt the community's internal and external relationships and rich and wonderful traditions of all helping each other to gather the means to survive through the long polar nights. Practices and identities developed over many centuries may well be lost as irrelevant and impractical to a warmer world.

While it would seem that the longer duration of open water could bring many benefits, great care will need to be taken as a result of the floating ice that could catch ships in its grasp, or even cause damage to ships and thereby lead to pollution of this pristine, and slow-healing, environment. In addition, although ocean transportation will become easier, land transportation will become more difficult as permafrost melts and the soils stay frozen for shorter and shorter periods each year. Thus, while there is likely to be increased access to coastal areas, moving resources over land to ships may well become more problematic.

The thawing of the permafrost is also going to destabilize buildings and other infrastructure such as roads, airports, sewage systems, pipelines, and industrial facilities. Future development is going to require new design elements to account for the changes, thereby increasing construction costs. Thawing permafrost also has the potential for diverting water courses and changing the water table, affecting both ecosystems and water resource infrastructure.



While warming is of utmost concern, there are actually multiple influences affecting the region. Reduced concentrations of stratospheric ozone are likely to persist for several decades, increasing levels of UV radiation for vulnerable species in the spring and also increasing exposure to humans, who will be outside more with warmer conditions. The Arctic is also experiencing increased levels of mercury and other toxic contaminants that can work through the food chain, affecting various species and eventually humans.

That warming is already so far along that it is causing noticeable impacts makes it clear that continuing onward with no serious international program to limit emissions will lead to warming that will transform the Arctic into a completely unfamiliar place for many plants and animals, leading to at least local

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extinctions and an on-going situation of relatively rapid changes that do not allow time for many Arctic species to adapt. For those of us in the rest of the world, the significance and difficulty of dealing with rapid changes in climate should be a lesson that we must alter the carbon-based energy path that we are on—and soon.

ICELAND: EXAMPLE FOR A GREENER WORLD

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Iceland is currently working with Hamburg Elektri-taets Werke of Germany on an Iceland-Europe hydrogen transport project called Euro-Hyport, further diminishing Iceland's net carbon emissions and demonstrating its desire to hydrogen expansion. Numerous states in America, including California, Iowa, Minnesota, and the Dakota's are looking to hydrogen as a source of renewable energy to quell shortages and fuel isolated agricultural areas.

Iceland is serious in its willingness to mitigate global warming and concurrently create jobs, improve air and water quality, lower economic burdens from imported oil and gas and show the world the efficacy of such undertakings.

Much of the world is mired in concerns over rising oil prices of oil and gas, pressures on balance of payments and economic growth and rising risks of climate change, but seem immobilized in changing the energy status quo. In contrast, Iceland understands the worth and limitless potential of resources as simple as water and oxygen and its people are taking advantage to improve themselves and the world community. President Olafur Ragnar Grimsson captures well these important implications: "Iceland is in a way serving as the model of the society of the future – the society which is environmentally sound; which is based on renewable energy and on a way of life which doesn't destroy the life or the atmosphere or the biosystem that we have. There's a lot at stake."

Endangered Islands Campaign

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climate change that encompass clean energy transformation, coastal protection, improved building design and siting, emergency preparedness and anticipatory climate adaptation to protect fragile ecosystems, 2) building of partnerships between participating island nations and coastal cities of more populous countries sharing similar vulnerabilities to climate change and sea level rise and 3) leveraging these partnerships to motivate the public in populous, heavy greenhouse gas emitting nations to insist on energy changes of the scope needed to save many small island states from extinction.

Drawing on threads from several disparate but sometimes overlapping efforts, the Climate Institute has begun with partners to cobble together a more comprehensive approach. Although resources have been quite piecemeal, in part due to the tendency of most OECD governments to focus climate protection funds

on a handful of populous developing countries, this may change once the Kyoto Protocol comes into force on Feb. 16, 2005. Island nations, many of which are the most vulnerable countries to climate change, may get increased funding for climate adaptation measures from a number of bilateral and multilateral aid agencies. Many of these agencies may be represented at Mauritius. At the Conference Endangered Islands Campaign proponents hope to build broader funding and technical participation in this effort and to gather stronger island state government participation in this effort. The nascent campaign has largely focused to date on several enterprising Caribbean nations; after Mauritius it is expected that the effort can be broadened to the Pacific and Indian Ocean regions.

With current increasing emissions of greenhouse gases raising atmospheric concentrations and contributing significantly to global warming, many small island states may be imperiled. The impacts of global warming, particularly sea level rise and an increase in severe weather conditions e.g., fiercer storms and hurricanes, may completely inundate or devastate many of these small island nations if mitigation and adaptation methods are not immediately undertaken. Even before some island nations are submerged, salt-water intrusion into their fresh water supplies may make them uninhabitable. Other island nations may find that the damage caused by increasingly severe storms may wreak havoc on their buildings making it quite difficult for residents to make a living. Many island nations with dwellings well above sea level have much of their economic activity at the beach and vulnerable to storm damage and inundation.

