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**Contact: Alex Viets, IGSD: +1.213.321.0911, [aviets@igsd.org](mailto:aviets@igsd.org)**

### **Dramatic Sea Level Rise Expected From Faster Melting of Arctic Snow and Ice**

Washington, DC, May 6, 2011 – Sea levels could rise up to 5 feet by the end of this century, driven by warming in the Arctic and the resulting melt of snow and ice, according to a new study by the International Arctic Monitoring and Assessment Program (AMAP). This is more than two and a half times higher than the 2007 projection of a half to two feet by the Intergovernmental Panel on Climate Change.

“The largest and most permanent bodies of ice in the Arctic – multiyear sea ice, mountain glaciers, ice caps and the Greenland Ice Sheet – have all been declining faster since 2000 than they did in the previous decade,” according to the Arctic study. “The Arctic Ocean is projected to become nearly ice-free in summer within this century, likely within the next thirty to forty years.”

The Arctic temperature increase and the decline of snow and ice feed upon themselves, in an accelerating feedback loop that is causing more rapid melting and sea level rise. The reflective Arctic ice and snow act as a protective shield, sending solar radiation into space. As the ice and snow disappears it is replaced by darker seawater or land, which absorbs more of the incoming radiation. This absorbed energy is released as heat during the summer months, further adding to Arctic warming, which in turn accelerates melting.

Among the feedbacks of greatest concern is the melting of Arctic permafrost (permanently frozen ground). Circumpolar permafrost regions contain the equivalent of about 6,000 billion tonnes of CO<sub>2</sub>. As more permafrost melts due to increasing Arctic temperatures, more of the gases that were previously trapped in the frozen ground are released.

According to the report, the temperature in the Arctic permafrost has increased by up to 2°C over the past two to three decades. This warming has caused the southern boundary for melting permafrost to move steadily northward, by 19 to 50 miles in Russia and by more than 80 miles in Quebec.

The combination of these changes could lead to “run-away” feedbacks that could push past other critical tipping points in Earth’s climate system including the loss of Hindu-Kush-Himalaya-Tibetan glaciers, which provide the head-waters for most major river systems of Asia, (the source of freshwater for hundreds of millions of people), and the die-off of the Amazon forest.

In addition to the global impacts, the increasing temperatures in the Arctic are expected to create fundamental changes in Arctic ecosystems, possibly erasing entire habitats. This will contribute to species extinctions, and dramatically impact Arctic societies, creating challenges for local communities and traditional ways of life.

Emissions of black carbon soot – produced mostly from diesel engines and burning of biomass – also contribute to the Arctic problem by darkening snow and ice and reducing their ability to reflect the sun’s radiation. Recent studies indicate that black carbon may be responsible for 50% of Arctic warming, or nearly 1.0°C of the 1.9°C warming since 1890.

“Slowing the feedback mechanisms will not be easy or simple, but there’s no alternative.” said Durwood Zaelke, President of the Institute for Governance & Sustainable Development. “Without the Arctic, we’re facing an extremely grave and uncertain future.”

Combating this threat to the Arctic and the globe requires tackling the problem of climate change. This in turn requires cutting emissions of CO<sub>2</sub>, the principal greenhouse gas, protecting and expanding forests and other “sinks” to absorb CO<sub>2</sub>, and developing other strategies to draw down current excess CO<sub>2</sub> from the atmosphere on a time scale of decades rather than the thousands of years the natural cycle takes to remove CO<sub>2</sub> from the atmosphere. It also requires cutting the other global warming gases along with black carbon soot. These other non-CO<sub>2</sub> climate pollutants can complement cuts in CO<sub>2</sub>. Both are needed to win the battle against global warming.

According to a recent UNEP/WMO report, full implementation of a package of sixteen emission reduction measures targeting black carbon and ozone precursors, including methane, can cut the rate of global warming in half for the next 30 to 60 years, and by two-thirds in the Arctic.

The AMAP report will be delivered to the foreign ministers of eight Arctic nations next week, including Sec. Hillary Clinton.

### **Alarming State of Glaciers Prompts Workshop and Report Commissioned by Vatican**

Glaciers are in rapid decline and loss of these glaciers will have profoundly negative impacts on climate and human life, according to a report published yesterday by a scientific working group that was commissioned by the Vatican’s Pontifical Academy of Science.

