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THE INTERNATIONAL GEOSPHERE-BIOSPHERE PROGRAMME: A STUDY OF GLOBAL CHANGE (IGBP)
OF THE INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

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AT THE OPENING OF THE IGBP/HDGEC REGIONAL MEETING FOR SOUTHEAST ASIA CHIANG MAI, THAILAND (JANUARY 1992)



From left to right: Dr. Richard Moss, Deputy Director, Human Dimensions of Global Environmental Change Programme; Prof. Thomas Rosswall, Executive Director, IGBP; Prof. Sanga Sabhasri, Thai Minister of Science, Technology & Energy; Dr. Tawesukdi Piyakarnchana, Chair, National Thai Committee for the IGBP; Prof. Kittichai Wattananikorn, Vice President of Academic Affairs, Chiang Mai University. See page 9.

SAC III

THIRD MEETING OF THE SCIENTIFIC ADVISORY COUNCIL FOR THE IGBP, MEXICO, 25-29 JANUARY 1993

The Scientific Advisory Council advises on the scientific contents of the IGBP, assesses its results and makes recommendations for the general policies of the Scientific Committee of the IGBP.

The Council is composed of representatives of National IGBP Committees, and scientists nominated by members of the International Council of Scientific Unions in all categories of membership. Observers from other organizations, such as major UN bodies, are also invited to attend SAC meetings.

They are chaired by the President of ICSU.

A NATURAL (AND SOCIAL) CONNECTION:

Research on Global Change and its Human Dimensions

DR. RICHARD H. MOSS

DEPUTY EXECUTIVE DIRECTOR, HDGEC, AND PROGRAMME OFFICER, IGBP

Natural forces have influenced and shaped the environment of the Earth over the course of its history. But this is not why global change is currently one of the most exciting and active areas of scientific enquiry or why it is a topic of tremendous importance to policy makers, resource managers, and the general public. Global change is currently a concern because anthropogenic forcing of global cycles is expected to lead to more rapid transformation of the Earth system than in any comparable period. The impact of global changes on natural and human systems may provide unusual opportunities and challenges.

Because of humankind's unprecedented importance as an agent of global change and the potential for future environmental changes to alter societal arrangements, no one would argue that there are not intimate connections between human activities and changes in nutrient cycling and energy or water fluxes. But the fact that the human and natural realms are so obviously connected in fact does not mean that the connections between natural and social science research on global change are either obvious or easy to make. What connections should exist between natural science research on changes to the Earth system and social science investigations of the human dimensions of global change?

The human condition

Grossly simplifying the issues, there are six aspects of the human condition that are important with respect to global change.

Population

Globally, population has doubled since 1950 to approximately 5.2 billion. It may double again during the next century be-

fore it is projected to level off at somewhere between 8-14 billion, depending on whose projections one believes. In many situations, population growth has increased pressure on the land to such an extent that traditional agricultural and land use practices are no longer viable ecologically, economically, or socially.

Consumption and production

Based on energy use, economic activity has quadrupled since 1950. This increase in production and hence consumption produces ever larger amounts of discharges which must be cycled through the Earth system. This increased load on natural cycles is forcing environmental changes at a global scale.

Technology

Development of new technologies has created new possibilities for humankind to disrupt the functioning of natural systems, but also holds the promise of enabling us to avoid the tradeoff between environmental protection and economic development. Technology is a major determinant of how much pollution will be produced by human consumption and production, and hence the extent to which natural biogeochemical flows will be altered.

Aspirations

While consumption and production have increased globally, this increase has come largely in developed countries. Those living in developing countries have legitimate aspirations for increased levels of affluence which will mean further increases in economic activity and environmental stress. Moreover, those living in developed countries are in no way satisfied simply to maintain their current standards

of living. They, too, demand further economic growth. The universal human drive to improve material standards of well being is a fundamental factor in global change.

Institutions

Political, economic and social structures shape human behaviour. Examples of these structures include international organizations; national, state, provincial, and local governmental bodies; economic markets; and land tenure systems. Variations in the structure of these institutions will affect decisions regarding the use of natural resources and will modify the rate at which fundamental human driving forces such as population density and level of consumption affect global cycles. They will also exert a strong influence on the formulation of policy responses to global change, and thus on the impacts which global change may have on human societies.

Perceptions

Perceptions and values condition the reactions of humans to their surroundings. Perceptions are based on such factors as individual psychological make-up, cultural background, and social, economic, and political circumstances. Human perceptions of global environmental changes, which will take shape over decades and longer, will be dominated by attitudes and assessments of current challenges and opportunities, as well by more general attitudes towards the environment. Understanding these perceptions will be crucial to understanding how individuals will react to global change.

Human-nature connections

These six aspects of the human condition

can be seen in three distinct relationships with global environmental change.

I Driving forces

Population growth, consumption and production patterns, and technology interact to produce different levels of environmental stress for a given level of human activity.

This relationship has been conceptualized in a rough identity by several researchers:

$$\left[\frac{\text{env. impact}}{\text{area}} \right] \text{function} \left[\left(\frac{\text{population}}{\text{area}} \right) \left(\frac{\text{consumption}}{\text{population}} \right) \left(\frac{\text{env. impact}}{\text{production}} \right) \right]$$

where the three determinants of environmental impact on a given area are: i) population growth rate, density, and structure; ii) the level and patterns of consumption of a population group; and iii) the environmental impact of production, which will be determined by the productive technology employed. Many human activities drive global change, including land use, energy production from biomass and fossil fuels, agricultural activities, and industrial activities that produce compounds such as chlorofluorocarbons.

II Impacts

Global environmental changes, whether to climate, hydrological cycles, or ecosystems, will affect human societies. The availability of freshwater resources, the productivity of coastal zones, the continued viability of agricultural activities in their current locations, forestry, human health, trade patterns, human settlements, and the transportation system are among those aspects of societies which could change as a result of human alterations to the global environment. There will be new opportunities and constraints to confront in meeting basic human needs and aspirations. The environmental security of some groups will be reduced, while others may benefit from global change. Studying the potential impacts of global change from the local to the international level is key to developing farsighted resource management strategies, which will minimize the negative effects and enable societies to make the most of new opportunities.

III Responses

The six aspects of the human condition will also affect how societies respond to global environmental changes and their region-



Contrasts in energy sources in developing countries.

al and local manifestations. International institutions will affect treaty arrangements and the formulation of mechanisms for resolving disputes which may arise out of global changes. Economic incentives can encourage individual behaviours which mitigate or slow the rate of change, just as insecure land tenure arrangements and the failure to enforce regulations and laws can lead to environmentally irresponsible behaviours. Cultural practices and norms will determine which government policies may be effective and which will have little impact because they violate norms. Perceptions of the importance of global change and its impacts relative to other social or environmental problems will determine whether individuals are willing to make changes in their behaviour now to

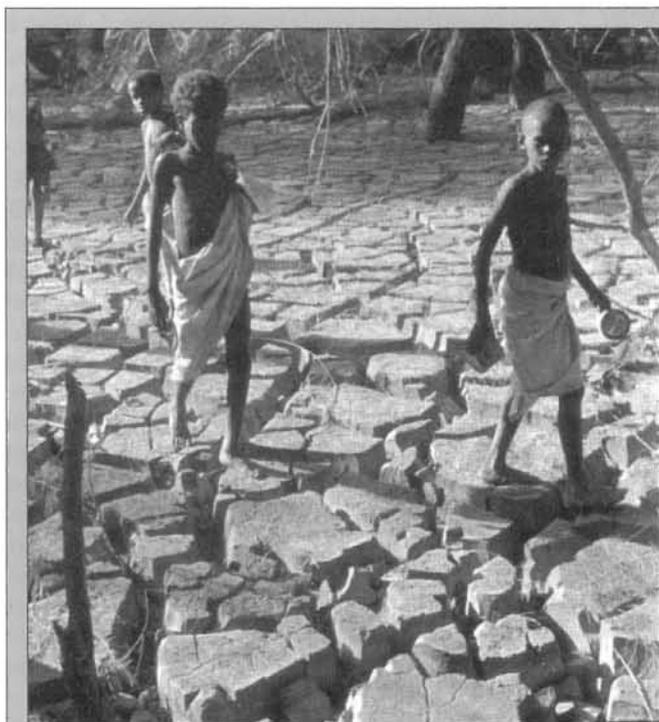
protect their future natural resource base.

A Research Programme on the Human Dimensions of Global Change

A programme on the human dimensions of global environmental change needs to address all aspects of this complex set of issues. Some of this research will be carried on completely independently of work in the natural sciences on the Earth system, while other projects will require close collaboration between social and natural scientists.