Because island nations are most vulnerable both to the impacts of climate change and to the ongoing stress of weather related disruptions, they are stepping up and playing an active role in building international interest in climate change and advocating global action to reduce greenhouse gas emissions. A number of island nations, for example, have been eager to move toward much greater use of renewable energy to show larger industrialized nations that they are willing to set an example. Three Caribbean nations- St. Lucia, Dominica and Grenada- are participating in a [Global Sustainable Energy Islands Initiative \(GSEII\)](#) designed to transform their economies to a renewable power base and several other island nations are considering taking this path. One affluent island nation- Iceland- is seeking to leverage its geothermal and hydropower energy base to have a hydrogen- based energy economy by 2030.

Although island nations are actively promoting clean energy and building international awareness on climate change, international commitment and cooperation are absolutely paramount in effectively developing mitigation and adaptation strategies to address potential impacts of future climate change. Without cooperative international efforts, many small island nations could soon become mere remnants in the sea. Even before then island nations and populations may be severely affected by storms such as the those that caused great havoc in 2004 in Grenada, the Cayman Islands and Haiti and the two typhoons that ravaged the US Territory of Guam in 2002.

Working with its partners in the GSEII, and groups skilled in climate adaptation, coastal protection and emergency

preparedness such as the International Hurricane Research Center, Island Resources Foundation, James Lee Witt Associates, the International Code Council Foundation, the MS Swaminathan Research Foundation, in Chennai, India, the Climate Institute is working to develop an Endangered Islands Campaign. This nascent and promising initiative will be announced at the January 10-14, 2005 meeting in Mauritius of heads of government of small island states. Representing the Climate Institute will be The Hon. Tom Roper, an Australian who leads the GSEII energy transformation effort, and Nasir Khattak, Director of Global Environmental Programs of the Climate Institute, and a national of Pakistan.

The Endangered Islands Campaign would enhance the capacity of island nations to respond to climate change by changing their energy systems toward renewable and indigenous *contd*

Hurricanes of 2004

(Continued from Page 4)

and Colorado State University^[iii] have shown that the number and intensities of hurricanes follow a 50-70 year cycle. This cycle, called the Atlantic Multidecadal Oscillation (AMO), is controlled by gradual changes in the North Atlantic Ocean currents. The “thermohaline circulation,” as it is called, moves warm water northward in all latitudes of the Atlantic Ocean, even south of the equator. When seawater in high latitudes (near Greenland and Iceland) is warm and salty, the weight of the extra salt allows it to sink easily and the thermohaline circulation runs quickly. Warm water moves northward freely to replace the foundering surface water. When seawater in high latitudes is relatively fresh, it has to be colder in order to sink, and the circulation is more leisurely northward flow of not quite so warm water. Rainfall and evaporation throughout the world’s oceans set the tempo of the AMO.

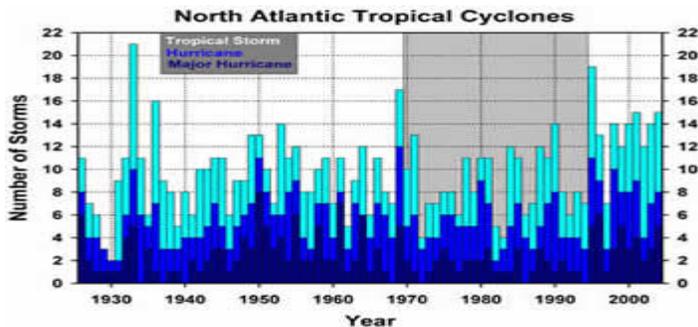


Bokeelia, Florida. Manufactured homes were no match for Hurricane Charley.

Through a complicated chain of cause and effect, the faster oceanic circulation causes the mid-latitude westerlies (winds blowing from the west) to stay north of the tropical Atlantic. Then, deep tropical Trade Winds, which blow steadily from the east, produce conditions favorable for hurricane formation. That’s the phase of the AMO that we are in now. When the thermohaline circulation is weaker, the west winds bend farther southward above the Trades at altitudes just below the stratosphere. This situation causes increased vertical wind shear that suppresses hurricane activity. That is the AMO phase we were in during the inactive



View from second-story window of house shown below in Pine Island



Cycle of frequency and intensity of tropical cyclones in the North Atlantic

1970s through early 1990s. There was a previous active phase of the AMO from the late 1920s through 1969. The current active AMO phase began in 1995. Even counting 1997 and 2002, when El Niño kept hurricane formation in check, the years since 1995 have been the most active on record in terms of number and intensity of hurricanes. By these measures, 2004 has been typical of the non-El Niño years since 1995.

The difference this year is the greater fraction of hurricanes that hit Florida. During first nine years of the active AMO phase from 1995-2003, and also during the inactive phase from 1970-1994, very few of the hurricanes that formed made landfall anywhere in North America. A simple return to the long-term average ratio of landfalls to hurricanes would be a big change from experience during the last third of a century.

During the time when so few hurricanes hit North America, we as a society framed decisions about land use, construction standards, and other aspects of our lives around the shores of the Atlantic Ocean and Gulf of Mexico. Built into these plans was the unstated assumption that hurricanes would continue to stay away from our shores as they had for the last third of a century.

