



Inter American Institute for Global Change Research



*The Challenge of
Global Environmental Change
in The Americas*

The Challenge of Global Environmental Change

Global Environmental Change is one of the greatest challenges that humanity faces today. The many interacting components of our global system—chemical, physical, and biological—have always been undergoing change, some on time scales of centuries and eons, others in the much shorter term of days, months, or years. But in the last century, the effects of human activity have for the first time assumed a truly major role in bringing about global change.

The changes to the global environmental system engendered by human activities affect society in many important ways. Modifications in land use, such as the clearing of forests for agricultural production, are disrupting natural ecosystems and altering the chemistry of the atmosphere, which in turn can influence climate; industrial emissions into the atmosphere can also influence climate in this way. Climate variability, while bringing more benign weather to some regions, can inflict devastation on others: severe storms, leading to loss of life and property; droughts, resulting in crop failures and food shortages; shifts in ocean circulation and temperature, affecting the productivity of fisheries; and melting polar ice, with the potential of raising ocean levels and threatening coastal cities.

In the face of this growing challenge, policy- and decision-makers need better tools. These tools must be forged through an improved understanding of the behavior of the global system that defines the environment of our planet and the options that are available for responding to changes in this complex system.



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Black rockfish, Kip Evans, Monterey Bay National Marine Sanctuary; Hurricane Mitch, NOAA; grass snails, Mary Hollinger, USDA Natural Resources Conservation Service

What is IAI? Responding to the Challenge

The Inter-American Institute for Global Change Research (IAI) is an intergovernmental organization whose goal is twofold: to advance understanding, throughout the Americas, of global environmental change phenomena and their socioeconomic implications; and to provide the policy- and decision-makers of IAI member countries with sound scientific information that will help them develop appropriate plans and actions for dealing with the effects of global change in the Americas. In pursuit of this goal, the IAI is dedicated to the principles of scientific excellence, international cooperation, and the open exchange of scientific information.

The IAI was created in response to a plea issued by world leaders during the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro, Brazil, in 1992. They called for the formation of an international entity that would take a regional approach to addressing global environmental change—in particular, to conduct multinational collaborative research and produce scientific information that no one nation could undertake on its own. Sixteen nations of the Americas initially responded to that call, signing an International Agreement establishing the IAI on May 13, 1992, in Montevideo, Uruguay. At present, the Institute has 19 member countries: Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Panama, Paraguay, Peru, the United States of America, Uruguay, and Venezuela.



IAI's mission

"to develop the capacity to understand the integrated impact of past, present and future global changes on regional and continental environments in the Americas and to promote collaborative research and informed action at all levels".

The IAI Science Agenda: Science that Serves Society

To fulfill its mission, the IAI encourages research that goes beyond the scope of national programs; it advocates the development of comparative studies that focus on scientific issues important to the Americas as a whole. The agreement establishing the IAI specified that the Science Agenda should be dynamic and should continually evolve to incorporate new scientific priorities and to address changes in the needs of the region's countries, as articulated by the scientific and the policy- and decision-making communities. To date, the following four broad themes have been identified by the IAI.



1 *Understanding Climate Change and Variability in the Americas*

The focus of this theme is to observe, document, and predict climate change and variability in the Americas, their links to changes in natural systems, and their societal impacts. The goals are to understand the role of the ocean–land–atmosphere interactions in climate; to determine the key processes that cause climatic variability, from seasonal to decadal time scales; and to apply the insights gained through these findings to improve weather and climate predictions. Topics suggested under this theme:

- Tropical Atlantic Variability (TAV), El Niño–Southern Oscillation (ENSO), and other forms of low-frequency climate variability.
- Ocean variability, including sudden climate change, and its influence on the climate and weather of the surrounding continents.
- Variability of the American monsoon systems.
- Ocean–land–atmosphere interactions and hydrology, including atmospheric mesoscale processes.
- Global and regional changes in the water cycle.
- Aerosol impact on climate change and variability.
- Climate change at regional scales: scenarios, impacts, vulnerability, and adaptation.
- Climate changes in the past.
- Development of the Americas component of a Global Observing System for climate.