Social scientists working in resource management have been studying human-nature interactions for a long time. Demographers and economists have long been carrying out research on issues directly relevant to the study of global change. What is less widely recognized is that researchers in other social science disciplines, including political science, sociology, anthropology, psychology, and history, are increasingly investigating questions regarding human driving forces, potential impacts, implementation of policy responses, and historical relationships between human activities and environmental changes. This growing body of research provides a foundation for planning and coordinating an international research programme on the human dimensions of global change.

The Human Dimensions of Global Environmental Change Programme (HDGEC) of the International Social Science Council (ISSC) is starting to expand the intellectual framework of the growing volume of research on the human dimensions of global environmental change. This framework will provide a means for relating this research to a structure similar to that provided by the IGBP, so that individual results can be integrated and synthesized into a more complete picture of the ways in which human activities are driving global change and how global changes will affect human systems. The primary means through which the programme seeks to operate is through research planning and coordination, building on and relating ongoing research in the social sciences, identifying areas of strength and weakness, and developing proposals for needed research initiatives. The development of the programme is



What kind of world will the changes in precipitation patterns leave for the next generation?

being supervised by an international, multidisciplinary committee chaired by Professor Harold Jacobson (USA, University of Michigan).

A list of some of the projects and ideas for research currently being discussed by the HDGEC Programme includes:

Global Omnibus Environmental Survey (GOES)

This is a proposed survey of perceptions and attitudes towards environmental issues generally, and global change more specifically. It will be administered on a regular basis throughout the world, building on existing questions and survey. It will seek to consolidate and coordinate this research so that the data are more useful comparatively and longitudinally.

Industrial Heritage

This project addresses the issue of how a nation's current industrial metabolism and infrastructure will constrain the adoption of more efficient production technologies which produce less waste and emissions.

Impact of institutions on resource use

This project will address the question of how a variety of institutions affect resource management decisions. Institutions to be investigated include land tenure systems, economic incentives, social institutions, and political decision-making arrangements at all levels from the local to the international.

Technology transfer and diffusion

Why do some individuals and societies innovate? Why do others fail to adopt even tried-and-true technologies which may be desirable because they have a lower impact on the environment per unit of output? What obstacles will exist to implementing potential commitments to reduce greenhouse gas emissions? What sorts of domestic and international policies are most likely to facilitate international technology cooperation and the diffusion of new technologies to increase end-use efficiency and generate energy from alternative (non-fossil fuel) sources?

Projects such as these will be conducted independently by social scientists, in some cases relying on data provided by global change research in the natural sciences.

Collaborative Research in the Social and Natural Sciences

A second set of projects will require close collaboration between social and natural scientists. Social scientists need this collaboration to ensure that information regarding changes to natural systems and

their probable environmental impacts is accurately integrated in studies of social impacts and the development of responses. Natural scientists working within the IGBP framework will need the knowledge and expertise of social scientists to fully understand human forcing of natural systems, to understand how human responses may create new and unexpected feedbacks in natural systems, and to move towards development of projections of global change. A provisional list of questions for collaborative research, which will be expanded, includes:

Land use/cover change

What are the implications of changes in land cover (and related environmental impacts such as increased soil erosion or changes in the availability of fresh water) for economic and social activities in rural and urban areas? How will replacement of multi-species forests and grasslands with single-species managed ecosystems affect biogeochemical cycles and regional ecosystem resiliency? In turn, how will these changes affect human social structure, patterns of economic relationships, and rural lifestyles? What is the potential for assessing changes in land cover due to changing land use practices, and further, linking present and future land-use practices to socio-economic factors including demographic patterns, income levels and distribution, international commodity prices, global capital flows, and structural adjustment policies? A project in this area is already under development and by a joint IGBP-HDGEC working group. This area of research has relevance to a number of IGBP core projects including Biospheric Aspects of the Hydrological Cycle, Global Change and Terrestrial Ecosystems, Land-Ocean Interactions in the Coastal Zone, Global Analysis, Interpretation and Modelling, and that portion of Past Global Changes focusing on global changes of the past 2000 years. It will also be of interest to social scientists interested in land tenure systems, the impact of agricultural price supports, rural sociology, and international capital flows.

Coastal zone utilization and management

What is known about the utilization of marine and terrestrial resources in the coastal zones? What is the economic value and social importance of these activities? How will these activities affect the long-term harvestable biological productivity of the coastal zones? What are the economic and ecological costs and benefits of such activities as aqua-culture, shrimp and fish farming, and factory fishing? What

are the priority needs for assessing the socio-economic impacts on coastal-zone communities of potential environmental changes such as sea-level increase, increased siltation, salinization, and changes in productivity which may be caused by the alteration of natural biogeochemical cycles?

These questions are of obvious importance to natural science research projects such as Land-Ocean Interactions in the Coastal Zone (LOICZ). Perhaps less obvious are some of the ways in which research on coastal zones could illuminate topics traditionally of interest in the social sciences. By treating coastal zones, which encompass both urban and rural areas, as integrated social and economic systems, these studies may enable social scientists to gain new insights into the interaction between urban and rural development. These studies would also provide valuable subjects for increasing our understanding of the impact of perceptions and values on resource management decisions. Finally, this area of research provides challenges and opportunities for developing the field of ecological economics, such as devising a detailed system of resource accounting for the coastal zones that would include the ecological impact of various uses of coastal areas, including dumping of wastes, so that the overall economic value of these uses could be compared more accurately.

Potential impacts of meso-scale climate change

How will current predictions of future meso-scale climate changes affect agriculture, economic activities, human health, rural life-styles, and the availability of key natural resources? What are the priorities for assessing these potential impacts? What capabilities exist in key regions to perform climate change impact analysis? Which of the various approaches currently available for assessing potential impacts of climate change — including modelling climatic and socio-economic scenarios of the future and using present-day climate variations and their socio-economic impacts as analogues for potential effects of future climate changes — hold the most promise for regional impacts assessment? In addition to their intrinsic importance for natural resource planning, economic development policy, and the formulation of response strategies, this area of study will provide opportunities for methodological advances in both natural and social science modelling.

Greenhouse gas emissions

Future scenarios of greenhouse gas (GHG)

emissions from deforestation, biomass burning, and the use of fossil fuels already exist. Yet the estimates produced by the models which underlie these scenarios can vary tremendously. Since these estimates are becoming the basis of international agreements to reduce GHG emissions, careful assessment of why the scenarios differ, including examination of their assumptions about both natural and socio-economic processes, are urgently needed.

Past environmental and social change

How can the study of global environmental changes of the last centuries be related to anthropological and archaeological research on changes in human societies in order to illuminate the links between environmental and social change in the past?

In particular, how can the study of regional paleoclimates be used to develop assessments of potential future socio-economic impacts of climate change?

El Niño forecasting and human response

What is the impact of the ability to forecast El Niño events on agriculture, the exploitation of fisheries, other economic and social activities, and public attitudes regarding the environment and scientific research? Historically, how have societies adjusted to El Niño events? What sorts of data and other research resources are needed to develop studies of these impacts?

Obstacles and Opportunities

Carrying out this sort of collaborative research will not be easy. Social and natural

scientists use very different languages and methodologies. Their models are very different. Socio-economic data are not compatible with geophysical data and will need to be converted to a grid-based system. Researchers in both the natural and social sciences will need training in the methods and knowledge of their collaborators. These obstacles are not insurmountable, but they will require persistence and resources to overcome. Developing collaborative research programmes, as well as a strong programme of social science research on the human dimensions of global changes, is important to realising the common interest of natural and social scientists in understanding how humankind's relationship with the environment can be managed ■

A Quick Start for START

Guidelines for Regional Research Networks and Centres

Just over a year ago, the IGBP, in collaboration with the World Climate Research Programme (WCRP) and the Human Dimensions of Global Environmental Change Programme (HDGEC), formulated plans for a global system of regional research networks to stimulate research, modelling, and training activities related to global change in both the natural and social sciences. Rapid progress in implementing the initiative - called the System for Analysis, Research, and Training (START) - has been made. The plans were first published in IGBP Report No. 15 (1991).

The Standing Committee for START recently held its third meeting and finalized guidelines for establishing centres which will become part of the network. A series of meetings and consultations in the three priority regions for START - Equatorial South America, Tropical Asian Monsoon Region, and Africa north of the equator - have been held or are currently on the drawing board. And plans for establishing a START secretariat are moving forward.

Rationale for a Regional Focus

The international scientific community, through the mechanisms of the IGBP, the

WCRP, and the emerging research framework of the HDGEC, has identified a set of critical unknowns related to global change. These programmes have formulated research questions related to these unknowns, and they are implementing or planning scientific projects to address them.