Nonetheless, we can argue that the present active AMO phase may be a bit more active than the last one. Despite the lack of US landfalls until this year, there have been more hurricanes, more intense hurricanes that can cause the worst destruction, and more days when hurricanes were present. Is the apparent change from the 1925-1969 active phase the result of more comprehensive observations at the turn of the 21st century or is it real?



Pine Island, Florida. Two-story home near Hurricane Charley's landfall point with obvious de-

To address that question we need to understand the basics of tropical cyclones. The pressure in the eye of a hurricane is low because the vortex center is filled with warm air. Since warm air is less dense than cold air, the pressure, which is simply the weight of air above the surface, is lower near the center than it is outside. Hurricane winds circulating around the center grow stronger with greater pressure difference. Thus, the *difference* in temperature between inside and outside is what determines the

Hurricanes of 2004

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strength of the hurricane.

The sea supplies the heat required to keep the air column warm. By late summer the sun has warmed the tropical ocean to the temperature of bath water (27-29° C). Circulating storm winds promote evaporation from the sea as they spiral inward toward the hurricane center. When the vapor is drawn into the clouds around the eye, it condenses to make rain. Condensation turns the stored heat into a temperature increase, lowering the surface pressure, and strengthening the wind.

For every hurricane there is a “Maximum Potential Intensity (MPI)” that depends upon the temperatures in the air around it and in the sea under it. Most hurricanes are weaker than the MPI calculated from conditions before the storm— either because of storm-caused cooling of the sea or because of wind shear (the difference between the surface wind around the storm and the wind above 10 km altitude). With the notable exceptions of Andrew and Hugo, the two costliest recent landfalls, and Charley in August 2004, hurricanes that have struck the U.S. since 1970 were weaker than their MPI and weakening as they came onshore, predominantly because of wind shear.

In *global* warming, we might suppose that the effect of a warmer surrounding atmosphere and a warmer ocean would result in the same temperature difference as before, so that MPI would be unchanged. But the amount of vapor that air can hold increases rapidly with temperature. A 3° C warming is equivalent to a 1% increase in absolute temperature, but *causes a 20% increase in the energy that air can store in water vapor* at 100% humidity. This large increase in energy for a small increase in temperature in the tropics is one reason why global warming isn't global at all, but concentrated in high latitudes generally during the cold season (See companion article by Mike MacCracken). The New York Times recently highlighted studies^[iv] by Tom Knutson and Bob Tuleya, well-respected climate and hurricane researchers at NOAA's Geophysical Fluid Dynamics Laboratory. This research provides evidence that the most intense hurricanes may indeed become more intense on a warmer globe. Knutson and Tuleya applied ocean and air temperatures calculated for doubled CO₂ by several Global Circulation Models as the storm environment in the computer model used by the National Weather Service to forecast hurricanes.

They found that there was little reason to expect more hurricanes or hurricanes in different places, but the intensities of the few hurricanes that get close to their MPI increased as a result of the thermodynamics described above. The amount of the

increase was only 7-16 miles per hour, or about half a Saffir-Simpson^[v] category. In addition to the stronger winds, hurricanes on the warmed globe rained 28% more on average. CO₂ doubling will not happen until late in the 21st Century. Nonetheless, examples of what to expect then are Ivan and Isabel of 2003. Both were extreme category 5 hurricanes at maximum intensity, but weakened for days before U.S. landfall. An even more threatening harbinger was Hurricane Jeanne's torrential rainfall that drowned thousands of men, women, and children in Haiti.



For now, the key questions are: Do Charley, Frances, Ivan, and Jeanne, which made US landfall as garden-variety hurricanes, presage more frequent landfalls in the context of a not-too-different climate or will the incredibly good luck of the late 20th century hold for the foreseeable future? The consensus among hurricane researchers and forecasters is that the hurricane landfalls of 2004 resulted from the AMO, a natural cycle of hurricane activity, combined with a lapse in the incredibly good fortune of the previous 35 years. The effect of global warming was at most second-order, and probably not present at all.

Notes:

^[i] “Hurricane” is the term for a cyclonic storm of tropical origin in the western hemisphere with winds stronger than 75 miles per hour. Similar cyclones west of the International Dateline in the North Pacific are called typhoons. Systems with winds between 5 and 40 miles per hour are called “tropical storms.” “Tropical cyclone” encompasses hurricanes, typhoons, tropical storms, and similar systems worldwide

^[ii] For a readable, though anecdotal account, see: Lynas, Mark, *High Tide: The Truth About Our Climate Crisis*, (Picador, 2004), 384 pp.

^[iii] Goldenberg, S. B., C. W. Landsea, A. M. Mestas-Nuñez, and W. M. Gray, The recent increase in Atlantic hurricane activity: Causes and implications, *Science*. **293**, 474-479 (2001).

^[iv] Kutson, T. P. and R. E. Tuleya, Impact of CO₂-induced warming on simulated hurricane intensity and precipitation: Sensitivity to choice of climate model and convective parameterization. *J. Climate*, 3477-3495 (2004).