2 *Comparative Studies of Ecosystem, Biodiversity, Land Use and Cover, and Water Resources in the Americas*

The IAI encourages comparative and integrated analyses of the effects of global environmental change on natural and anthropogenic systems and processes in tropical, temperate, and cold-latitude systems. Sponsored work should increase our knowledge of the drivers and dynamics of variability and the impacts of such variability on food security, biodiversity, and the provision of ecological goods and services. It is expected to include work in terrestrial, coastal, and oceanic environments; and work that integrates land and sea research will be encouraged. Topics suggested under this theme:

- Impacts of global change on biodiversity, including species and genetic biodiversity—of natural systems as well as of agricultural systems and cultivars.
- Comparative studies of resilience of ecosystems, key species, and important agricultural cultivars in the face of global change.
- Comparative studies of changes in land use and/or in the use of coastal, marine, and freshwater resources.
- Prediction and documentation of estuarine changes due to changes in freshwater inflows and in watershed land use and cover.
- Effects of changes in climate and habitat on wide-ranging species across the Americas.

3 *Understanding Global Change Modulations of the Composition of the Atmosphere, Oceans and Fresh Waters*

The focus of this theme is to observe, document, and understand processes that modify the chemical composition of the atmosphere, inland waters, and oceans in a manner that affects productivity and human welfare. A multidisciplinary approach to this research area is expected. Topics suggested under this theme:

- Effects of air pollution and rainwater quality on ecosystems.
- Impact of mega-cities on regional climate.
- Regional and global air pollution: transport and impacts.
- High-latitude processes and ozone depletion.
- Comparative studies of regional air and water pollution.
- Biogeochemical processes and ecosystem hydrology.
- Greenhouse gases and their effects on climate change.
- Coastal processes and water pollution.

4 *Understanding the Human Dimensions and Policy Implications of Global Change, Climate Variability and Land Use*

The focus of this theme is to research the dynamic interactions between global change (climate variability, land use, etc.) and human beings, whose health, welfare, and activities depend on the productivity, diversity, and functioning of ecosystems. Emphasis will be placed on projects that employ a multidisciplinary approach to address the complex interactions between natural and socioeconomic systems. The objective is to promote public policies that increase the sustainability of natural systems and, thus, human welfare. Topics suggested under this theme:

- Health and environmental issues with emphasis on vector-borne diseases.
- Increased vulnerability of human settlements due to global changes, such as climate variability and changes in land use.
- Rapid urbanization and its effects on the sustainability of natural and human systems.
- Changes in food production patterns; potential actions for increasing food security.
- Effects of global environmental and economic change on biodiversity; implications for conservation strategies.
- Effects of global environmental change, such as climate variability and land-use changes, on natural disaster occurrences; implications for mitigation strategies and policies that limit loss of life and property.
- Effects of global environmental change, such as climate variability, on fisheries and fishermen; strategies for limiting socioeconomic effects.
- Identification of factors that contribute to resilience of natural ecosystems; conservation strategies to promote resilience.
- Effects of global environmental change, such as climate variability and land-use changes, on water supply, freshwater flows, and security of water for human uses.
- Participatory environmental decision-making.

The IAI's Scientific Development Plan

The IAI was conceived as a regional network of research institutions working together to implement the Institute's Science Agenda. To be selected for IAI support, a project must meet internationally recognized, transparent, and peer-review-based standards of scientific excellence.

The first phase of the IAI's development plan was launched in 1995, and from the outset the science programs have all complemented one another. (The table that follows lists the various programs and gives some basic information about each.)

IAI Science Programs

Program	Funding (\$ US)	Period	Number of Grants	Objective
<i>Start-up Grants Program (SG)</i>	2M	1995-1997	37	To aid project planning activities for one year—specifically, to enable researchers to come together to write proposals for submission to the CRN Program.
<i>Initial Science Program (ISP I, II, III)</i>	4M	1996-2001	39	To augment ongoing scientific activities in research, training and education, data and information collection, and climate modeling, as well as a limited number of workshops.
<i>Program to Expand Scientific Capacity in the Americas (PESCA)</i>	300K	2000-2001	11	To enable scientists of member countries having low participation in IAI activities to link with projects funded under the ISP III and the CRN.
<i>Collaborative Research Network Program (CRN)</i>	10M	1999-2003	14	To develop multinational networks of scientists and scientific institutions working together on a common global change issue of regional importance.
<i>Director's Special Fund</i>	60K	Every year	46	To support scientific activities (small research projects, workshops, training activities, travel support). Funding for such activities is limited. Grants are made on a case-by-case basis and according to IAI priority areas and activities. Several small grants (\$1–30K) have been made.
<i>Small Grants Program (SGP I and II)</i>	1M	2002-2004	38	To support small research/capacity-building/ planning activities to facilitate the development of larger science programs and research networks; and to bring scientists together with decision makers so that scientific knowledge can be incorporated into decisions regarding global environmental problems of regional relevance.

