

INTERNATIONAL COORDINATION OF SCIENTIFIC EFFORTS IN SUPPORT OF ENVIRONMENTAL AND ECOLOGICAL SUSTAINABLE DEVELOPMENT

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Summary

Since the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 (the Earth Summit), bilateral and multilateral scientific coordination in the environmental field has developed more extensively and intensively because environmental problems are becoming more important throughout the world. The first part of this article describes the background of international scientific coordination on the environment, including the increasingly serious global environment problems, economic globalization, and the requirement for scientific evidence. Then, the current status of environmental coordination is outlined. The cooperative programs are classified in terms of bilateral cooperation, multilateral cooperation, regional cooperation, and global joint action. Bilateral and multilateral environmental scientific cooperation has been actively implemented since the UNCED in 1992, especially in the field of basic research, yet the most far-reaching are worldwide joint actions. In the second part of this article, several important and significant international organizations and their relevant activities in scientific coordination are introduced, and some global research programs

are also described. Finally, some obstacles are analyzed and the present situation is presented. Several conclusions can be drawn about environmental scientific coordination. First, the serious environmental situation will intrinsically strengthen international environment cooperation. Second, appropriate technological improvements are required in all economic sectors, that is to say further coordination on environmental science and technology is needed. Third, more authoritative scientific evidence will be required not only for environmental problems but also for social development, which will as a matter of course promote international scientific coordination on the environment and ecology.

1. Introduction

It was predicted that efforts to save the earth would replace the conflict between the different ideologies of East and West and this seems to have come true. Environmental problems are becoming increasingly important for the whole world, and environmental cooperation remains a priority in international cooperation. International cooperation on the environment means that international society takes joint action and countermeasures based on the principle of equity and mutual benefit to overcome global environmental problems.

The global environment is one of the most important issues for the future of human beings and the earth. Countries throughout the world and international organizations are focusing on it, and devoting human capital, material resources, and financial support to broad and in-depth research on relevant mechanisms, developing rules, defining future trends, possible aftereffects, etc.

Since the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 (also known as the Earth Summit), bilateral and multilateral scientific coordination in the environmental field has developed more extensively because environmental protection has become the focus of international scientific cooperation. Cooperation on observation of the earth has been addressed and many other relevant projects based on international coordination have been carried out.

Along with the continuous development of the environmental industry and its markets, international scientific coordination in the environmental science field has broadened from the basic research of understanding the world to technology exploitation for expanding the market. The USA, Germany, Japan, and Canada are among the developed countries that have strengthened environmental scientific cooperation with developing countries because of their large potential environment markets. Such scientific cooperation will benefit the market for their products and technologies in the developing countries. A typical example is the Japan International Cooperation Agency (JICA), which has coordinated environmental protection technology cooperation and transfer in many countries.

The first part of this article describes the background of international scientific coordination on the environment. Then its development is outlined, and some major relevant international organizations and international cooperation programs are introduced. In the final part, some obstacles are analyzed and the present situation is presented.

2. The Background to International Scientific Coordination on Environment Protection

Human domination of the earth's ecosystems is in one sense an extraordinary evolutionary success story. In quite another sense, it poses a threat to delicate equilibria that are vital to the earth's natural economy. These include the relationship between fundamental biogeochemical cycles; the forces linking oceans, atmosphere, and climate; and the balance between population and resources. The extent of that domination has been documented in an impressive summary by Vitousek and his colleagues. Land transformation by human activity—deforestation, conversion to cropland and pasture, and other modifications—now involves over 40% of the terrestrial globe. Humans now control indirectly, or intercept for their own use, nearly half of all the energy fixed by terrestrial plants in the solar-powered process of photosynthesis. Industrial activity has fundamentally altered the major cycles of carbon, nitrogen, and water. Carbon dioxide (CO₂) added to the atmosphere by fossil fuel combustion and deforestation has increased the concentration of CO₂ by about 30% above its stable, pre-industrial level of 280 parts per million by volume (ppm/vol). People are now responsible for over half of all global nitrogen fixation. Humans use well over half of the world's usable runoff water, most of it to support agricultural production on the nearly one-quarter of the earth's land surface that is planted in row crops or used for pasture. The impact of human activity on natural ecosystems has been equally profound: about 60% of the world's fisheries are overexploited or seriously depleted; nearly a quarter of the earth's bird species have become extinct; and human-abetted biological introduction has radically rearranged the geography of living things.