^[v] The Saffir-Simpson scale categorizes hurricanes by intensity. Category 1 is the weakest. Category 5 includes the strongest hurricanes imaginable. In the present climate, category 5 hurricanes are rare. Only three, the Florida Keys Labor-Day Storm in 1935, Camille in 1969, and Andrew in 1992 have struck the US since reliable records began in the late 19th century. “Major hurricanes” with winds stronger than 111 miles per hour cause 80% of hurricane damage in the US.

*Photographs courtesy of Dr. Forrest Masters, Florida International University.

Russian Ratification of Kyoto Could Spark Large Scale Renewable Energy Development in Siberia

By Sarah Ferriter*

Following the ratification in November by Russia's Duma the Kyoto Protocol will come into force on February 16, 2005. Under the Protocol's terms, industrial country parties will be obligated by the 2008-2012 time frame to limit their greenhouse gas emissions, in most cases reducing them slightly below 1990 levels. The Protocol that will go into force is somewhat enfeebled as it will lack participation of the US and Australia, which together generate about 40% of all industrial country emissions and it also has no enforcement teeth. The European Union, however, seems ready to develop real teeth to ensure compliance by its member states and this prospect seems likely to produce a rising value to carbon dioxide offsets. Facing anti-Kyoto arguments from contrarians, some of whom see a warming as beneficial to Russia and regard emissions controls as limiting Russian oil and gas development, Russian President Vladimir Putin decided to opt with the Europeans who had lobbied him heavily. Much of the speculation following ratification by the compliant Duma has concerned what Putin got in return from the Europeans- trade concessions, commitments on energy investment or some other inducement. In the longer haul, however, perhaps the more significant result of Russian participation in Kyoto may be a prospect of stimulating wide scale development of cheap, renewable energy.

The Kyoto Protocol establishes a framework for confronting and managing the output of systems contributing to the build-up of carbon dioxide and other greenhouse gases in the atmosphere. By some estimations, Russia already stands to gain upwards of \$10 billion by selling of its extant carbon credits (see <http://www.pointcarbon.com/article.php?articleID=2325&categoryID=147>), mostly, the so called "hot air" emissions reductions resulting from the collapse of inefficient Soviet era industry. Perhaps the more intriguing question pertains to how much Russia has to gain from diversifying its energy-based economy with solar, wind, geo-thermal and other important types of "climate-friendly" renewable energy resources.

The opportunity for sustainable development in Russia on the eve of implementation of the Kyoto Protocol is an enticing prospect. It is doubtful that any other country has renewable energy resources equivalent to Russia. The International Energy Agency's World Energy Outlook (www.worldenergyoutlook.org) outlines the implications of Russia on the world energy market. Exploitation of Russia's wealth of natural resources is of immense global significance. Currently renewable energy sources in Russia are underutilized, and when exploited to their full economic potential could make up one third of Russia's total primary energy supply (TPES).

In 2001, the IEA reports, only 1% of Russia's TPES (887 Mtce) was derived from non-hydro renewable energy, but non-traditional energy resources (i.e. everything besides nuclear and fossil fuels) have remained largely untapped. In terms of economic potential, these non-traditional types of energy; geo-

thermal, small hydropower, biomass, solar and wind (listed from highest to lowest economic potential), amount to over 270 million tonnes of coal equivalent (Mtce) each year. In contrast, technical potential of renewables in Russia amounts to 4,593 Mtce, and gross energy potential (total available resources) for renewables is estimated at over 500 times the technical potential and over 8,500 times the economic potential. Economic potential is based in part on the current price of fossil fuels, and therefore fluctuates with the energy market and with the advent of new technologies.

The most abundant form of renewable energy in Russia is geothermal, representing over half of the economic potential for renewable energy. Russia's Far East, where geothermal resources have the most potential, is the only region importing oil for energy production. Other "low-hanging fruit" exist across Russia that demand entrepreneurial attention to enable the expansion of geothermal and other renewable energy resources, including the millions of households removed from the central electric grid that are now dependent mainly on diesel generators for power. (http://sparksdata.co.uk/refocus/fp_showdoc.asp?docid=41215152&accnum=1&topics=

Furthermore, turning to locally produced and long-term sources of energy will also help solve many problems with an inefficient and dilapidated infrastructure for distributing fossil fuels over Russia's massive landscape. Recent economic trends have been favorable to Russia because of the higher prices for oil and gas abroad. This limited economic growth should not hide the fact that Russia's economy is extremely vulnerable to even slight variations in the price of fossil fuels. Russia's future depends on diversifying the economy to rely less upon fossil fuels and more upon renewables. As the objectives of Kyoto are met, and perhaps exceeded, steering farther away from its reliance on fossil fuels may provide more staying power to the Russian economy.