While these programmes focus on understanding *global* systems and processes in both the natural and human spheres, they will require regional and sub-regional data and analysis in order to attain their scientific objectives and fulfil their common responsibility to provide information about global changes and their impacts to policy makers, resource managers, and the public. START is intended to promote research which focuses on the *regional* origins and implications of global environmental changes. This research will provide a basis for a more detailed understanding of the anthropogenic forcing of global cycles, the impact of global changes, the options for reducing local and regional contributions to these environmental stresses, and potential ways of taking advantage of those environmental changes which may now be inevitable.

START will consist of thirteen Regional Research Networks (RRNs), which

span a scientifically coherent area. Each RRN will be comprised of a Research Centre or Centres (RRCs) and affiliated Regional Research Sites (RRSs). The research centres will facilitate regional participation in the core projects of the IGBP, the WCRP, and the HDGEC, with special emphasis on aspects that have distinct regional manifestations. The centres will develop, synthesize, and interpret regional data sets of key variables related to global change research, thus enabling indigenous analysis and the incorporation of these data into global-scale modelling efforts. They will also extract and interpret the components of global models relevant to their regions, and in this way provide regionally-important information to decision makers.

A vital component of START is the commitment to build the scientific capabilities and infrastructure required to enable scientists from developing countries to participate in all aspects of planning, coordinating, and implementing research on the causes and potential impacts of global change.

Guidelines Announced

The START initiative seeks to work with existing research centres and sites which

are interested in participating in the global change research network as well as to foster new research networks. To facilitate the process of developing proposals to participate in START, the START Standing Committee adopted guidelines for establishing research networks at its third meeting, held at the International Institute for Applied Systems Analysis (IIASA) outside Vienna, Austria, on 30 November - 1 December 1991. Together with the framework described in IGBP Report No. 15, these guidelines provide information about the objectives of START and the functions which institutions seeking to be a part of the network must plan to fulfil.

Research networks or centres which wish to become affiliated with START should submit a proposal to the START Standing Committee, with the endorsement of the IGBP National Committees of the region. Proposals should include detailed information regarding scientific orientation, training, plans for the organisation and management of the network through its research centre(s), proposed legal arrangements between participating countries and organisations, and financial information. In recognizing regional research networks, the START Standing Committee will allow considerable flexibility in formal organisational structure in order to accommodate the special needs and characteristics of each region so long as the essential objectives and functions of an RRN are met.

The START Standing Committee has defined five sets of objectives for regional research networks and centres.

Data

Provide a focus for data and information management including data acquisition, quality control, archiving, and effective dissemination and exchange; ensure that development of data-related activities is coordinated with IGBP-DIS and other major international programmes; facilitate the exchange of data with other networks and provide access to the network's data to interested researchers.

Research, analysis, and modelling

Stimulate and facilitate interdisciplinary research on regional aspects of global change in both the natural and social sciences; provide regional analysis, interpretation, and modelling of global change phenomena; strengthen regional participation in the projects of the IGBP, the WCRP, and the HDGEC; provide experimental sites with appropriate infrastructure.

Policy outreach

Encourage the incorporation of global

change research findings in the policy process and operational management by involving decision makers in some of the activities of the network.

Training

Developing indigenous scientific capabilities through training, collaborative research, and scientific and technical cooperation.

Scientific cooperation and access

Participate fully in START through exchange and collaboration with other RRNs; provide comprehensive knowledge of and directories to the databases, projects, and activities within the RRN.

To make it possible to attain these objectives, regional research networks should have:

- A commitment to incorporate all interested parties in the region in global change research;
- a clearly defined mission statement with specific analytic, research and training goals;
- scientific competence and credibility relating to global change research and education;
- the necessary infrastructure, such as computing capability, laboratories, equipment, libraries, and scientific and technical personnel;
- a commitment to facilitate scientific exchange by providing access to scientists from within and outside the region;
- the expectation of long-term stability of interest and financial support from the host and donor governments/organizations;
- research and management functions located within the region; and
- research sites located in all major biogeographical zones representative of the region, in so far as possible.

Regional Consultations

All thirteen regions identified in the START initiative are important in terms of global change; each is distinctive, and only together can they provide a complete representation of environmental changes in a global context. Three regions, however, have been identified as priorities for assistance in establishing and funding regional systems for global change analysis, research and training considering the combined factors of sensitivity to global and climatic change, scientific unknowns, and the existence of available infrastructure. These are Equatorial South America, Tropical Monsoon Asia (with an initial focus on Southeast Asia), and Africa north of the equator.

To assess the scientific capabilities and interests of developing countries in these and neighbouring regions, the IGBP over the last two years has conducted several regional meetings. These meetings have been held in Mbabane, Swaziland (1988); Douala, Cameroon (1989); São José dos Campos, Brazil (1990); Lomé, Togo (1990); Niamey, Niger (1990) in New Delhi, India (1991), Singapore (1991) and in Chiang Mai, Thailand (1992). In addition, a workshop was convened in July 1991 in San Juan, Puerto Rico, at the invitation of the United States, to discuss the feasibility of establishing an Inter-American Institute for Global Change Research (IAI) which is hoped will become affiliated with START as the first operational RRN. An Interim Working Group was established to plan for the institute and has been working under a tight schedule of meetings with the expectation that plans for the IAI would be agreed upon and announced in May 1992.

Additional meetings and consultations to lay the foundations for RRNs in these priority regions have been held in Stockholm (25-26 September 1991), and in three ASEAN countries (Thailand, Indonesia, Singapore, 1-4 October 1991). Future meetings to continue developing plans and priorities are scheduled for each of the three regions, including consultations with West and Northern African nations in February 1992, workshops to finalize plans for the IAI in March/April and May 1992, a regional workshop in Latin America to plan a research agenda on the human dimensions of global change for the IAI, a possible meeting to continue planning for a Southeast Asian RRN in July 1992, a workshop in Toulouse and a regional workshop for Africa scheduled for November 1992.

The Standing Committee for START is currently discussing proposals for the establishment of a regional research centre for Antarctica in New Zealand and one for the Mediterranean in France. Discussions are also under way regarding development of Arctic, Caribbean and Temperate South America (as a component of IAI) and Temperate Northern Hemisphere Regional Research Networks.

Regional and Global Importance

START is a crucial component of global change research. It will contribute to the development of knowledge regarding how human activities in different regions contribute to climate forcing and other environmental changes. It will increase our understanding of how natural and human systems in the regions will be affected by

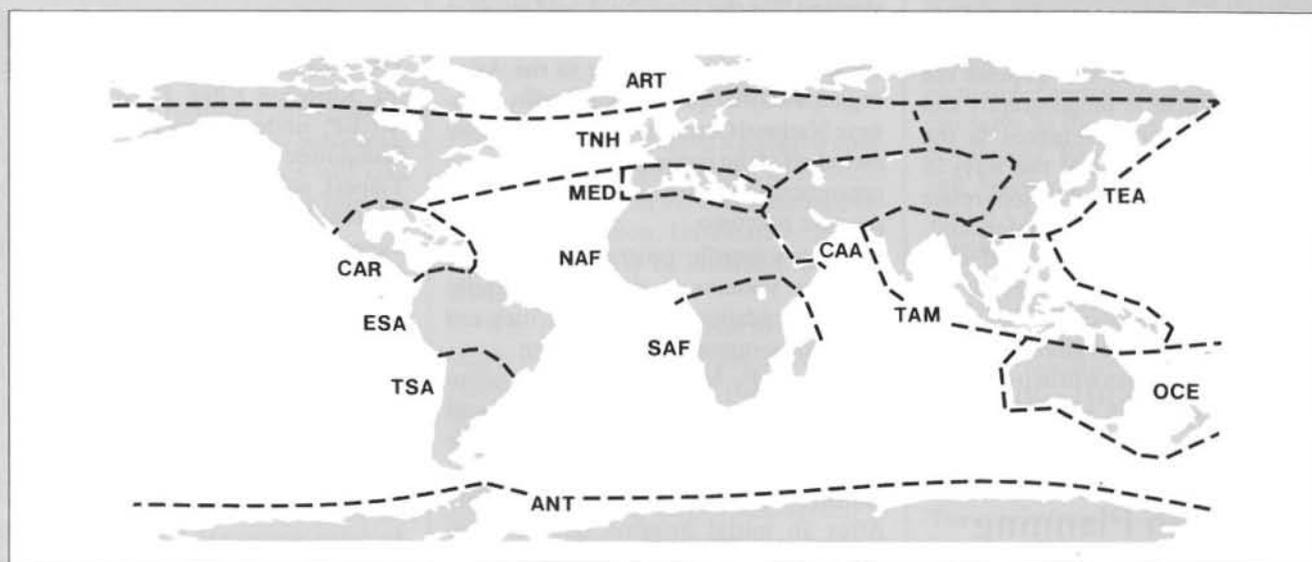
global changes. This knowledge will be crucial as a basis for formulating effective national and regional development policies as well as identifying strategies for adapting to environmental changes which may be inevitable. START also holds great potential for strengthening and expanding existing scientific talent and capabilities in developing countries.