The co-authors of “Fate of Mountain Glaciers in the Anthropocene” list numerous examples of glacial decline around the world and the evidence linking that decline to human-caused changes in climate and air pollution. The threat to the ways of life of people dependent upon glaciers and snow packs for water supplies compels immediate action to mitigate the effects of climate change and to adapt to what changes are happening now and are projected to happen in the future.

“This group’s consensus statement is a warning to humanity and a call for fast action—to mitigate global and regional warming, to protect mountain glaciers and other vulnerable

ecosystems, to assess national and local climate risks, and to prepare to adapt to those climate impacts that cannot be mitigated,” reads the report.

Though scientists usually refrain from proposing specific action, Professor Ramanathan from the Scripps Institution, at the University of California, San Diego, and one of the workshop co-chairs, said the circumstances of climate change warranted advancing suggestions from the working group.

In “Fate of Mountain Glaciers in the Anthropocene” the working group – made up of glaciologists, climate scientists, meteorologists, hydrologists, physicists, chemists, mountaineers, and lawyers – makes three central recommendations to minimize climate impacts:

- Reduce emissions of carbon dioxide quickly and aggressively, including through protection of forests, wetlands, grasslands, and other carbon sinks, and through the development and deployment of strategies to draw down excess CO<sub>2</sub> in the atmosphere, all within decades;
- Reduce concentrations of other climate warmers and air pollutants, including black carbon soot, methane, lower atmosphere ozone, and hydrofluorocarbons (HFCs) by as much as 50 percent, also within decades; and
- Prepare to adapt to climate change impacts that will undoubtedly occur even if mitigation measures are successful.

“Climate change is a moral issue, as well as a scientific issue,” said Durwood Zaelke, President of the Institute for Governance & Sustainable Development and a member of the working group. “Hundreds of millions of the most vulnerable of the Earth will suffer needlessly,” he added, “unless we take fast action to slow and ultimately reverse global warming.”

Zaelke continued, “The Vatican’s support for fast action to mitigate climate change is heartening. Religious leaders have the authority to build a groundswell of support that persuades even conservative political leaders to take the strong and fast action we need to protect the Planet.”

Report authors met at the Vatican from April 2 to April 4, 2011 under the invitation of Chancellor Marcelo Sanchez Sorondo of the pontifical academy. The report was issued by the Vatican yesterday and will be presented to Pope Benedict XVI.

The report title refers to the term coined by Crutzen to describe what is considered a new geologic epoch that began when the impacts of mankind on the planet became a major factor in environmental and climate changes.

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Snow, Water, Ice and Permafrost in the Arctic Executive Summary:

<https://www.documentcloud.org/documents/88367-arctic-ice-melt-2011-executivesummary.html>

Fate of Mountain Glaciers in the Anthropocene:

[http://www.vatican.va/roman\\_curia/pontifical\\_academies/acdscien/2011/PAS\\_Glacier\\_050511\\_final.pdf](http://www.vatican.va/roman_curia/pontifical_academies/acdscien/2011/PAS_Glacier_050511_final.pdf).

Members of the working group commissioned by the Pontifical Academy of Sciences:

Ajai, L. Bengtsson, D. Breashears, P.J. Crutzen, S. Fuzzi, W. Haeberli, W.W. Immerzeel, G. Kaser, C. Kennel, A. Kulkarni, R. Pachauri, T. Painter, J. Rabassa, V. Ramanathan, A. Robock, C. Rubbia, L. Russell, M. Sánchez Sorondo, H.J. Schellnhuber, S. Sorooshian, T. F. Stocker, L.G. Thompson, O.B. Toon, D. Zaelke

*Working Group Co-chairs are underlined*

The Institute for Governance & Sustainable Development's mission is to promote just and sustainable societies and to protect the environment by advancing the understanding, development and implementation of effective, accountable and democratic systems of governance for sustainable development.

Beginning in 2006, the Institute embarked on a “fast-action” climate mitigation campaign to promote non-CO<sub>2</sub> strategies that will result in significant emissions reductions in the near-term, to complement cuts in CO<sub>2</sub> which are essential for the long-term. These strategies include reducing emissions of local air pollutants such as black carbon, methane, and tropospheric ozone; mitigation of hydrofluorocarbons (HFCs) through the Montreal Protocol ozone treaty; and carbon-negative measures such as biosequestration through expanded biochar production.

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