Global Possible

A detailed agenda for action to put society on a course towards living in balance with the environment while enjoying higher quality of life has emerged from a conference of world leaders held last May in Washington, D.C. Meeting to discuss ways of ensuring compatibility between economic development and the protection of resources, their central message is that though bleak forecasts could prove accurate, "it is possible to build a world that is more secure, more prosperous, and more sustainable both economically and environmentally."

The agenda for action covers a wide range of activities requiring the cooperation of governments, international organizations, business and scientific communities, and citizens. Many policies and activities are recommended for an array of programs beginning with population, spanning the natural resources sectors, and concluding with science and research. Priorities for the latter are assigned at the largest and the smallest scales of human interaction. At the global level an urgent need is seen for understanding the great natural cycles of nutrients and water and how they are altered by human acts. At the local level there is a call for research on health, technology, and production on a scale that will directly benefit the poor.

Several gradual changes are essential to a sustainable and renewable world. These include a demographic transition to a stable global population, a transition to an era in which energy is produced and used at high efficiency without creating other global problems, a transition in resource use to reliance on nature's "income" and not depletion of its "capital," an economic transition to sustainable growth and a broader sharing of its benefits, and a political transition to a global bargaining based on complementary objectives between North and South.

WATER

Fresh water is abundant enough globally to support current and anticipated populations, though serious shortages and pollution affect many regions. To provide adequate supplies of fresh water steps that should be taken include:

- Preparation of national analyses of existing uses and supplies of fresh water and likely future demands, incorporating environmental and social factors as well as public participation into the planning of water projects.
- Charging water users rates that encourage efficiency and reflect the costs of providing water on a sustainable basis.

Figure 1: Bringing water to the rural poor - from a guidebook to handpumps in India.

- Devoting more attention to opportunities for groundwater storage, as opposed to surface storage, so as to stabilize variations in supply.
- Managing fertilizers and pesticides to protect surface and groundwaters. Exporters of agricultural chemicals and firms that manufacture them have an obligation to help educate users about prudent application rates and techniques.
- The encouragement as a matter of priority of the development and demonstration of simple, low-cost decentralized urban water supply systems and sanitary techniques that minimize water conveyance, promote nutrient recovery and reduce human exposure to pathogens.
- The control of potential industrial water pollutants at the source, both through the application of effective processes and technologies and through "chemically tight" management that recycles or contains hazardous industrial wastes.

ENERGY

In the energy field the conference pointed out that a temporarily soft oil market, due partly to a world-wide recession, has diverted attention from the simple fact that within the next 15-25 years, global oil production will begin to decline, as it has already in the non-OPEC producing states. A gradual transition to a new energy era will then take place, one no longer dominated by oil and where individual national energy plans are far more individualistic and tailored to each nation's particular needs, uses, and resources.

Conventional strategies that focussed mainly on fossil fuels and nuclear energy pay insufficient attention to (1) the environmental impact of expanded fossil fuel used, (2) the threat of nuclear weapons proliferation implicit in widespread nuclear fuel enrichment and reprocessing, (3) the political and economical vulnerability of economies highly dependent upon imported energy, (4) the pressing energy needs of the rural sector of developing countries, (5) the economic impact of expanding energy use in the industrial countries on the growth of developing countries, and (6) the imperative to meet the basic human needs of the poor.

Agenda items identified in order to promote a more sustainable energy supply include:

- Promoting rapid gains in conservation and energy efficiency, for example through raising domestic oil and natural gas prices to international levels.
- Developing renewable energy sources by eliminating subsidies and advantages enjoyed by fossil and nuclear supply sources, by greatly increasing current research and development of solar and biomass technologies, and by undertaking major investments in fuel wood production.
- Establishing national and international mechanisms to reduce misleading oil price signals.
- Insisting on control of pollution and other environmental impacts of energy production, with detailed consideration being given to the use of natural gas as a transitional energy source.

