THINK GLOBAL, WORK LOCAL

As the focus on climate change intensifies in years to come, understanding and response will depend on scientists with detailed local climate knowledge.

by **Filippo Giorgi**

Italian physicist Filippo Giorgi is the head of the Earth system physics section at the Abdus Salam International Centre for Theoretical Physics in Trieste, Italy. His expertise lies in climate modeling, variability and change; chemistry-climate interactions; and land-atmosphere interactions. He worked at the National Center for Atmospheric Research (Boulder, Colorado, USA), from 1986-1998, and earned his PhD from the Georgia Institute of Technology (USA).

The Earth system, including the atmosphere, oceans, biosphere, cryosphere and anthroposphere, is one of the most complex and non-linear systems in science. Its study is based on extensive global observing networks and on increasingly comprehensive mathematical models which are integrated on the most powerful supercomputers and used to understand the history and future evolution of the Earth's climate. The evidence shows unequivocally that the climate is warming, mostly because of increasing emissions of carbon dioxide, methane and other greenhouse gases associated with the use of fossil fuels and with some agricultural practices.

As emissions increase, global warming will continue and possibly accelerate in future decades, leading to phenomena such as rising sea levels, melting glaciers and increased weather extremes. The impacts could be severe on natural ecosystems and human communities, threatening water resources, food security, health and even tourism.

Added to other environmental stresses, such as air and water pollution, soil degradation and loss of biodiversity, global warming can inhibit the sustainable development of societies. This is particularly the case for developing countries, which are most vulnerable to climate changes and lack the resources to implement suitable responses.

In fact, global warming research is an area where the divide between economically advanced and poor countries is especially marked. The large infrastructure needed to carry out climate projections with state-of-the-art global models simply is not available in most institutions of the developing world.

Yet climate information is needed at the regional-to-local scale in order to provide the basis for making decisions about climate change. The production of credible and robust regional- and local-scale climate projections is one of the great challenges in climate change research, since local climates are characterized by large variability and are affected by local conditions (e.g. topography, land use, aerosols) not captured at the coarse spatial resolution of global models.

Different techniques have been developed to overcome this problem, such as regional climate models and empirical-statistical approaches, which do not require massive infrastructure. These can enable researchers from developing countries to be more directly involved in the study of climate change problems specific to their regions.

EU Humanitarian Aid and Civil Protection

By offering the potential to employ critical know-how of local climate phenomena and related needs, regional climate research offers a tremendous and important opportunity for developing country scientists at the time of profound environmental stress. Not only can they provide invaluable scientific insights to an emerging field of research, but they can make influential contributions to the protection and sustainable development of their regions.