Over the twentieth century, as the scope and intensity of human activities increased, human impact on the natural world rose dramatically. And the environment problems have widened rapidly: transboundary air pollution, deterioration of ecosystems, desertification and deforestation, reduction of biodiversity, destruction of the ozone layer, global climate change, acid rain, and so on. To deal with these problems, international societies have been very active. During the UNCED meeting in Rio de Janeiro a number of countries signed the Convention on Climate Change (1992) and the Convention on Biological Diversity (1992). Many developing countries are signatories to these conventions as well as a number of other international agreements that impose obligations with regard to sound management of natural resources and the environment. The Convention on Desertification (1994) attaches importance to the development of national, subregional, and regional action programs to combat deterioration in arid

agricultural areas, particularly in Africa. The Montreal Protocol (1987) followed up by the Vienna Convention seeks to protect the ozone layer. The Basle Convention (1989) deals with the monitoring and control of hazardous waste. The Food and Agriculture Organization of the United Nations (FAO) Code of Conduct for Responsible Fisheries (1995) and the United Nations Agreement on Fishing in the High Seas (1995) establish important guidelines for assistance in the fisheries area. A panel on forestry has been appointed to examine all issues related to the protection and sustainable use of forests. The results of the Food Security Summit: Global Plan of Action (1996) figure prominently in relation to the development of sustainable production systems. In the social sphere it is necessary to take into account the Conference on Population in Cairo (1994), the Social Summit in Copenhagen (1995), and the Conference on Women in Beijing (1995). The World Heritage Convention is formally not a part of the 1992 Rio umbrella, but it will be important to take this into account along with the Habitat II-City Summit and the Global Plan of Action for plant genetic resources in 1996. Several of the global conventions also cover development, which makes it imperative to secure optimal accord between commitments in the conventions and guidelines in development assistance policy. Governments and organs, organizations and programs of the United Nations (U.N.) system, as well as other intergovernmental and nongovernmental organizations (NGOs), have taken the necessary actions for effective follow-up to these documents.

Another factor affecting world responses to protecting the earth is globalization. The five years after UNCED saw accelerated globalization of interactions among countries in world trade, foreign direct investment, and capital markets. Globalization presents new opportunities and challenges. It is important that national and international environmental and social policies be implemented and strengthened in order to ensure that globalization has a positive impact on sustainable development, especially in developing countries. Globalization provides the basic theory and practical principles of international environmental coordination. The development of environmental problems and ecosystem problems, as a global problem, and the understanding and solving of this problem are both processes of globalization. The solution to environmental problems depends on international coordination.

Globalization of the world's economies, international communications, liberalization of trade, adoption of a worldwide unsustainable consumption model coupled with the absence and uneven application of worldwide standards, widespread external debt, and increasing threats to the atmospheric and oceanic commons. These all argue for global approaches to understanding the relationship between trade and economic policies and the environment, and for the establishment of global and regional accords and policies to respond to environmental challenges on a planetary scale.

A supportive environment needs to be established to enhance national capacities and capabilities for information collection, processing and dissemination, especially in

developing countries, to facilitate public access to information on global environmental issues through appropriate means. These means would include high-tech information and communication infrastructure related to the global environment, in the light of country-specific conditions, using, where available, such tools as geographic information systems and video transmission technology, including global mapping. In this regard, international cooperation is essential.