The Standing Committee for START

recently submitted a proposal to the Global Environmental Facility for support of global change research networks in the three priority regions. The Scientific and Technical Advisory Panel of GEF has given the START proposal its highest priority, and preliminary indications are that GEF will provide funding. Initial activities will focus on Tropical Monsoon Asia. The START Standing Committee

and programme staff will continue to work to earn GEF support for the establishment of networks in Northern Africa and Equatorial South America. It is hoped that this funding will soon be made available to reinforce the rapid progress in establishing a research network being made in the Americas and the expansion of the global change research community in Africa ■

The 13 approximate geographical regions for a global set of RRNs. Regions and boundaries adopted for the global START initiative will be based on regional needs and desires, through discussions with appropriate representatives from the nations involved.



ANT Antarctic

ART Arctic

CAA Central Arid Asia

CAR Caribbean

ESA Equatorial South America

MED Mediterranean

NAF Northern Africa

OCE Oceania

SAF Southern and Eastern Africa

TAM Tropical Asian Monsoon Region

TEA Temperate East Asia

TNH Temperate Northern Hemisphere

TSA Temperate South America

REGIONAL IGBP MEETINGS

Two IGBP meetings were held in Asia, within one month of each other: in Singapore in December 1991, and in Chiang Mai, Thailand, in January 1992. The first addressed the general issues of IGBP science planning over the entire Asian region, and the second, targeted to six mem-

ber states of the Association of South East Asian Nations (ASEAN), focused on IGBP's Global Change System for Analysis, Research and Training (START), and the Human Dimensions of Global Environmental Change Programme (HDGEC). A Regional Meeting for Africa

is planned for 23-27 November of this year.

There is a critical need to stimulate and facilitate regional aspects of these global research programmes in both developed and developing countries and regions. Global change research will require

a regional approach for many reasons. First, the research needed to develop a global perspective demands that regional differences in the characteristics such as biogeography and climate be taken into consideration. Second, the goal of a "practical predictive capacity" for global environmental change makes it necessary that this capacity be developed for distinct subcontinental regions. Global change predictions will be of greatest value to decision makers if they apply on a regional basis, and if scientists from throughout the region are involved from the start of the process through which they are generated. Third, the impacts of global change on socio-economic systems will vary from region to region and country to country. This regional variation will depend not only on differences in biogeography and climate, but also on differences in the socio-economic system and the ways in which different regions and nations relate to and use the environment. Understanding how different regions may be affected by global change is a prerequisite for understanding how these societies can effectively mitigate or adapt to global changes, and how these responses will in turn affect the natural systems in which they are imbedded.

IGBP Asian Planning Meeting

Singapore, 12-14 December 1991

An Asian workshop was held in New Delhi in February 1991 to bring together scientists from Asian countries and IGBP experts to create awareness, to identify topics of importance and relevance to the region, and to recommend areas and topics for regional and international co-operation. The Delhi workshop's recommendations were published in IGBP Report No. 18:1. In order to implement the recommendations on future plans and programmes, an Asian meeting of scientists and decision makers was organized by the ICSU Committee on Science and Technology in Developing Countries (COSTED) during 12-14 December 1991 in Singapore, jointly with the Asian Network of Biological Sciences (ANBS). It was co-sponsored by the IGBP. About thirty representatives attended from fourteen countries of Asia including, Australia. Prof. Thomas Rosswall, Executive Director of

IGBP, and Dr. Stan Ruttenberg, Chairman of the ICSU Panel on World Data Centres also attended.

The Programme

Prof. Kho Hong Woo, Dean of Science of the National University of Singapore, inaugurated the meeting. Prof. A. N. Rao, Secretary, ANBS, welcomed the delegates. Prof. R. R. Daniel, Scientific Secretary, COSTED, detailed the need and objective of the present meeting. He remarked that the Delhi Workshop was mainly "getting to know" about the IGBP, and the present one was "getting to work". He stressed that this meeting should result in planning work on topics of IGBP Core Projects that are important to the Asian region. Prof. M. Yoshino, Chairman, Japanese National Committee for IGBP, spoke on behalf of the participants, thanking the organizers and expressing optimism for its positive outcome.

The scientific programme included separate sessions to discuss the Delhi Recommendations on IGBP activities, and regional co-operation and funding.

Dr. A. P. Mitra, Chairman, Indian National Committee for IGBP, reviewed the World Climate Research Programme (WCRP) and Prof. Thomas Rosswall summarised recent developments in IGBP. After an initial briefing on the Core Projects, the workshop discussed the recommendations and the current country plans, and proposed actions. The delegates detailed specific activities, and identified countries willing to take responsibility for coordinating or participating in regional programmes, with individual contacts for each project where possible.

An important topic discussed extensively was START. Prof. Rosswall gave a description of START and the need for establishing Regional Networks to coordinate IGBP activities, with emphasis on the special need for locating a Regional Research Centre in Southeast Asia within the Tropical Asian Monsoon Region.

Useful action plans resulted. It is now hoped that the countries of the region will make this co-operative activity a great success.

Recommendations and decisions

International Global Atmospheric Chemistry Project (IGAC)

Recognising the importance of monitoring greenhouse gases as recommended in the Delhi Workshop, these projects were suggested for immediate action:

- A campaign on monitoring and measur-

ing methane flux in the Asian region is to be initiated in addition to a training programme on the methodology of methane measurements. This activity should strengthen instrument development and research capabilities. Bangladesh, China (CAST and the Academy in Taipei), Indonesia, Japan, Pakistan, Philippines, Singapore, Sri Lanka and Thailand agreed to work with India as coordinating country (Contact: Dr. A. P. Mitra, India).

- A network on the monitoring and measuring of UV-B and ozone was agreed among Australia, India, Indonesia, Japan, Malaysia, Sri Lanka (Contact: Dr. M. Ilyas, Malaysia).

Joint Global Ocean Flux Study (JGOFS)

The session stressed the importance of the Kuroshio Edge Exchange Process (KEEP; under the auspices of the IGBP Committee of the Academy of Sciences, Taipei), and noted that this was closely relevant to JGOFS scientists. Suggestion was made to include this project in JGOFS. A study of coral reefs in relation to CO₂ flux was also suggested. A proposal was made that JGOFS provide opportunities for scientists from countries without scientific research vessels to participate in scientific cruises.

Land Ocean Interactions in the Coastal Zone (LOICZ)

An Asian representative should be included in the Core Project Planning Committee of LOICZ. An *ad hoc* Committee with members from Bangladesh, Indonesia, Japan, Pakistan, Singapore and Thailand was formed to formulate the LOICZ priority areas for Asia. (Contact: Prof. T. Piyakarnchana, Thailand).

Global Change and Terrestrial Ecosystems (GCTE)

Dr. W. Steffen, Core Project Officer for GCTE, said that GCTE welcomed research projects on national or regional priorities, and bilateral linkages on a regional basis, and would be willing to help groups working on GCTE-related topics to obtain funding. For this it is necessary to compile a list of scientists in the region involved in global change related research, and COSTED has promised follow-up.

Past Global Changes (PAGES)

- The participants stressed the importance of the Asian monsoon. They suggested the study of climate and trace gas records by measuring the carbon cycle, and the preparation of paleo-environmental maps and vegetation change maps. (Contact: Prof. E. Matsumoto, Japan). They recommended a regional co-opera-

tive programme on PAGES taking into consideration the offers of Japan, the Academy of Sciences in Taipei and India.

Data and Information System (DIS)

Data generation and information systems are part and parcel of any IGBP study. Efficient systems must be developed and supported in order to accommodate the voluminous amounts of data necessary to meet IGBP's objectives. Programmes outlined for action were:

- Regional and National Centres dealing with DIS and data exchange could be established in the region and be linked to IGBP-DIS.
- National Committees for IGBP should submit relevant data on the subject and interact with IGBP-DIS.
- IGBP member countries interested in having non-member countries participate in IGBP regional programmes will take the necessary steps to exchange relevant data and information.
- Training programmes will be organised for scientists or computer persons with the Panel on World Data Centres at their facilities. Dr. Ruttenberg informed that a PC version of the Master Directory for remote sensing data should be ready by June 1992.