News Reports

NON-FUEL MINERALS

Supplies of non-fuel minerals need not seriously limit world economic growth or welfare, even in the long run, provided that market adjustments can readily take place and that governments do not erect barriers to exploration and exploitation of new deposits or to the flow of capital and technology to producing countries. Management and financial reserves, including international credit, can mitigate the impact of short-term price fluctuations. These are usually more disruptive to producing than to consuming countries, and they become less important as exports are diversified and mineral producers expand their processing and fabrication operations.

Few countries are truly vulnerable to disruptions of supplies of strategic minerals such as cobalt, chromium, manganese and the platinum group. Even here most uses are not strategic, other supply sources exist (such as recycling and substitution), and properly managed stockpiles reduce vulnerability. Recycling, for example, can both disrupt a highly concentrated supply situation and lessen environmental damage from mineral use. Greater recognition should be given to the potential benefits, especially through the removal of economical and institutional barriers that hinder widespread use of recycling mechanisms.

In order to ensure adequate supplies and stable prices, to increase the benefits that developing countries derive from mineral exploitation, and to harmonize mineral development with sound environmental management, the following steps should be taken:

- Ensure adequate flow of investment capital to developing countries for exploration and development, for example by expanding World Bank and other institutional co-financing and loan guarantee facilities, political risk insurance, and support for pre-investment studies. Developing countries for their part can reduce uncertainty to investors by avoiding unstable fiscal and regulatory climates.
- Oppose vigorously the cartelization of mineral markets, and the imposition of trade restrictions for price ceilings by importing countries.
- Reduce the vulnerability of producing countries to market fluctuations by applying appropriate financial and foreign exchange reserve management and by encouraging the diversification of exports through tax, exchange rate and investment policies.
- Increase the benefits of mineral exploitation to developing countries by "unbundling" foreign direct investment (that is, by making separate supply agreements for capital, technology, management and marketing), by relaxing tariff and non-tariff barriers

Figure 2: Recycling copper in the U.S.A. 706 million pounds in 1975.

by importing countries to imports of processed mineral products, and by investing a reasonable fraction of producing countries' projected revenues in pre-investment studies, staff training, consulting services, and measures to avoid environmental damage.

- Establish and enforce reasonable standards for the restoration of the mining sites and the prevention of off-site pollution. Compensatory set aside policies to preserve recreational and wilderness areas should be created to exclude highly sensitive or valuable areas from development. The "polluter pays" principle provides sound guidance for environmental protection.

The agenda calls for a number of actions by business and industry, the environmental community, and science as well as obvious governmental decisions. The scientific community is urged to take the following general steps:

- Strengthen international scientific organizations so they can play a larger role in shaping and coordinating the research required on global resource problems.
- Support the proposed International Geosphere Biosphere Program.
- Obtain a greater consensus on important environmental and resource indicators for world monitoring and on common units of measurement and geographical formats for international compatibility data and their presentation.
- Consider means of stimulating the active development and application of remote sensing technologies, which have the potential to revolutionize environmental monitoring.
- Focus more efforts on the environmental and resource problems of developing countries by educating funding sources and scientists on the importance of research into technologies relevance to the developing world and the poor, by expanding scientific exchanges between industrial and developing countries, by creating stronger links between research institutions in the two areas, and by expanding a number of top scientific institutions in developing countries.
- Work closely with the policy research centres on global resource and environmental issues in order to bridge the gap between basic research and policy.

Figure 3: Diamond drilling in the Philippines.

("The Global Possible: Resources, Development, and the New Century," 1984, 38p. Available from World Resources Institute, 1735 New York Avenue NW, Washington DC 20006, U.S.A., price \$3.50.)

Global Change

At its 20th session, held in Ottawa, September 23-28, 1984, the International Council of Scientific Unions (ICSU), of which IUGS is a leading member, approved in principle an interdisciplinary program to study interactions between the geosphere and biosphere (see Episodes 1983/4, p. 29; and vol. 7/3, p. 2, 1984). The aim is to understand global change over long time-scales and the influence of man on the environment.