With international cooperation, scientific evidence is important for assessing environmental conditions and changes. Steps should be taken by governments, academe, and scientific institutions to improve access to scientific information related to the environment and sustainable development. Many international organizations and regional and global programs are useful for this purpose.

3. International Scientific Coordination on Environmental and Ecological Sustainable Development

The goals of international scientific coordination on the environment are generally divided into two categories: basic cooperation on basic research for understanding the world, and technology exploitation for occupying the market. According to their scope, they are classified into bilateral cooperation, multilateral cooperation, regional cooperation, and global joint action.

Bilateral and multilateral cooperation has been actively implemented since the UNCED in 1992, especially in basic research. The USA, Japan, and some European countries have planned to launch more than 50 satellites to carry out jointly projects on the function of cloud layers, ocean currents, atmosphere change, global ecosystems, and so on. The program on tropical-ocean and climate changes of a duration of 10 years has attracted many scientists from 18 countries. The European Network for Environmental Research Organization (ENERO) was established in 1993 through the cooperation of six national laboratories in different countries to promote environmental information communication and technology exploitation of all the member states. It helps share a technology pool of over 3000 environmental researchers, avoid duplicating research, and advance the implementation of uniform standards for environmental protection products and technology exploitation in Europe. The original six member states—Spain, Ireland, France, Germany, Holland, and England—have since been joined by Italy, Portugal, Denmark, and Belgium. Soon after its establishment, the research network examined how to use their technologies to assist developing countries resolve environmental and development problems, thereby winning plaudits and support from the United Nations Environment Programme (UNEP). Another example of multilateral cooperation is the Special Grant for Expanded Environmental Cooperation started by Norway in 1995 and primarily covering countries in Asia. The aim of this grant is to establish priority areas for environmental cooperation (including global and regional problems as well as cooperation in the environmental technology field) with recipient countries. It also works

to strengthen the recipient country's institutional capacity and technical/economic basis for integrating environmental concerns so that the countries themselves are in a position to solve their own environmental problems and to fulfill international commitments.

Although bilateral and multilateral cooperation plays an active role in environmental and ecosystem protection, worldwide joint action is more far-reaching. The following sections introduce several important and significant international organizations and their relevant activities on scientific coordination. Some global research programs are also described.

3.1. Several Major International Organizations

3.1.1. The United Nations Environment Programme

UNEP is built on a heritage of service to the environment. As one of the productive consequences of the 1972 Stockholm Conference on the Human Environment, UNEP provides an integrative and interactive mechanism through which a large number of separate efforts by intergovernmental, nongovernmental, national, and regional bodies in the service of the environment are reinforced and interrelated. UNEP was established as the environmental conscience of the U.N. system, and has been creating a basis for comprehensive consideration and coordinated action within the U.N. on the problems of the human environment.

At the 1992 UNCED, an action program called Agenda 21, which is the framework for activity into the twenty-first century addressing the combined issues of environment protection and fair and equitable development for all, was adopted. In supporting the Commission on Sustainable Development (CSD) as a high-level policy forum for the continuous monitoring of *Agenda 21* implementation, UNEP provides scientific, technical, and policy information on the environment and global and regional cooperative frameworks for environmental action. UNEP furthermore discharges its responsibility for coordinating the work of the secretariats of international environmental conventions and promoting the integration of environmental considerations within the work and activities of multilateral development financing institutions.

On cooperative research and decision making on global environmental problems, UNEP has been making a great effort in the key issues including climate change, protection of the ozone layer, water resource conservation, combating deforestation, conservation of biological diversity, and prevention and control of land degradation.

UNEP plays a leading role in the global fight against the deterioration of forests. In collaboration with the FAO, the International Tropical Timber Organization, and other partners, UNEP provides valuable expertise to the Intergovernmental Panel on Forests established by the CSD. UNEP has also contributed to the conservation of the world's

endangered wild species and the creation of protected areas. In partnership with the World Conservation Monitoring Centre, UNEP has catalyzed the development of databases on threatened species of wild animals and plants.