Global Analysis, Interpretation and Modelling (GAIM)

Global Analysis Interpretation and Modelling in its broadest sense must be able to predict long-term global changes reliably and quantitatively. Recommendations were:

- The participation of developing countries in GAIM was at present low and requires a strategy to increase involvement. The delegates agreed to collect and document information on ongoing activities in this field in Asia, and COSTED will assure follow-up.
- A working group will meet and work out details regarding future activities. Australia, Bangladesh, China (CAST and the Academy in Taipei), India, Indonesia, Japan, Malaysia, Pakistan, and Singapore wish to participate. (Contact: Prof. Congbin Fu, China).

Global Change System for Analysis, Research and Training (START)

Noting the tremendous importance of START for developing countries, the following action plans were proposed.

- All participating countries endorsed the START concept. The meeting commended the efforts of IGBP to raise funds from the Global Environment Facility for initiating START in the priority developing

regions of the world. Appropriate links to the World Climate Research Programme (WCRP) and the Human Dimensions of Global Environmental Change Programme (HDGEC) in planning was found essential.

- The participants stressed the need for Regional Research Networks, apart from the support for the Regional Research Centres.
- The meeting stated that IGBP may encourage countries that are not national members to participate in IGBP regional programmes. It accentuated COSTED's important role, and recommended greater interaction between IGBP and COSTED.

Regional Cooperation

Countries not yet having a national committee for IGBP were urged to consider full membership in view of increased regional co-operation. Information needed to help them may be obtained from the IGBP Secretariat.

The participants agreed to organize a yearly meeting of the Chairs of the IGBP National Committees in the region. In addition, it was decided to invite to these meetings the regional conveners for the IGBP Core Projects. The Chairman of the Japanese National Committee agreed to host a second regional meeting in Japan in the later part of 1992. COSTED and ANBS agreed to co-sponsor this meeting (Action Prof. M. Yoshino, Japan).

Arranging meetings focused on specific scientific topics is important. One such meeting can be held in China (Academy of Sciences in Taipei) in May 1993 along with the meeting of the International Group of Funding Agencies (IGFA) for Global Change Research.

A directory of activities and personnel in the Asian region involved in IGBP-related activities is to be prepared. COSTED is entrusted with this task. Members were requested to collect relevant information in their country and forward it to COSTED for compilation (Action: COSTED).

The three day meeting was extremely productive and the responses very encouraging. We hope that with active cooperation amongst the participating countries the decisions would blossom into suitable actions at an early date.

Prof. R. R. Daniel, Scientific Secretary, and Dr. B. Babuji, Senior Scientific Officer, Scientific Committee on Science and Technology in Developing Countries

Southeast Asian Regional Meeting on START

Chiang Mai, Thailand, 13-17 January 1992

The Chiang Mai workshop was one of a series of regional IGBP meetings organized to discuss the involvement of the science communities in the international scientific efforts to understand global change processes. They encourage the planning of regional research agendas that can serve as the scientific framework for developing Regional Research Centres and Networks as part of the proposed Global Change System for Analysis, Research and Training (START). The workshop developed a scientific agenda for regional collaboration, reviewing the proposal to incorporate Southeast Asia in the START initiative, in collaboration with the WCRP and HDGEC. The steps needed to implement a set of Regional Research Sites and the establishment of a Regional Research Centre were discussed. The report from the meeting will be published as IGBP Report No. 22.

General Recommendations

Taking note of the recommendations from the two Regional IGBP meetings for Asia (New Delhi and Singapore, 1991), the Southeast Asian workshop, spearheaded by ASEAN countries, also attended by representatives from Australia, Japan, and the Academy of Sciences (Taipei) as well as IGBP, WCRP, HDGEC, Unesco, and UNEP/GRID meeting in Chiang Mai, Thailand on 13-17 January 1992 makes the following recommendations:

1. The workshop stresses the need for the scientific communities in the region to be fully involved in all aspects of Global Change research. It further notes that the International Geosphere-Biosphere Programme (IGBP), the World Climate Research Programme (WCRP), and the Human Dimensions of Global Environmental Change Programme (HDGEC) provide the international framework for this research. Countries in the region are encouraged to take active part in these international programmes as appropriate taking national priorities and available scientific expertise into account.

2. The workshop endorses the initiatives of the IGBP to address regional research needs in relation to Global Change, in particular the proposal for START. In the furtherance of these initiatives the workshop recommends the formation of National Committees for IGBP in all countries of the region. All national committees should preferably be interdisciplinary, including both natural and social scientists. In order for regional activities to be coherent and properly articulated, it is further recommended that there be a regional IGBP coordinator.

3. The workshop recognizes the need for continuity and sustainability of planned activities in order for the programmes to be meaningful and attain their objectives. Therefore, it recommends that the countries involved commit themselves to the programmes through funding support and identification of appropriate individuals and institutions that can follow through the activities.

4. The workshop recognizes the need for substantial funding to carry out the various activities proposed. It recommends that international and bilateral donors, and individual countries and institutions in the region support the regional programmes on Global Change through financial assistance.

In particular, the workshop strongly endorses the IGBP proposal for START to the Global Environmental Facility (GEF), especially with reference to the Tropical Asian Monsoon Region with an initial focus on the ASEAN countries. The workshop notes with interest the proposals from the Thai and Indonesian IGBP committees in relation to START and requests the START Standing Committee to continue discussing these proposals with countries in the region as a priority.

5. In the eventuality that START is successfully launched with the needed initial seed money, the meeting invites the participation of countries from the broader Southeast Asian region. In addition, the meeting notes and welcomes Japan's interest in collaboration with the region, and notes the possible Japanese invitation to host a regional meeting to further address regional aspects of global change research including possible support for the START initiative.

6. The workshop identified the need for appropriate linkages and

interactions among scientists and institutions both within and outside the region. In this context, it recommends the following:

- Training of manpower for Global Change research to maximize the use of indigenous expertise.
- Periodic experts meetings in the region focused on IGBP Core Projects.
- Compilation of a directory of individuals and institutions with active interest in Global Change research.
- Establishment of appropriate regional data bases to serve the specific global change projects.
- Information exchange making use of existing mechanisms where possible. Data generated through IGBP/WCRP/HDGEC projects should be accessible to participating countries.
- Access of involved countries to each other's Exclusive Economic Zones in the context of IGBP and WCRP activities.

7. The workshop recommends the improvement of existing infrastructure that can be mobilized to address Global Change research. Hence, projects in the region should give due regard for enhancing capacities of existing institutions.

8. The workshop recognized that South-east Asia has natural phenomena peculiar to it such as the monsoon regime, the pronounced land-ocean interaction due to the archipelagic nature of the region, and the incidence of volcanic eruptions that can affect global change. In addition to Global Change concerns that are common to many regions (e.g., ENSO events), the meeting recommends, among other issues, that some attention be focused on

episodic events likely to have global implications, especially the monsoon influence on land-ocean interactions in the region and physical and socio-economic impacts of volcanic eruptions.

9. As a follow-up to the workshop, the participants recommend the formation of an *ad hoc* IGBP Planning Committee to carry forward the above recommendations in particular and IGBP concerns in general. It is suggested that the committee consist of the Chairs of the IGBP National Committee in the region plus representatives from Brunei Darussalaam, Malaysia, the Philippines, and Singapore. The workshop also welcomed the tentative invitation from the Indonesian IGBP Committee to host a follow-up meeting in mid-1992.

Africa and Global Change

A Regional Meeting of the IGBP and the Human Dimensions of Global Environmental Change Programme (HDGEC) will be held in Niamey, Niger on 23-27 November, 1992.

The objectives of the meeting are:

- To present current understanding of global change issues in relation to their importance for Africa;
- Identify key areas of global change research in both natural and socio-economic sciences;
- Review IGBP and HDGEC Core Projects and set priorities for African scientific participation in the projects including the identification of impediments to for such participation;

- Discuss global change research networks as part of the IGBP/WCRP/HDGEC initiative for a System for Analysis Research and Training (START) in the Mediterranean, Northern African, and Southern African regions;

- Review possibilities for strengthening collaboration with other relevant research and monitoring programmes (e.g., UNEP's Global Environmental Monitoring System and Global Resource Information Database; and Unesco's Man and the Biosphere programme, the International Hydrological Programme, the International Geological Correlation Programme, and the Intergovernmental Oceanographic Commission).

Governments face decisions about whether the risks posed by



Shifting cultivation in the Thai highlands, in which forest is cleared and the land is cultivated for a few years before being abandoned, is a major cause of the high rate of deforestation. At the Mae Sa Integrated Watershed and Forest Land-use Project in Chiang Mai Province, farmers are introduced to market-oriented agriculture and land-use management that are alternatives to the present slash-and-burn economy.

global change processes warrant potentially costly policy responses, and if so, which responses will be feasible and effective. The scientific community, through the mechanisms of the IGBP, the developing research framework of the HDGEC, and the World Climate Research Programme (WCRP), has identified a set of research questions about critical unknowns related to global environmental change. The workshop will discuss the proposed international programmes, review their relevance to Africa and suggest priorities for African participation. The constraints for full involvement of the scientific communities in Africa will also be addressed.