Ironically, Siberia, the Russian Far East, and the windy North could be on the verge of becoming a bastion of renewable energy development, catalyzing a more sustainable energy revolution for all. Siberia has had a history of being exploited for the sake of economic gain with little regard to environmental consequences. Development activities profiting from its vast natural resources may soon be sparked by the most pressing environmental issues humankind has ever-faced; the disruption of our planet's climatic system and our unsustainable reliance on fossil fuels. The combination of large-scale and economically exploitable resources of wind and geothermal and Kyoto related carbon credits may move Siberia from a role as an environmental wasteland to a key part of the planetary response to climate change.

** A research intern with the Climate Institute from June to August 2003 whose projects included establishing the Global Forum for Clean Air and Public Health, and researching climate policy across the US and the science and politics of climate change in the Russian Federation.*

NANCY WILSON PERKINS, CLIMATE ALERT FOUNDER AND EDITOR FOR 12 YEARS, DIES

Nancy Crenshaw Wilson Perkins, who edited *Climate Alert* from its founding in early 1987 until late 1999, died of complications following hip replacement surgery, March 28, 2004, at George Washington University Hospital in the District of Columbia. She was 83 years old. An economist who had worked at the Brookings Institution, the National Science Foundation, and as a professional staff member for the Congressional Budget Committee, Nancy played a key role in the Climate Institute, from its inception until her retirement.

Born in Philadelphia, Pennsylvania, on March 24, 1921, Nancy attended Germantown Friends School and Vassar College where she majored in economics and French. Nancy chose economics, she said, because of its potential to provide an effective means of helping the poor.

Upon graduating from Vassar in 1943, she left for Europe, where she worked for the United States Office of War Information in Italy, and saw a great deal of the final years of World War II. Soon after returning to the US, she married Armine Taylor Wilson, a medical doctor and researcher from Ohio. They moved to a farmhouse in Chadds Ford, Pennsylvania, where they shoveled coal for heat and bought milk from the three neighboring dairy farms. They raised three daughters, Joyce, Sylvia, and Marcia. "If you have a Vassar education, you never let yourself sit still for a minute," Nancy remarked about those busy years.

While raising her daughters, Nancy published occasional articles, among them one on domestic life that appeared in *Everywoman's* magazine. She also wrote and distributed a town newsletter, served on the PTA, and helped to launch the celebratory Chadds Ford Day. Though the focus of these projects was close to home, their scope was large, and she encouraged her daughters to develop an awareness of the greater purposes of the world. Motivated by a sense that they were living in a unique place and time, she and Armine spent many hours exploring the woods and fields near their home, identifying birds and wild flowers. They set their goal to take photographic images of all the wild flowers in a five-mile radius. These collections were shown to classes at the public schools and other local audiences. After Armine died suddenly in 1964, Nancy began to work part time as a research assistant at Swarthmore College. Later, she moved on to jobs with the Brookings Institution, the National Science Foundation, and the Congressional Budget Committee, acquiring along the way a Masters in Economics from the University of Delaware. She served briefly as a managing editor of *The Climate Impact Assessment Journal*, a monthly magazine launched by NOAA (the National Oceanographic and Atmospheric Administration) in 1982. And for a "vacation" one year in the late 1970s, she went to Nepal to study rhesus monkeys with Earthwatch. In 1981 she married Courtland Davis Perkins, a distinguished aeronautical engineer, President of the National Academy of Engineering, and an old friend of Nancy's from Germantown Friends School.

Nancy began working for the Climate Institute shortly

after its founding, and served as liaison to the news media for the First North American Conference on Preparing for Climate Change held in Washington, DC in October 1987. This conference, the first broad-based meeting on climate in the United States, generated wide focus on climate change and helped inspire cover articles in several major US publications. Following the Conference's success the Climate Institute decided to launch a newsletter on climate change directed alike at scientists and policymakers. Nancy Wilson became Editor and the driving force behind this publication, *Climate Alert*. More than simply an editor, Nancy actually wrote most of the articles in *Climate*



Alert, and continued to participate in many of the Institute's other activities, including the 1989 Cairo World Climate Conference, which she also made the occasion for another of her strenuous working/educational vacations, inviting her daughter Joyce and granddaughter Kaelen to join her, along with about 40 of the conference participants, for a week-long tour of the Nile. With Nancy's skillful mastery of scientific and technical details and her remarkable ability to relate such matters to a lay audience, *Climate Alert* played a pivotal role in the early years of the climate protection effort, familiarizing policy makers and the news media with the potential implications of climate change. *Climate Alert* helped inspire many other groups to launch newsletters on climate change and to build an interest in climate protection both in the US and abroad. Much of its focus centered on implications of climate change in developing countries. Among Nancy's strongest contributions to *Climate Alert* were issues or special reports on Climate Change Implications for Asia, Energy Trends in China, Potential Impacts of Climate Change in Developing Countries, Implications of Climate Change for Coastal Regions of the World, Implications of Climate Change for Small Island States, the Potential for Collapse of the West Antarctic Ice Sheet, and the Potential for a Change in Extreme Weather Events in the US and Canada as the Climate Warms, as well as articles on the vulnerability of US regions to climate change and actions by states and localities to address these challenges.