These programs, with their individual scientific goals, together constitute a framework for the construction of multinational and multidisciplinary research networks based on rigorous scientific planning and open competition. The development plan for the next several years is to

- consolidate the current research networks;
- develop synthesis analyses and regional assessments; and
- develop a second phase of IAI programs.

The second phase of science programs should not only encompass the range of activities that the first phase did—including sponsoring meetings and scientific projects that can lead to the establishment of additional research networks—but should go even further. The second phase should provide opportunities for new research groups and for work on emerging global-change themes of regional relevance; and should promote strong capacity building, especially in Latin America. The aim of all the programs is the effective functioning of collaborative research networks in the Americas that produce high-quality results—results that can be used to identify and address global change issues in the region.

Capacity Building through Training and Education

The IAI considers one of its main priorities to be the support of training and education (T&E) activities, such as granting fellowships and research opportunities to students and professionals from many countries of the Americas. In the past 10 years, the IAI has supported hundreds of professionals attending technical workshops and seminars, as well as students in academic programs at the undergraduate, graduate, and post-graduate levels. Recipients of academic grants not only receive financial resources to conduct their studies, but also benefit from exposure to scientific environments and from opportunities to link their degree studies with current research activities (through field trips, laboratory experiments, related studies in countries other than their own, and the exchange of scientific data and knowledge with other investigators within the IAI network). The IAI also supports other T&E efforts and initiatives, such as scientific and technical workshops, Training (formerly called Summer) Institutes, and seminars.

In 1999, the IAI launched its summer Training Institutes as a vehicle for promoting the human dimensions aspect of environmental change—and the consequent need for a science–policy interface to ensure that relevant scientific findings are accessible to and usable by policy makers. Their success in fostering communication between natural and social scientists and promoting multinational and multidisciplinary collaboration led the IAI to plan further Institutes. Eight have been held since 1999, and for the future, two are planned per year, to focus on themes of priority to the governments of the Americas. Some of the important global-environmental-change themes and their science–policy linkages that have been explored to date through the Training Institutes are vulnerability associated with climate change and variability and their socioeconomic impacts; urbanization and global change in Latin America; and globalization and food security.

The IAI's plan for future Training Institutes is to incorporate a new approach based on strong policy relevance (finding effective ways to apply scientific data to policy development, as an ongoing process) and strong capacity building. The Institutes will continue to be organized as institutional, programmatic, and financial partnerships with other national and international organizations. This co-planning and implementation strengthens the linkages among the participating agencies and institutions and at the same time maximizes financial and human resources.

Some Initial Results

As the IAI programs have evolved, the numbers of participating scientists and institutions from all 19 member countries have greatly increased. For example, the CRN I program alone has grown in 5 years from 171 scientists representing 99 institutions throughout the Americas, to 347 scientists and 236 institutions. The additional support required for this growth has come from complementary funding raised through the IAI projects themselves. As of August 2004, this very successful effort had brought in nearly US\$21 million. Such a result demonstrates that the providers of those additional funds believe strongly that the projects are worthwhile and are meeting a need. The CRN I program has also involved 429 students, 148 of which have received financial support in the form of fellowships and academic grants.

One measure of the impact of IAI research is the steady stream of publications on IAI-funded projects in scientific journals and the large number of presentations at scientific meetings (examples are the American Meteorological Society, the Latin American Studies Association, the Open Science Conference of the International Geosphere Biosphere Program [IGBP], and the International Human Dimensions Program [IHDP]). The number of articles related to just one of the IAI science programs that have been published in peer-reviewed scientific and technical journals is now nearly 300; and the journals include such prestigious ones as *Nature*, *Science*, *Ecology*, and *The Journal of Climate*. More than 250 CRN I-related papers have been presented in symposia, congresses, and seminars, or as books or book chapters—further clear evidence of the high scientific quality.

The IAI has been able to attract and maintain the involvement of scientists who are world leaders in global change research. A number of those participating in the regional scientific networks and other IAI activities are recipients of awards for excellence in science—in many cases for work carried out under IAI sponsorship. Some examples of these awards are: the Argentine Konex Award, a very prestigious recognition for cultural and scientific achievement; the Paul Crutzen Award for the best paper at the START Young Scientists Conference on Global Change (Trieste, Italy); and nomination to the French Agricultural Academy of Science.

