

**SOCIETY:****Green smoke is sighted as Vatican releases glacier report**

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Climate change is shrinking the world's mountain glaciers, whose retreat creates new risks for humans and sensitive ecosystems alike, warns a new report commissioned by the Roman Catholic Church.

"The widespread loss of ice and snow in the world's mountain glaciers is some of the clearest evidence we have for global changes in the climate system," concludes the analysis, which will be delivered to Pope Benedict XVI. It was assembled by an international team of experts at the behest of the Pontifical Academy of Sciences, the Vatican's non-denominational scientific arm.

The report warns of "serious and potentially irreversible impacts of global warming caused by the anthropogenic emissions of greenhouse gases, and by changes in forests, wetlands, grasslands, and other land uses," urging steep cuts in the world's output of heat-trapping pollutants.



Kyetrak Glacier in Tibet, 1921. Photo courtesy of Royal Geographical Society.

Failure to do so will imperil vulnerable ecosystems and human societies that depend on glaciers for freshwater, it says, including a huge swath of Central Asia where mountain glaciers store water for millions of people. Inaction also leaves some communities vulnerable to flooding from unstable meltwater lakes that can burst without warning, causing outburst floods and mudslides.

"We are committed to ensuring that all inhabitants of this planet receive their daily bread, fresh air to breathe and clean water to drink as we are aware that, if we want justice and peace, we must protect the habitat that sustains us," the document continues. "The believers among us as God to grant us this wish."

Atmospheric chemist V. Ramanathan of the Scripps Institution of Oceanography -- a member of the Pontifical Academy since 2004 -- said he hopes the new report will have a lasting impact. His model is the papal academy's 1981 statement on nuclear war, which condemned the use of nuclear weapons.

"That was communicated to world leaders personally, in some cases by the pope," Ramanathan said. "Apparently it had a big impact on President Reagan."

The scientist, who has spent decades studying climate change, said working under the auspices of the Vatican also offered a fresh perspective.

"I have never participated in any report in 30 years where the word 'God' is mentioned," Ramanathan said. "I think the Vatican brings that moral authority."

**'Humbling' meeting inside the Vatican**

That is especially evident in the report's discussions of climate change's effects on the world's most vulnerable peoples and regions, said Durwood Zaelke, president of the Institute for Governance and Sustainable Development, who contributed to the analysis.

The idea for the report arose three years ago, when the Vatican science academy's head contacted Ramanathan.



Kyetrak Glacier, 2009. Photo courtesy of Glacier Works.

"I had just published a paper on black carbon's contributions to glacial melt in the Himalayan region and the chancellor of the Vatican academy, Marcelo Sorondo, emailed me within two days," Ramanathan said. "He said, 'We should have a meeting at the Vatican on this.'"

That meeting took place over three days in April, when two dozen scientists and policy works gathered in the Casina Pio IV, the 16th-century villa in the Vatican City that is home to the Pontifical Academy of Sciences. The group, which evolved from an earlier scientific organization founded in 1603, stands as one of the world's oldest science academies.

"The setting was quite humbling," said Tom Painter, a snow hydrologist at NASA's Jet Propulsion Laboratory. "The room was choked with expertise."

The Vatican academy fielded a group of two dozen researchers, including experts in snow, glaciers and atmospheric chemistry, led by Ramanathan, Lennart Bengtsson, the former director of the European Centre for Medium-Range Weather Forecasts, and Paul Crutzen, who shared the 1995 Nobel Prize in chemistry for his work on the ozone layer.

Crutzen later coined the term "Anthropocene" to describe the idea that human activities have pushed Earth's climate into a new geologic epoch that will last for thousands of years. That concept lies at the heart of the new report.

**Reckoning with the power of humanity**

"Humanity has created the *Anthropocene* era and must live with it," the document says. "This requires a new awareness of the risks human actions are having on the Earth and its systems, including the mountain glaciers discussed here. It imposes a new duty to reduce these risks."

Painter said his experiences conducting research on the relative impacts of rising and temperatures and dust -- stirred up by agriculture -- on the mountain snowpack that feeds the Colorado River illustrate humanity's power to alter the environment.

"When I am doing fieldwork in the mountain ranges of the world ... I am continually stunned by how, in the case of dust, how much mass can be moved out of the desert and how much of an impact that can have hundreds of miles away, the change that humans have made," he said.

"We have become a force of nature."

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