Nancy Crenshaw Wilson Perkins, 1921 - 2004

Several of Nancy's articles were reprinted in other publications, where they helped to broaden the discussion of climate change and its impact on both the natural and the human environments. Perhaps the most notable of these was her Special Report (in *Climate Alert*, July/August 1993) on the growing interest of the insurance industry in the economic consequences of climate change. Reprinted in *The Journal of Meteorology, U.K.* (January 1994), this pioneering article highlighted Nancy's special array of talents and strengths, showing how she could put her professional training in economics, and her lifelong interest in scientific research, into the service of her broadest vision and her most humane values.

Climate Institute President John Topping stated:

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Endangered Islands Campaign Begins to Gather Momentum As Mauritius Conference Approaches

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energy sources, developing anticipatory coastal and emergency preparedness measures to lessen damage to people, structures, and fragile ecosystems, and improve building codes and land use planning to ensure resiliency from storms and use of natural resources such as passive solar. The World Bank is now managing \$ two million US of Global Environment Facility Funds to implement specific climate adaptation measures in three Caribbean nations- St. Lucia, Dominica, and St. Vincent and the Grenadines. The Climate Institute is partnering in this effort, seeking to attract other institutions such as those listed above to help these three nations develop an anticipatory strategy. Once the Endangered Islands Initiative has been fully solidified, the Climate Institute will seek to build partnerships between Caribbean island nations and US and Canadian coastal cities such as Miami, New Orleans, Charleston, Boston and Halifax to work on issues such as common vulnerabilities, improved building design and sustainable energy. Ultimately similar links might be forged among US cities such as Honolulu and San Francisco, Australian cities such as Sydney, Melbourne and Cairns, New Zealand cities such as Wellington and Auckland and Pacific and Indian Ocean small island nations.

In its role as Executive Secretariat of this initiative the Climate Institute is taking the following steps to move the initiative toward a comprehensive worldwide effort.

- Developing a web site to reach individuals and institutions, especially in the Americas and the Asia Pacific region, to make them aware of the vulnerability of island states to climate change and gain their support for adaptation and mitigation measures.
- Building on the activities it is now undertaking in the post-hurricane recovery efforts in Grenada and the Cayman Islands to ensure that energy system resiliency and pro-active emergency planning become the norm in future island state planning.
- Working with multilateral and bilateral development agencies to ensure that application procedures are streamlined to make it possible for island state projects to compete for resources.
- Working with the International Hurricane Research Center in Miami to ensure that state of the art techniques for storm surge and wind resistance planning in South Florida are adapted for use in island states.
- Working with the International Code Council Foundation and James Lee Witt Associates to ensure that island state governments have a state of the art understanding of ways building codes and pre-disaster planning can limit damage from even the most severe storms.
- Drawing on the deliberations and findings of the Mauritius Conference to make this initiative truly global.

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“Nancy played a pivotal role in moving climate change onto the international policy agenda. She brought an uncanny ability to master the most complex scientific concepts and translate them in terms that could be understood by policymakers, few of whom have much scientific grounding. Under Nancy’s pioneering leadership *Climate Alert* helped lay the groundwork for the Intergovernmental Panel on Climate Change and the negotiations that led to the Framework Convention on Climate Change. Nancy’s reporting of the events leading to the December 1989 Cairo Conference and the resulting Cairo Compact were a real catalyst in the success of the conference and in bridging a North-South divide before the 1992 Rio Conference. For much of the next decade Nancy made readers in the US and Western countries aware of the potential gravity of climate change for developing countries.

Although future generations are indebted to Nancy for her timely role in catalyzing interest in climate change, we at the Climate Institute will remember Nancy most for her quick wit, remarkable knowledge of so many interesting things, warm humanity and indefatigable energy. Although in her seventies during most of her time as Editor of *Climate Alert*, Nancy would run circles around the rest of us and had an energy level that those a third her age would have been delighted to have. We all miss Nancy greatly and extend our deepest condolences to her beloved husband, Court Perkins, and the three daughters she loved so much – Joyce, Sylvia, and Marcia- and to their families.”

Mark Goldberg, Vice Chairman of the Institute’s Board, added: “Many readers around the world know Nancy Wilson from her fine, pioneering work as the founding editor of *Climate Alert*. Those of us at the Climate Institute who were privileged to know her as a colleague and friend will always remember her as an exceptional person -- kind, wry, idealistic, committed to the Institute’s mission of helping to build a better international dialogue about climate policy, curious, empathetic, and sensible. She was a mentor to many of the Institute’s staff members and in her capacity as an officer of the Institute -- she served as corporate secretary -- a force for clear thinking, accountability, and, especially, attention to first principles.

Climate Institute News

Sir Crispin Tickell initiates lecture series on abrupt climate change.