Many areas for potential study under this International Geosphere-Biosphere Program (IGBP) were discussed at a one-day symposium held during the General Assembly and attended by leading scientists from many disciplines and nations. The proceedings, which will be published by the ICSU Press, reviewed aspects ranging from atmosphere-ocean interactions and life systems, to solar-terrestrial relations, the earth's interior and soil dynamics.

The symposium generated much debate between those urging immediate action and those wary of creating yet another international project at the risk of weakening existing efforts like the World Climate Research Program. Unresolved issues include the scientific scope of the program, its credibility (especially among developing countries), the institutional framework and the financial resources that will be required.

The IGBP will link geophysics, chemistry, biology and geology in a more "holistic" framework than now exists. Topics like acid rain, ozone depletion, CO₂ and methane buildup, and

biogeochemical cycles are certain targets, and techniques of study will depend heavily on computers and remote sensing. The problem, to judge from the strong pleas from the many disciplines represented at Ottawa, may well be what topics to exclude rather than which ones to support.

The question of time-scales is also unresolved. Many natural processes driving global changes operate on 10 to 100-year scales, but geoscientists emphasize the importance too of studying, for example, hydrothermal action at mid-ocean ridges, which dominate ocean chemistry on a scale of a million years.

Will Third World scientists be able to participate fully in the IGBP? How will the program avoid the risk of trading data of economic or even military relevance, e.g. on crop yields? Will the IGBP require its own bureaucracy or will a small coordinating body be sufficient? Who will control and manage the international archive of data that results? And where will the money to finance the program come from, especially if it is not to be developed at the expense of existing efforts?

The final outcome in Ottawa was a decision by ICSU to set up an ad hoc planning group to review current activities, to identify priority subjects and to develop a "coherent" program. This group will report to the 21st ICSU Assembly in 1986. National members of ICSU are invited to support this process and to consider their possible contributions.

Update from CGMW

A major review of the activities of the Commission for the Geological Map of the World (CGMW) was held during the recent International Geological Congress. The 134 participants from 48 countries expressed their sincere appreciation to the retiring Secretary General, **Frances Delaney**. The formal resolution thanked her "for the untiring efforts she has devoted to the activities of the commission for 22 years, which fostered the creation of an efficient, international network and the production of more than 20 maps, as well as the geological atlas." **Olivier Dottin** was appointed as her successor, and several other changes were made to the composition of the CGMW Bureau (see Episodes 1984/3, p. 34).

There was warm praise for the recently completed, 22 sheet Geological World Atlas, co-edited by CGMW and Unesco. The general coordinators, **A. Faure-Muret** and **G. Choubert**, put years of hard work into this "brightest feather in our cap," with guidance and assistance from **Frances Delaney**, the former CGMW President **Jean Malcais**, and the Unesco Publications Department.

As regards ongoing projects on geological maps, the first draft of the map of South America is in progress and should be presented in 1985. The continental portion of the final draft for South and East Asia has been completed, but the work on the sea floor geology is still continuing. The draft of the continental part of the Middle East map is finished, with publication planned for early 1985, and the Soviet Union has announced a project to prepare a new atlas of Antarctica.

The proof print of the International Tectonic Map of the World (1:15,000,000) was presented at Moscow. Preparation of the new edition of the Tectonic Map of Europe and an International Tectonic Map of Asia (both at 1:5,000,000) is continuing.

Metallogenic maps of Europe and South America have been published, and the final draft for South and East Asia is nearing completion. A draft of the first sheet of the Metallogenic Map of Africa was presented at the assembly. A Metamorphic Map of Australia (1:5,000,000) has just been published, with the explanatory text scheduled for 1985. A proof print (1:10,000,000) of the Metamorphic Map of South and East Asia was presented, with publication scheduled for late 1984. The draft of the Metamorphic Map of South America is still in preparation, somewhat behind schedule.