Topics will cover: the importance of Africa in the context of global change; climate change and desertification; biomass

burning as a source of greenhouse gases; impacts of global change on savanna ecosystems; global change impacts on agriculture; the role of tropical forests in the hydrological cycle; land-surface processes and the climate system; past global changes in Africa; population growth and land-use change; political and social institutions and environmentally sustainable economic development; energy systems, land-cover change, and greenhouse gas emissions; and the human dimensions of global change in the Sahelian region.

Working groups on the Mediterranean region, the Northern African region, and the Southern African region will address the issues of: desertification and deforestation impacts on climate and climate-change driven land-cover change; impacts

of land use and climate change on large river basins and on coastal ecosystems; past global changes; and human dimensions of global environmental change. Each working group will be asked to prepare a written report on its conclusions. The reports will cover the importance of the topic for Africa with an overview of ongoing research in Africa, monitoring needs, availability of data bases, the impediments to further regional and international collaboration, and give recommendations for action.

It is hoped that there will be a very wide participation of African scientists ■

For further information, please contact the IGBP Secretariat, Box 50005, S-104 05 Stockholm, Sweden.

International Group of Funding Agencies for Global Change Research (IGFA)

FRED EYBERGEN AND JOHN MARKS

The International Group of Funding Agencies for Global Change Research (IGFA) is an informal partnership of agencies established during a meeting in Washington in January 1990. It is composed of national coordinating bodies for funding global change research and/or leading funding agencies from 16 countries the Commission of European Communities.

IGFA was set up to promote effective support for the international global change research programmes. These now include the World Climate Research Programme (WCRP); the International Geosphere-Biosphere Programme: A Study of Global Change (IGBP), and the Human Dimensions of Global Environmental Change Programme (HDGEC). IGFA has strongly encouraged effective coordination of resource allocations and fostering the development of research in the field of human dimensions of global change.

Representatives of IGBP, WCRP, HDGEC as well as the International Council of Scientific Unions (ICSU) are invited to participate in IGFA activities relevant to their interest.

IGFA's objectives are to:

- Exchange information on national global change research programmes, supporting programmes, and facilities;
- Discuss approaches to the integration and phasing of the implementation of global change research in the light of available resources;
- Promote coordination of access to and deployment of specialized research facilities;
- Aim to optimize the allocation of national contributions to global change research.

IGFA met for the fourth time on 2-4 December 1991 in Scheveningen, the Netherlands. The meeting was hosted by the Netherlands' Ministry of Education and Science. Mention of earlier meetings in Bonn and Brighton was made in issues No.4 and No.6 (1991) of the *Global Change NewsLetter*.

IGFA has made clear progress in addressing resource issues. The first results of a pilot project initiated at the Brighton meeting identified a number of such issues. These relate to the establishment of a comparative framework for a full scale study of

national resources available for international global change research programmes. IGFA staff is developing a format for the collection of data for this study. The effort of IGFA should evolve into a management tool to allow dealing with the issue of funding global change research programmes, like the IGBP.

IGFA has decided on new ways to operate, both between and during sessions, and adopted a document on its mode of operation. In order to carry out more effectively the tasks described above, IGFA set up a Steering Group with rotating membership and with three issue-oriented Working Groups and a Task Force.

IGFA Steering Group

The Steering Group will be responsible for the review of IGFA's mandate and the development of the long term agenda for its work. The Steering Group will set directions for the working groups and give instructions for the preparations of meetings. The group will further identify, in consultation with IGFA members, issues that require action.

The Steering Group is composed of five persons. Three are the Chairs of the upcoming meeting, the last meeting, and the following one, thus with one member rotating at each session. The other two are members at large to be elected by IGFA and serve a period of three sessions.

IGFA Working Groups

The three issue-oriented working groups are: Working Group A on Global Observing Systems and Data Management Aspects; Working Group B on Resource Analysis; and Working Group C on Socio-economic and Human Dimensions Research.

Working Group A on Global Observing Systems and Data Management Aspects was set up to improve discussions on global observing systems (both space based and ground based) as they relate to the needs of the research programmes. The envisaged Global Observing System should be more comprehensive than the present plans for Global Change Observing System (see *Global Change NewsLetter* No. 6 (1991), p. 9). The Working Group will establish contacts with the relevant bodies involved (World Meteorological Organisation, Intergovernmental Oceanographic Commission, International Council of Scientific Unions and the Committee on Earth Observing Satellites) and develop plans for a meeting that will bring them together. The group will also address the needs of the socio-economic research community, in particular with regard to data accessibility.

Working Group B on Resource Analysis resulted from a process initiated at the Bonn meeting to determine the total levels of projected resource requirements for international global change research programmes (as identified by the scientific community) and resource allocations (as identified by funding agencies) to be provided for such programmes. Since then a pilot study was carried out aimed at aligning the needs of research programmes with the plans of the funding agencies. Results indicated that the exercise is very complex and needed a special working group for its supervision and coordination. It was decided that the scope and focus of the exercise will concentrate on the specific research projects within the WCRP, the IGBP and the HDGEC.

Before the next meeting, the Working Group will have completed a full inventory of resource requirements and availability at a level that allows a first inter-comparison and analysis of bottle necks. It expects to complete this first analysis and summarize it in an internal IGFA report by the end of July 1992.

The activities of Working Group C

on Socio-economic and Human Dimensions Research will focus on the exchange of information on national socio-economic research programmes in the field of global change and on development of mechanisms to link these on an international scale. The group will further improve and update an analysis of national summaries on socio-economic and social science research on global change prepared by the Economic and Social Research Council (UK) for the Scheveningen meeting. The group will stimulate regional network development and exchange across disciplines.

In addition, a Task Force was set up to look at current mechanisms for support, and explore future mechanisms and ways of sustaining the stability of funding of the central scientific planning and coordination of the international programmes during the implementation phase. For this purpose the first preliminary results of an inventory of existing and planned national and international offices dealing with the management and coordination of global change research were presented in Scheveningen. Before its next meeting IGFA will receive the results of the inventory together with concrete proposals from the Task Force for dealing with the resource requirements of international offices.

Future IGFA Meetings

IGFA is scheduled to meet in September 1992 in France; in the first or second quarter of 1993 in Taipei; and possibly next in late 1993-early 1994 in Canada. The meeting in France will address the financial commitments to the implementation of IGBP and WCRP. The first results of the resource analysis is also on the agenda. Participation of developing countries will be the central issue at the spring 1993 meeting in Taipei, and the Canadian meeting will focus on the Human Dimensions of Global Change.

For more information about IGFA you may contact:

Steering Group Members

Mrs. Eileen Buttle, National Environment Research Council, UK

Ms. Ho-ching Lee Liu, National Science Council, Taipei

Mr. Jean Labrousse (Chair), Ministry of Research and Technology, France

Dr. John Marks, Directorate for Research and Science Policy, Netherlands

Dr. Robert Corell, National Science Foundation, Washington, DC, USA

Staff Support Group

Dr. Louis B. Brown (Chair), Directorate for Geosciences, National Science Founda-

tion, Washington, DC, USA

Mrs. Antoinette Wennabo, Secretariat for Working Group on Global Change, NSF, Washington DC, USA

Drs. Fred Eybergen, Directorate for Research and Science Policy, Ministry of Education and Science, The Netherlands

Dr. Meinhard Schultz-Baldes, Nationales Global Change Sekretariat, Bremerhaven, Germany ■

IGBP Meetings

1992

3-6 April, Munich, Germany

4th Meeting of the Scientific Committee for the IGBP

7-8 April, Oxford, UK

GCTE Focus 3: Global Change Impact on Agriculture and Forestry Working Group

8-9 April, Berne, Switzerland

2nd Meeting of the Scientific Steering Committee for PAGES

27-30 April, Berlin, Germany

2nd Meeting of the Scientific Steering Committee for BAHC

29 April-2 May, Sidney, Vancouver Island, BC, Canada

IGBP and SCOR *ad hoc* Working Group on Global Ocean Euphotic Zone Study.