Chairman Emeritus of the Climate Institute, Sir Crispin spoke June 18 in the Climate Institute Conference room to about eighty leaders of the climate protection effort in the US and a few from embassies. His address, on line on www.climate.org, describes the potentially disruptive effect abrupt climate change could have on the human species. On April 27 Sir Crispin convened about forty leaders from government, environmental groups and the media at Oxford University to discuss possible

contingency plans to address abrupt climate change. Sir Crispin continues to serve as Co-Chair of the China Council for International Cooperation on the Environment and Development and has discussed abrupt climate change in meetings with Chinese leaders. The second major meeting in this lecture series was a briefing, focused on Washington based-embassies and international groups, on the Arctic Climate Impacts Assessment. Dr. Robert Corell, Chair of the group producing the Assessment, Climate Institute Chief Scientist Dr. Michael MacCracken, and Susan Joy Hassol, Author of the Synthesis Report, spoke to a diverse audience including representatives of the embassies of Finland, Norway, Germany, France, Canada, the Netherlands and Mexico, the Inuit peoples, and many environmental groups as well as a former US National Security Advisor. The Arctic assessment shows that a dramatic warming is already underway in Alaska and Eastern Siberia with a real prospect of polar bears disappearing from the wild in a generation or two.



Left to Right : Bob Corell, Mike MacCracken and Susan Joy Hassol

Gordon MacDonald Dinner Lecture Series focuses on Latin American affairs, the oceans and the Caribbean

A total of about fifty interns and recent college graduates, about two thirds from Dartmouth College, participated this summer in three dinner seminars all held in the Institute's conference room in the first floor of the National Trust for Historic Preservation Building. Dean Louis Goodman of American University's School of International Service and Michael MacMurray, who directs Latin American programs in the Office of the Secretary of Defense, captivated the group, including a large contingent from the Canadian Embassy, with a candid discussion of the role of the military in Latin American politics. Dr. Diane Stanitski, who directs NOAA's sea-based observations related to El Nino and climate change, and Dr. Tom Hourigan, who heads the coral reef protection work in NOAA's National Marine Fisheries Service, discussed the crucial role oceans play both in climate and in the health of coastal ecosystems. The final dinner discussion of the summer focused on the State of the Environment in the Caribbean.



Left to Right : John Topping, Lou Goodman, Kate Schoener, and Mike MacMurray

Nasir Khattak, Director of Global Environmental Programs for the Climate Institute, discussed efforts St. Lucia, Dominica and Grenada are making to move toward renewable energy based economies. Sasha Gottlieb of the Organization of American States described steps the OAS is taking to further large-scale geothermal development in Dominica or St. Lucia. Bruce Potter, President of the US Virgin Island-based Island Resources Foundation, described work underway to protect vulnerable ecosystems against the combined effects of development, pollution and climate change. Working with Institute

President *John Topping* in organizing these dinners was *Kate Schoener*, Class of 2005 at Dartmouth. A Dartmouth Class of 1964 intern, (this is Goodman's, MacMurray's and Topping's class) Kate worked on the intern dinners, abrupt climate change and US domestic energy policy while serving at the Climate Institute. MacDonald Program Director John Topping is serving this next year as an advisor to *Sasha Earnheart – Gold*, a Dartmouth Senior Fellow, in his independent research project exploring the legal case that vulnerable small island nations and the Inuit and Eskimo peoples may have against populous nations whose greenhouse emissions threaten their way of life.

Interns provide valuable assistance to the Climate Institute

Since spring of 2003 the Climate Institute has benefited greatly from eleven different interns, each from a different school. *Julian Dautremont-Smith*, a 2003 graduate of Lewis and Clark College where he had spearheaded efforts to make it the first carbon-neutral US college, placed a huge compendium of information on climate change impacts on www.climate.org. A Truman Fellow, he served as a Fulbright Scholar in Barbados following his work with the Institute. *Sarah Ferriter*, who is studying environmental policy in Russia at the University of Southern Maine, developed on the Institute's web site similarly comprehensive information on air quality. Initially an intern working on both these efforts, *Nicole Okuniek* served for nearly a year at the Climate Institute as a Research Associate before returning to her native Germany to resume her graduate studies. Nicole both oversaw our move to our new offices and led a research effort on opportunities for solar photovoltaic installations in homes. *Makoto Kanagawa*, a Japanese graduate student from the School of Engineering at Tokoku University, developed extensive background information on automotive emissions control policies for use by the Ministry for the Environment of Pakistan. *Ben Richard*, a student at University of California San Diego, worked extensively on the Climate Institute web site during his service in the spring of 2004.

Besides Kate Schoener, three other interns worked at the Climate Institute in the summer of 2004. *Andrea Carone*, a 2004 graduate of University of Michigan, worked on developing the Climate Institute's twenty year report, its new brochures and its domestic energy work. A graduate student in environmental policy at nearby George Washington University, she remains in close touch with the Institute. *Max Davis*, who transferred from University of Pittsburgh to George Washington University as he was carrying out his internship, worked on the Global Sustainable Energy Islands Initiative. *Eun Soo Lim*, a 2003 graduate of Barnard College, worked in several areas including compiling data on hurricanes and on potential impacts of climate change on water availability along the US-Mexican border. Eun Soo, who did a senior thesis at Columbia University's Lamont-Doherty Earth Observatory on climate in the tropical Atlantic during the Holocene era, has now begun working at the Climate Institute as a Research Associate



Nicole Okuniek and Eun Soo Lim, Climate Institute Research Associates

with primary responsibilities in the Climate Impacts area.