The networks motivate scientists who would otherwise be working in isolation to interact with one another, South–South and North–South, and the resulting scientific interchange contributes in a major way to the regional capacity to deal with global change phenomena. In addition, other international global change organizations and programs are increasingly expressing interest in and forming alliances with the IAI—signing agreements or planning and co-funding joint activities.

Research funded by the IAI is already influencing planning and policy. A good example is a project that investigated El Niño and its effects on agriculture, producing results that not only are of great value to science, but are being used by governments to decide how best to respond to El Niño. Another example is IAI-supported work that has advanced our understanding of changes that occur in the oceans and how they relate to currents, fish populations, etc. Although this is not the first work in this area, it has provided the “glue” that brought different researchers together to share their data, achieving synergies not possible before.

An excellent example of multinational collaboration is an IAI project that deals with how seasonal changes in the Rio de la Plata discharges and the Brazil-Malvinas confluence affect the continental shelf, which has a strong impact on commercial fisheries; and seasonal-to-multidecadal climate variability and its effects on the climate of South America.

This project represents a coordinated effort among the Brazilian Navy, the Argentine Navy, the Uruguayan Air force, and scientists from Argentina, Brazil, Uruguay, and the USA. Still another example is a project that has given birth to the creation of a “disaster database,” which now stores a vast amount of spatially disaggregated information on natural disasters, covering a minimum period of 30 years, for the eight participating countries.

Although a young institution, in the area of capacity building the IAI has sponsored approximately 500 students, some receiving an academic degree at the Bachelor’s level, but most at the graduate level (Master’s, Doctorate, and post-Doctorate). In addition, the IAI has supported more than 2000 professionals and students attending training workshops, short courses, seminars, etc.



Data and Information System: Open Exchange of Scientific Information

The IAI-DIS (Data and Information System) is an Internet database system that references information produced by the IAI's scientific projects. Technically, these references are called METADATA, that is, information about real data such as publications, final and partial reports from the scientific programs, posters, presentations, workshops, and other programs and projects.

The IAI plans to continue to update the system—to improve its features, make it more “user-friendly,” and, in particular, make it more interoperable with similar systems from other institutions and organizations. These improvements will be incorporated into a new version of the DIS. For further information on the IAI-DIS, please access the IAI-DIS website at <http://disbr1.iai.int> or send an e-mail to iaidis@dir.iai.int.

The IAI Structure

The IAI has four permanent organs and a multinational network of research institutions. The permanent organs are as follows:

- The **Conference of the Parties (CoP)** comprises representatives from all countries ratifying the Montevideo Agreement and is the Institute's policymaking organ. It establishes, reviews, and updates the Institute's policies and procedures and evaluates its work.
- The **Executive Council (EC)** is composed of nine members, each of whom is elected by the CoP for a two-year term, and has two mandates: (1) to develop policy recommendations for submission to and approval by the CoP, and (2) to ensure that policies adopted by the CoP are implemented by the Directorate.
- The **Scientific Advisory Committee (SAC)** is the Institute's main scientific advisory body. It has ten members elected by the CoP for three-year terms. It makes recommendations to the CoP regarding the Science Agenda, long-term plans, the Institute's annual program, and science programs to be funded. In addition, it assesses the scientific results of the Institute's funded research.
- The **Directorate** is the Institute's primary administrative organ. It is hosted by the Brazilian Government and is composed of an internationally recruited staff and local support staff.

Outreach Mechanisms

The IAI uses a variety of communication and outreach mechanisms to increase its visibility, make information about its activities and programs available to the scientific and policy-making communities and the general public, and make known the results of its scientific research and capacity-building efforts.

- **Newsletter:** may be accessed electronically via the IAI website or may be ordered in hard copy from the website.
- **The IAI Website:** includes institutional and scientific information. Website address: www.iai.int
- **Listserv:** distribution of e-mail information. Interested parties can sign up on the IAI website to receive Listserv information via e-mail.
- **The Annual Report:** covers the many activities of the Institute during the past fiscal year. Annual reports are available as hard copies and—through the IAI website—in electronic format.
- **Scientific Publications:** articles in scientific journals and magazines, book chapters, etc., reporting on research projects supported by the IAI. To access a list of these publications, please visit the IAI website and select IAI Communications; Publications; Scientific.
- **Other Materials:** a variety of informational materials, including a brochure about the IAI, pamphlets describing several of the Institute's past programs and workshops, and IAI infosheets on various topics. These can be downloaded from the IAI website and are also available as hard copies.

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