A seismo-tectonic map covering Iran, Pakistan and Afghanistan (1:5,000,000) has now been printed and will serve as the basis for the future seismo-tectonic map of the whole Middle East in preparation. Also under study are projects to compile environmental maps and experimental legend for an International Plate Tectonic Map at a scale of 1:10,000,000. Under consideration are a proposal for a geological wall map of the world, a mineral atlas of the world and possible cooperation with a circum-Atlantic map project.

New Commission on Comparative Planetology

During the recent 27th International Geological Congress in Moscow, the IUGS Council approved the formation of a new Commission on Comparative Planetology to replace the advisory committee which it had set up in 1980.

As outlined in Past President Eugen Seibold's address to the Congress, international efforts in this field of basic science have produced a broad spectrum of exciting research results in recent years (see Episodes, 7/3, 1984). Planetary bodies are no longer viewed simply as astronomical objects but also as bodies whose geological records complement that preserved on Earth. Planetary studies have also helped place the Earth in the context of an evolving planetary body and have raised significant questions about terrestrial geological problems. These include the increased awareness of the role of random events such as impacts in the geological record of the Earth, the genesis of the crust in early Earth history, and the use of a variety of remote sensing data to characterize and understand geological processes.

The Commission will promote communication among the various bodies of IUGS and other associated organizations, with respect to the application of planetary studies to problems of terrestrial geology. It will also stimulate research efforts in areas of significance to geology, and stimulate the application of available data and results of planetary studies to research in geology. The Commission will also advise the IUGS Executive Committee on initiatives in applying the results of planetary studies and will represent the Union on the ICSU Coordinating Committee for Moon and Planets and other organizations.

Further information on the Commission and its future activities can be obtained from the Chairman, J.W. Head III (Dept. Geological Sciences, Brown University, Providence, RI 02912, U.S.A.) or the Secretary, R.A.F. Grieve (Earth Physics Branch, Ottawa, Ontario, Canada K1A 0Y3). A.T. Basilevsky (U.S.S.R.) is the Vice-Chairman.

New Forum for International Mineral Development

Long-range mineral supply is emerging as one of the critical problem areas for the future. Much has been written on it, and a number of organizations both in and outside the United Nations system give attention to it on a sporadic basis, but at present there is no organization giving it continuing attention.

To help fill this gap, the Forum for International Mineral Development is being established as an international non-governmental program, run by a consortium or club consisting of a relatively small number of members (initially 150 to 200) drawn from organizations working in fields related to mineral development and supply. These include producing and consuming countries and companies, financing bodies, regulatory bodies, research institutes, and a wide range of other professional organizations. Within this neutral framework, they will identify and discuss issues and problems that affect international mineral development and supply.

The Forum will promote increases in the level of development of and investment in mineral extraction and processing in developing countries. Another objective is to help assure the orderly expansion of mineral markets and the orderly flow of materials to satisfy these markets. These will be accomplished by improving the mechanisms and channels for communication, and by developing mutual understanding among the various groups involved in mineral development.

Study groups will be set up to prepare reviews on specific issues and to support these reviews, a series of separate studies and analyses will be made. These can be carried out by the Forum secretariat on a limited basis, by other groups and organizations with which cooperative links will be established, by companies and other organizations participating in the program that are willing to make all or part of the results of their work available to the groups, and by universities and other research bodies working in related fields.

The Forum will also operate information services, consisting initially of a quarterly newsletter outlining developments in the program, notes on major developments of interest to participants, and abstracts or titles of recent articles and publications. Over time, it is expected that the program will

lead to technical papers, popular articles and books to be published through normal channels. The Forum will also organize regional and international seminars on topics of wide interest, where possible in cooperation with other groups working in related areas.

Forum activities will be largely self financing, but there will also be nominal program and overhead costs. In the long run these will be covered by members through a subscription, but in the early stages while the program is being built up, most of these costs will be covered by grants from interested organizations and programs. Support of this type is now being sought from a large number of sources in order to assure the neutrality of the program.

The concept of the Forum has evolved over recent years on the basis of discussions with many specialists and officials in government, industry, and international organizations. The professional interest and support is impressive, although it is recognized that this is a difficult time to establish and fund a major new program. Thus it is planned to move slowly, with reliance on links with existing programs in related areas.