13-15 May, Ottawa, Canada

4th Meeting of the START Standing Committee

18-22 June, (near) Washington, DC, USA

BAHC Focus 3 Working Group on Continental Integration

21-24 July, Saskatoon, Canada

GCTE Workshop on Global Change and Agriculture: Modelling the Wheat Ecosystem

23-26 June, Washington, DC, USA

BAHC Focus 2 Working Group on Large Scale Experiments

26-29 July, Paris, France

GCTE Monitoring Workshop

27-31 July, Tallinn, Estonia

BAHC Open Meeting. Contact: Alfred Becker, BAHC Core Project Office, Institut für Meteorologie, Freie Universität Berlin, Dietrich-Schäfer-Weg 6-10, D-1000 Berlin 41, Germany, Fax: (+49-30) 838 71160

13-16 September, Uppsala, Sweden

SCOPE/IGBP-GCTE Workshop on the Effects of Climate Change on Production and Decomposition in Coniferous Forests and Grasslands.

23-27 November, Niamey, Niger

IGBP-HDGEC Regional Conference for Africa

1993

25-29 January, Mexico

SAC III: Third Meeting of the Scientific Advisory Council for the IGBP

ASCEND 21

AN AGENDA OF SCIENCE FOR ENVIRONMENT AND DEVELOPMENT INTO THE 21ST CENTURY

The International Conference on an Agenda of Science for Environment and Development into the 21st Century (ASCEND 21) was convened in Vienna at the end of November by the International Council of Scientific Unions (ICSU) and other science organizations, and hosted by the Government of Austria.

The aim of ASCEND 21 was to make major and authoritative contributions to the formulation of future directions of science with regard to the pressing concern of our age – environment and development and the interaction between the two, contributing as well to the preparations for the Earth Summit – UNCED, the United Nations Conference on Environment and Development that will take place in Rio de Janeiro in June. The rationale behind ASCEND 21 was the commitment of the international scientific community to affirm the role of science in decision making at the highest levels.

Sixteen themes formed the basis of the synthesis process, grouped into three sections. Section I, Problems of Environment and Development, included the five themes: (i) Factors Affecting Population and Natural Resource Use; (ii) Agricultural Land Use and Degradation; (iii) Industry and Wastes; (iv) Energy; and (v) Health. Section II, Scientific Understanding of the Earth System, was more at the heart of the IGBP and covered the six themes: (i) Global Cycles; (ii) Atmosphere and Climate; (iii) Marine and Coastal Systems; (iv) Terrestrial Systems; (v) Fresh Water Resources; and (vi) Biodiversity. Section III on Contributions of Science to Environment and Development Strategies addressed the five themes: (i) Quality of Life; (ii) Public Awareness, Science and the Environment; (iii) Capacity Building; (iv) Policies for Technology; and (v) Institutional Arrangements.

ASCEND solicited enormous interest among international scientists. A considerable number of those who participated have close connections with the IGBP. Among these was Prof. R.W. Stewart, who is a Vice Chairman of the IGBP Scientific Committee, and ICSU Global Change Science Officer. He has contributed the following view:

A PERSONAL RETROSPECTIVE BY R.W. STEWART

Attending the ASCEND 21 Conference was a unique experience for a number of reasons: Its structure did not follow any of the usual models; in particular there was little time allotted for set piece presentations, with most time set aside for discussions.

Theme documents were prepared by teams of authors; each team had usually members from both developed and developing countries. The themes covered a very wide range of topics from many disciplines, including natural, engineering and social sciences. The participants had a comparably wide range of expertise. They were a very distinguished group, with a mixture of specialists in mid-career, at the cutting edge of their disciplines and "senior statesmen", noted for their breadth of view and their wisdom.

There was an urgency to create a "product" which would serve the two purposes of having some influence on the 1992 Earth Summit, and of starting the process of laying out a course for those aspects of science which should be brought to bear on problems of environment and development during the next few decades.

The scope of the Conference was broader than the IGBP. Nevertheless, most of the concerns of scientists working with the IGBP at least touched on some of the issues being addressed by participants in the Conference. The meeting was structured in such a way that each discussion session involved both natural and social scientists. About one third of participants were social scientists. However, the strong interplay between these disciplines that might have been hoped for did not develop. This may have been due to the large number of participants, their respectful deference to the expertise of those in disciplines very different from their own, and the time it takes to break down the "language" barriers of different jargons and different assumptions. Good will, which was present in abundance, is not sufficient to assure interaction between social and natural scientists. It will require work and energy, and above all time

to forge the links needed.

Some 250 persons from nearly 70 countries attended the conference in their personal capacities, selected on the basis of their knowledge of scientific environment and development issues. As a matter of policy, a substantial proportion hailed from developing countries. From the point of view of those concerned with the IGBP, seeing such a large group of well informed, articulate, people from developing countries in action was a most encouraging feature of the Conference. It is people of this kind, and in many cases these very people, who will determine the success of START in particular. It augured well!

The fact that people were invited as individuals, and not as "representatives" of countries or regions was probably instrumental in inhibiting the formation of conflicting blocks and there was little sense of "us" vs. "them". There were some interesting bits of by-play. For example, in discussions of the Energy theme, the most vigorous and well informed defence of nuclear power came from an individual from India; when one speaker called for "cooperation" in a way that usually would have passed as banal, another speaker reminded us that where he lived in Eastern Europe the assumption of the benefits of cooperation, with which he had been brought up, were being challenged.

From any point of view, the Conference was a reasonable success. If allowances are made for the shortness of preparation time (just over a year) and the fact that in many ways it was unique and there were no models to follow, it could be claimed to have been an outstanding success.

No informal report of this kind should fail to mention the remarkable performance of the small organizing team, led by Julia Marton-Lefèvre, Executive Director of ICSU. Help of all kinds was available when needed. Documentation and meeting arrangements all worked smoothly and with an apparent effortlessness which belied the enormous amount of work involved.

ASCEND 21 A Science Statement Executive Summary

The International Conference on an Agenda of Science for Environment and Development into the 21st Century (ASCEND 21) was convened by ICSU in Vienna during the last week of November 1991. The results of ASCEND 21, the first international conference of its kind, will serve to make a major contribution to the formulation of the future directions of world science, as well as to the preparation of the 1992 United Nations Conference on Environment and Development.

ASCEND 21 stressed a **new commitment** on the part of the international scientific community as a whole to work together so that improved and expanded scientific research, and the systematic assessment of scientific results, combined with a prediction of impacts, would enable policy options in environment and development to be evaluated on the basis of sound scientific facts.

Furthermore, it forcefully asserted the **responsibility of science** (encompassing the natural, social, engineering and health sciences), to provide independent explanations of its findings to individuals, organizations and governments. In this context, ASCEND 21 underlined the central importance of the precautionary principle, according to which any disturbances of an inadequately understood system as complex as the Earth system should be avoided.

Members of the scientific communi-

ty participating in ASCEND 21 agreed on the **nature of the major problems** that affect the environment and hinder sustainable development, and identified a number of specific areas through which the scientific community could begin to tackle those problems considered by ASCEND 21 as being of the highest scientific priority: population and *per capita* resource consumption; depletion of agricultural/land resources; inequity and poverty; climate change; loss of biological diversity; industrialization and waste; water scarcity; energy consumption.

ASCEND recommended:

- intensified research into natural and anthropogenic forces and their inter-relationships, including the carrying capacity of the Earth and ways to slow population growth and reduce over-consumption;
- strengthened support for interactional global environmental research and observation of the total Earth system;
- research and studies at the local and regional scale on: the hydrological cycle, impacts of climate change; coastal zones; loss of biodiversity; vulnerability of fragile ecosystems; impacts of changing land use, of waste and of human attitudes and behaviour;
- research on transition to a more efficient energy supply and use of materials and natural resources;
- special efforts in education and in building up of scientific institutions as well as involvement of a wide segment of the population in environment and development problem-solving;

- regular appraisals of the most urgent problems of environment and development and communication with policy-makers, the media and the public;
- establishment of a forum to link scientists and development agencies along with a strengthened partnership with organizations charged with addressing problems of environment and development;
- a wide review of environmental ethics.

The proceedings of ASCEND 21 will be published by the Cambridge University Press in May 1992: Cambridge University Press, Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, UK. Fax (+44-223) 315 052. Enquiries on the ASCEND 21 Conference and follow-up: ICSU Secretariat, 51 Boulevard de Montmorency, 75016, Paris.



At ASCEND 21: Prof. Devendra Lal, Member of the ICSU Advisory Committee on the Environment, and Dr. Robert W. Stewart, at right.