Two interns joined the Institute in the fall. *James Keller*, a student at Brigham Young University, where he studied after completing two years as a Mormon missionary in Russia and Belarus, worked on *Climate Alert* and expansion of the Climate Institute islands initiative to encompass Iceland. *Aarti Ramachandran*, a graduate student at Northwestern University and a native of Chennai, India, began work in December and is planning to work at the Institute until the summer or fall of 2005. A talented writer and prospective journalism student, Aarti will be *working on Climate Alert* and development of brochures and publications.

Devra Davis named to head Center on Environmental Oncology at Pitt.

Climate Institute Board member Dr. Devra Davis, whose book, *When Smoke Ran Like Water: Tales of Environmental Deception and the Battles Against Pollution*, was a finalist in the 2002 National Book Awards competition, was named in September 2004 to head the newly created Center for Environmental Oncology at University of Pittsburgh Medical Center. The mission of the center, based on an approach that is prevention-focused and multi-disciplinary, is to reduce the risk of cancer by applying the latest scientific findings on the avoidable causes of cancer to protect individuals and the community at large.

"Dr. Davis is a national leader in the field of epidemiology. We anticipate that she will have a major impact in synthesizing the vast amount of scientific data that is available on the causes of cancer and converting this information into effective public policy and education programs," said Bernard Goldstein, MD, dean of the University of Pittsburgh Graduate School of Public Health (GSPH).

In her role as director of the new program, Dr. Davis, who also will serve as professor of epidemiology at GSPH, will work to create a center for excellence in research, education and public policy that seeks to identify novel causes of cancer, to develop and evaluate instruments for assessment and control of environmental risk factors for cancer and strategies to protect people from environmental cancer risks, and to create public and professional programs that inform, educate and change individual and institutional behaviors. According to the National Cancer Institute, an estimated two-thirds of all cancer cases are linked to environmental causes; many of these to lifestyle factors that can be modified.

"There are about ten million cancer survivors in the United States today, each of whom is concerned with both their own survival and with preventing disease from occurring in their family members," said Dr. Davis. "Unfortunately, however, aside from smoking, drinking, other bad habits, and some workplace exposures, most cases of cancer occur in people who have led otherwise healthy lives. Patterns of the disease remain largely unexplained. With this new center, we aim to more fully understand our risks for developing cancer by identifying controllable conditions and urging prudent ways to lower the risk of the disease. One of our first goals is to discover and promote

concrete steps that can be taken by individuals, hospitals, health professionals, the surrounding communities, and private and public sector organizations to prevent cancer and reduce the chance of recurrence."

John Topping named to Presbyterian Church USA energy task force

Early in 2004 Institute President John Topping was named to an eleven member task force that will develop policy on energy for consideration by the General Assembly of the Presbyterian Church USA at its meeting in 2006. The task force is engaged in the most comprehensive analysis of energy policy undertaken by the nearly three million member denomination in a quarter of a century. The task force is chaired by Pam McVety, a former senior environmental official in Florida, and includes Jan Sharpless, a former Chair of the California Air Resources Board. The task force has met in Washington and San Francisco to gather background from energy experts and church groups and will meet in June 2005 in Louisville to develop a draft document.

John Ashton founds E3G, new international environmental group

John Ashton, a member of the Climate Institute Board of Advisors and of its delegation to the 1997 Kyoto conference, is the founder and CEO of a pioneering group, E3G, shorthand for Third Generation Environmentalism. After four years as the UK's most senior environmental diplomat, John Ashton embarked in October 2002 on a period outside government to explore these ideas further from the newly created position of Director for Strategic Partnerships at LEAD International. LEAD (www.lead.org) is a non profit body providing high level training in leadership for sustainable development for outstanding mid-career individuals. It supports its graduates, known as LEAD Fellows, in working collectively and in partnership with others to achieve sustainable development goals.

John's experience in government and at LEAD convinced him that activated networks of individuals, spanning cultural and sectoral boundaries, can create powerful forces for change. With a group of like-minded colleagues he has developed a new organization, E3G (for Third Generation Environmentalism), which aims to create projects, tools and processes to engage the hundreds of thousands of environmentally aware power brokers within various institutions worldwide to address the challenges we face and implement sustainable solutions. John, who is fluent in Chinese, has worked extensively on developing links with Chinese policymakers and environmentalists. He also was very active in European efforts to persuade Russia to ratify the Kyoto Protocol.

A Happy New Year of and from Climate Institute

Just before the New Year on December 16th, Nasir Khattak's lovely wife, Sonia, gave birth to a beautiful daughter, Laila. Nasir from Kohut, Pakistan is the Director of Global Environmental Programs for the Climate Institute. Sonia, a molecular biologist, comes from Curitiba, Brazil, one of the world's leading environmental cities. This photo was taken on Laila's first day of life. All of us at the Climate Institute join in wishing you a very Happy New Year and extending our heartiest congratulations to the Khattak family.



Nasir, Sonia and Laila