One of UNEP's key programs is Earthwatch, an international surveillance network that monitors current conditions and changes in the environment. It has three main components, two of which are relevant to biodiversity: INFOTERRA and the Global Environmental Monitoring System (GEMS). INFOTERRA consists of computerized national centers or focal points around the world and stores and relays sources of information through a network. This has proven a success in disseminating information and ensuring communication throughout the world, especially in developing countries where the latest information and scientific breakthroughs can greatly facilitate their technological progress. GEMS provides governments with the information necessary to understand and anticipate environmental changes, while monitoring and assessing the state of the environment. These two systems play an important role in protecting our environment, and should be considered by all nations as a feasible solution. This system can provide information service to environmental researchers and managers worldwide through the Global Resource Information Database (GRID) centers. It provides information such as datasets in response to the thousands of requests received by the network each year. In conjunction with its system-wide Earthwatch partners across the U.N. system, UNEP coordinates and integrates the efforts of the entire U.N. system for environmental observations, assessments, and reports to improve information for decision making and provide early warning on emerging environmental issues.

UNEP also established the Environment and Natural Resource Information Networking (ENRIN), which helps develop national and sub-regional capacities of institutions for environmental data management focusing on cooperative state-of-the-environment assessment and reporting. For example, in Asia and the Pacific, ENRIN provides assistance for database and assessment reporting support for one regional (Economic and Social Commission for Asia and the Pacific) and four international state-of-the-environment reports with a sub-regional focus (ASEAN, South Asia, Mekong River Basin, south Pacific). ENRIN also has cooperative assessment and reporting agreements with seven sub-regional organizations in Africa, Asia, and the Pacific and Latin America and the Caribbean.

The International Register of Potentially Toxic Chemicals (IRPTC) databank is a vital service provided by UNEP. It covers over 8000 chemicals, and is distributed at no cost to over 100 countries, while a query-response service handles thousands of requests annually. UNEP is also part of the U.N.

UNEP has organized or coorganized many other research projects on global environment problems: the Regional Seas Programmes, Protection of the Marine Environment from Human Activities, Global Biodiversity Assessment, Intergovernmental Panel on Forests,

Wildlife Conservation, the World Climate Assessment and Response Strategies Programme, Cleaner Production Programme, Transfer of Green Technologies, Awareness and Preparedness for Emergencies at the Local Level program, Chemical Databanks, Inter-Organization Programme for Sound Management of Chemicals, Environmental and Natural Resource Accounting, the Environment Information and Assessment Programmes, Global Environmental Outlook, and World Resources Report.

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Biographical Sketches

Can Wang is a Ph.D. candidate in the Department of Environmental Science and Engineering, Tsinghua University. He was awarded his Bachelor of Engineering and Bachelor of Economics in June 1998 in the Department of Environmental Engineering and the School of Economics and Management, respectively.

Kunmin Zhang graduated from Tsinghua University, Beijing, in 1963, and completed his postgraduate training in Tsinghua University in 1966 (at that time there were no degrees in the People's Republic of China). Then he became a teacher in the same university and occupied the position of vice dean of the Department of Civil Engineering and Department of Environmental Engineering. Professor Zhang was

appointed vice president of the National Training College of Environmental Management in 1985. From 1988 to 1998, he was deputy administrator of the National Environmental Protection Agency (NEPA). He currently holds the positions of secretary general of the China Council for International Cooperation on Environment and Development (CCICED), senior advisor of the State Environmental Protection Administration (SEPA), vice president of the China Sustainable Development Association, honorary chair of the Environmental Literature Association, professor with Peking University, Tsinghua University, China People's University, Nanjing University, etc.

Professor Zhang has compiled nine books, translated or collated 11 books, and published over 90 papers. His *Introduction to Sustainable Development* won the Eleventh China Books Award and the State Environmental Protection Science Award.

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