This process has already begun with the organizing in 1983 of a regional workshop on aspects of mineral development in SE Asia (see Episodes, 1983/4, p.39). From this meeting came a proposal to establish a study group to review "Environmental Impact of Mineral Development in Humid Tropics," and steps are now being taken to set up such a group.

The Forum is serviced by a small secretariat, linked to the Association of Geoscientists for International Development. Its interim headquarters is located in Indonesia, and in the early stages most activities will be based in Southeast Asia to take advantage of existing institutions and contacts, but the program is international in coverage. Emphasis will be placed initially on building up the basic structure, strengthening professional and institutional contacts, developing information services and testing the study group approach.

Individuals or organizations wishing to be involved are invited to contact: Forum for International Mineral Development, P.O. Box 19 (RMRDC), Bandung, Indonesia.

News from IAGOD

The International Association on the Genesis of Ore Deposits has established a new category of membership. A national organization interested in the progress of knowledge of the genesis of ore deposits may be accepted by IAGOD as a national member (one per country). Each scientific member of such an adhering body may participate in the ongoing program of IAGOD Commissions and Working Groups on the same terms as IAGOD individual members. The national adhering organization determines its dues payments to IAGOD on the basis of the number of its own members who are interested in IAGOD. The new category provides a mechanism to facilitate participation in and support of IAGOD in countries where individual scientists are faced with currency restrictions.

Volume 1 of the proceedings of the sixth quadrennial IAGOD symposium (Tbilisi, U.S.S.R., 1982) has now been published (see "For Your Bookshelves" in this issue). This contains papers of the plenary sessions and of the three main symposium topics: ore-forming hydrothermal systems, relationship between ore formation and granitic magmatism, and mathematical methods in the study of ore deposits. Volume 2, comprising papers from the sessions of IAGOD

Commissions and Working Groups, is scheduled for release by Nauka, Moscow, in January 1985. Its publication has been delayed by Nauka's commitment to publications for the 27th I.G.C.

At the recent Moscow Geological Congress, IAGOD co-sponsored with SEG, SGA and IGCP Project 161 a symposium on the geology and conditions of formation of copper deposits. The proceedings are to be published in 1985 by Springer-Verlag under the joint editorship of G. Friedrich, A.J. Naldrett, R.H. Sillitoe and F.M. Vokes, assisted by J.D. Ridge.

Gunnar Kautsky, the incoming president of IAGOD (and an IUGS Vice-President) announced details of the 7th Symposium to be held at Lulea, Sweden, 18-22 August 1986. The arrangements are being supported by the Geological Surveys of Denmark-Greenland, Finland, Norway and Sweden, and the symposium will be combined with the final reporting on the results of the Nordkalott Project, which is defining ore provinces in the northern Nordic area.

G.B. Leech
Ottawa, Canada

International Union of Geological Sciences, Commission on
Tectonics, Subcommission on Precambrian
Structural Type Regions
Final Report

Precambrian Tectonics Illustrated

Edited by ALFRED KRÖNER and REINHARD GREILING, Mainz

VIII, 419 pages, 317 figures, 13 tables, 17 x 24 cm. 1984. Bound DM 188,— / US \$ 71.60

The study of tectonic processes in these still little understood lower parts of the crust is essential for an analysis of global crustal evolution through time. This well illustrated volume contributes to our understanding of the phenomena of crustal deformation and interaction over nearly 3 billion years of earth history. Contents: I. Structural styles in Archaean greenstone and gneiss terranes. II. Granite tectonics and basement / cover deformation. III. Shear zones and shear belts. IV. Polyphase deformation and interference patterns.

E. Schweizerbart'sche Verlagsbuchhandlung
(Nägele u. Obermiller) · Johannesstr. 3 A, D 7000 Stuttgart (Germany)

US Agents: Lubrecht & Cramer Ltd., RD 1, Box 244, Forestburgh, NY 12777, USA, Tel. (914) 794-8539