National Committees

GeoTechnica in Cologne, Germany

The first GeoTechnica, the International Trade Fair and Congress for Geo-sciences and Technology, was held in Cologne on 18-21 September 1991. It was organized by the Alfred Wegener Foundation, and was held in conjunction with the Cologne Fair. The programme presented scientific sessions on the changing biosphere, sensing and recording the Earth's system, using the geo-biosphere, and using available knowledge for protecting the environ-



Dr. Klaus Töpfer, German Federal Minister for the Environment, Nature Protection and Reactor Safety, visiting the IGBP stand at GeoTechnica. From left to right: Mr. Heiner Benking, UNEP/HEM, Dr. Töpfer, and Dr. Sabine Lütke-meier, Head of the German IGBP Secretariat in Berlin. Photo, courtesy of Mr. A. Kaiser.

ment. Two ministers gave talks at the congress: the French Minister for Research and Technology, Dr. Hubert Curien, and the German Federal Minister for the Environment, Dr. K. Töpfer. The exhibition stands included companies, universities and displays by the Federal Ministry of Research and Technology.

The UNEP Centre for Harmonization of Environmental Measurement, located in München, and the German National Global Change Secretariat in Bremerhaven organized a poster exhibition on "Local and Global Change". Among other programmes, the German Secretariat of the IGBP presented posters on the five IGBP Core Projects, with an overall poster on IGBP itself.

New National Committees for the IGBP

Three new national committees for the IGBP have been established so far this year: Indonesia, Togo, and Nigeria, bringing the total number of national committees up to 51. Nigeria will announce the composition of the committee when it next meets.

Scientists in Togo formally selected their committee on 24 January. The Chairman is Prof. Komlavi Seddoh, Vice-Chancellor of the University of Benin, B P 1515 Lomé.

The Chair of the Global Change team of scientists in Indonesia, representing at the same time the IGBP National Committee, is Prof. Dr. Harsono Wiryosumarto, Chairman of the Agency of National Aeronautic and Aerospace, LAPAN, Jl. Permuda Persil No 4, Jakarta.

Announcements

Members of the Scientific Committee for the IGBP

Top honour for Canadian meteorologist

Prof. Gordon A. McBean, of the University of British Columbia, Vancouver, Canada, was recently awarded the Patterson Medal, the highest honour that can be awarded to meteorologists in Canada. He was cited for his scientific research and leadership in scientific programmes, in particular as chairman of the WMO/ICSU (World Meteorological Organization/International Council of Scientific Unions) Joint Scientific Committee for the World Climate Impact Assessment and Response Strategies Programme.



Gordon A. McBean

Prof. McBean has been chairman of the Atmospheric Science Programme at the University of British Columbia since 1988 and conducts research on atmosphere-ocean interactions, marine storms, heat transfer in the ocean and the atmosphere and related topics. He has published extensively in international journals, and is a fellow of the American and Royal Meteorological sciences. He is an ex-officio member of the Scientific Committee for the IGBP since 1990.

Assistant Director General of the IUCN

Professor Genady N. Golubev, of the University of Moscow, will assume the post of Assistant Director General, Conservation Programmes, at the International Union for the Conservation of Nature in April of this year. Prof. Golubev is also Chairman of the IGBP START Standing Committee, and a member of the Scientific Committee for the IGBP since September 1990.

Prof. Genady N. Golubev, IUCN, Avenue du Mont-Blanc, CH-1196 Gland, Switzerland.

International Earth Science Information Network receives new management

Professor John A. Eddy, formerly with the Office of Interdisciplinary Earth Studies in Boulder, Colorado, took the post of Chief Scientist and Vice President of Research at the Consortium for International Earth Science Information Network (CIESIN) at Saginaw Valley State University in Michigan in mid-February. The focus of the consortium is to make recommendations and define requirements for enhancing access to and use of data being generated by global change research programmes. Prof. Eddy has been with the IGBP since its founding, starting as a member of the Special Committee in 1987, and Vice-Chairman on the Scientific Committee since 1990. He is also Vice Chairman

of the PAGES Standing Committee.

Prof. John E. Eddy, CIESIN, Saginaw Valley State University, 2250 Pierce Road, University Center, MI 48710, USA.

Global Change and Terrestrial Ecosystems

Project Officer appointed for Focus 1: Change in Ecosystem Physiology

Dr. George Koch took up the position of Focus 1 Officer in January 1992. He is based in the Department of Biological Sciences, Stanford University, Stanford, CA 94305, USA, where he will work closely with Professor H. A. Mooney, GCTE's Focus 1 Leader.

George's research background in plant ecophysiology has focused on the regulation of carbon and nitrogen metabolism by environmental factors, including nitrogen availability, light and CO₂.

In September 1991, John Ingram became GCTE's Focus 3 (Global Change Impact on Agriculture and Forestry) Officer, at the Department of Plant Sciences, University of Oxford, South Parks Road, Oxford OX1 3RB, UK, as announced earlier.

Regional Information Centres

Three new libraries have joined in this international effort to make IGBP scientific literature available in all regions of the world. In Global Change Newsletter No. 7 (1991), 41 libraries were announced, bringing the number up to 44, with other answers still expected.

Argentina

Centro Regional de Investigaciones Científicas y Tecnologías, Dr. Mario A. Farias, C C 131, 5500 Mendoza. Tel: (+54-61) 380 370; Telex: 55438, Fax: (+54-61) 380 370, E-mail: ntericyt@criba.edu.ar/uucp; ntericyt%arcriba@uchcecvm/bitnet.

Austria

Zentralbibliothek für Physik in Wien, Dr. W. Kerber, Director of the Library, Boltzmannngasse 5, A-1090 Wien. Tel: (+43-1) 34 26 30/207, Telex: 116222 physia, Fax: (+43-1) 34 26 30/210.

Netherlands

The International Soil Reference and Information Centre, Dr. H. van Baren, Acting Director, Duivendall 9, NL-6700 AJ Wageningen. Tel: (+31) 8370 19063; Telex: via 45888 intas nl; Fax: (+31) 8370-24460, E-mail: ISRIC@RCL.WAU.NL.

India

Please note change in phone, telex, and fax numbers of the Indian Institute for Technology in Bombay: Telephone: (+91-22)

578 2545; 578 4079, Telex: 011-72313 iitb in, Telefax: (+91-22) 578 3480.

Publications:

Three new IGBP Reports have been published:

IGBP Report No. 19:

The PAGES Project: Proposed Implementation Plans for Research Activities, ed. by John A. Eddy. 1992. 112 pp.

The Past Global Changes (PAGES) project will secure better understanding of the natural and human-induced variations of the Earth system in the past, through studies of both natural and written records. Two streams are defined, one covering studies of changes in the past 2000 years, the other following fluctuations through a full glacial cycle. The implementation plans address: solar and orbital forcing and response, fundamental Earth system processes, rapid and abrupt global changes, multi-proxy mapping, palaeoclimatic and palaeoenvironmental modelling, advances in technology, management of palaeodata, and improved chronologies for palaeoenvironmental research. An initial pilot project on a global scale study of palaeoclimates of the northern and southern hemisphere, cutting across the PAGES general plan, will be initiated in 1992-1993.

IGBP Report No. 20

Improved Global Data for Land Applications: A Proposal for a New High Resolution Data Set, Report of the Land Cover Working Group of IGBP-DIS, Edited by

John R. Townshend. 1992. 75 pp.

This report outlines a proposal to produce a global data set at a spatial resolution of 1 km derived from the Advanced Very High Resolution Radiometer primarily for land applications. It defines the characteristics of the data set to meet a number of requirements of IGBP's science plan and outlines how it could be created. It presents the scientific requirements for a 1 km data set, the types and uses of AVHRR data, the required characteristics of a global 1 km data, the procedures, the availability of current AVHRR 1 km data, and the management needs.

IGBP Report No. 21

Global Change and Terrestrial Ecosystems: The Operational Plan, edited by W. L. Steffen, B. H. Walker, J. I. Ingram and G. W. Koch. 1992. 97 pp.

The objectives of GCTE are: to predict the effects of changes in climate, atmospheric composition, and land use on terrestrial ecosystems, including agricultural and production forest systems, and to determine how these effects lead to feedbacks to the atmosphere and the physical climate system. The research plan is divided into four foci: ecosystem physiology, change in ecosystem structure, global change impact on agriculture and forestry, and global change and ecological complexity. Research strategies are presented.

The National Committee for Hungary has recently published the Proceedings of the IGBP Symposium of the Hungarian Academy of Sciences: *Cycling of Nutritive Elements in Geo- and Biosphere*, edited by

Prof. Dr. István Pais, Budapest, September 1991. Dr. Pais is at the University of Horticulture and Food Industry, Department of Chemistry and Biochemistry, Willányi út 37-43, H-1118 Budapest.

Electronic mail addresses:

The IGBP has long been connected to Omnet. Our addresses on Omnet are: IGBP.Secretariat, T.Rosswall, P.Williamson and R.Moss. Since March the IGBP is also connected to Internet. These addresses are:

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The IGBP Global Change Newsletter is indexed in: GeoArchive, Geotitles and Hydrotitles.

Global Change (IGBP) Newsletter

Editor: Suzanne Nash

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