

A profile of environmental science in China

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Abstract—This paper concisely introduced the eco-environmental survey in China and the Chinese scientific programme for environmental research which is being practiced or being planned. China has established a nation-wide system relating to environmental scientific research and environmental administration and has taken the following strategies for solving the environment problems: (1) a series of laws and regulations for environmental protection has been promulgated so as to strengthen the legal administration and economic punishment. (2) the idea of ecological construction has been proposed for the purpose of taking the environmental protection work into the consideration of the national and provincial (or regional) economic construction planning. (3) spreading ecological engineering and ecological technologies have reduced the pollutant sources and have increased the industrial and agricultural economic profit.

Keywords: environmental protection; ecological construction; ecological engineering.

Scientific problems on the environment of China

There are two causes that have led to the current environment problems in China. The first is the destructed ecosystem and environment left over by history and being continuing at present. Forest overcutting and hilly land irrationally cultivating caused the heavy losses of water and soil. Secondly, in recent two or three decades, the rapid development of industry has brought about a large amount of industrial wastes that polluted water, atmosphere and soil, and reduced the self-purifying capacity of the natural system. The irrational use of natural resources and the economic development in inharmonization with the environment have not only affected the sustainable development of agriculture in China, but also exacerbated the complexity and seriousness of environment problems (Fig. 1).

Approaches to the solution of environment problems in China

Based on the awareness of the causes of environment problems raised in China and from the point of view of bringing about a temporary solution coupled with the permanent control, the management measures have been taken to reduce the discharge of pollutants. For example, the pollution sources of factories are controlled; the plants which have serious pollution are closed, removed, combined, or replaced with a non- or low-waste technology; as a principle effected, a polluter shall be responsible for cleaning up the pollution that he has produced.

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Meanwhile, environmental engineering such as oxygenated lagoon (or pond) have been spread to improve the purification capacity of the natural system by using the physical, chemical and biological interactions in the natural process of water to purify the water body containing less pollutants. On the other hand, the environmental protection is taken into account of the whole of the economic construction, i. e., it is precise in the construction that the protection resides. For this purpose, two arguments that we proposed and have practiced are as follows: (a) ecological engineering which takes the advantage of principles of the symbiosis and the graded productions in the natural ecosystem to design a production system consisting of a sequence of ecological processes from each of which the wastes can be the materials to be utilized in the next production process; (b) initiating the eco-environmental construction under the guidance of "the principle of society-economy-nature complex ecosystem", incorporating the society (including population), the economic construction and the natural eco-environment into a system within which the relationship among these three components is coordinated by overall planning to promote the sustainable development of industrial and agricultural economics. The content to be practically carried out involves the following three levels: the rural ecological construction, the regionally ecological trial area, and the national economic strategy in multi-linkages.

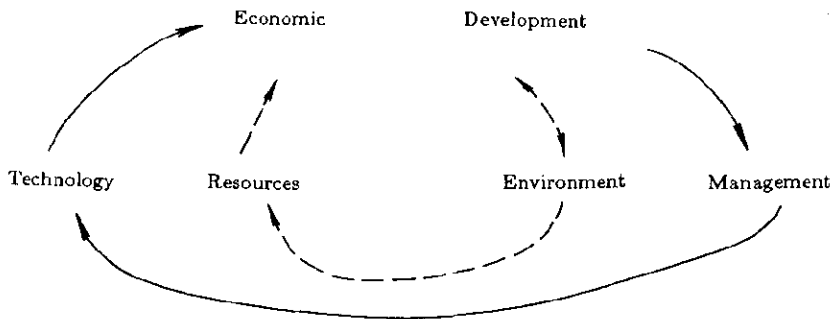


Fig. 1 Interaction between development and social, natural environment

Note: dash-line: restriction due to unbalance
solid-line: synchronized development

The "three level economic institution" i.e. nation, collective and individual (household production responsibility) make up a hierarchical structure, whose joint is resource. The superiority of this structure shows that either the existing administrative system can be handled conveniently or various-step people's activity can be stirred. Consequently, the utilization and exploitation of regional resources, the inter exchange of material, information and products will be enhanced; the stability and the ability of anti-change in economic construction will be strengthened.

In Fig. 2, I, II, III, IV, V stand for individual (family), collective, province, country and

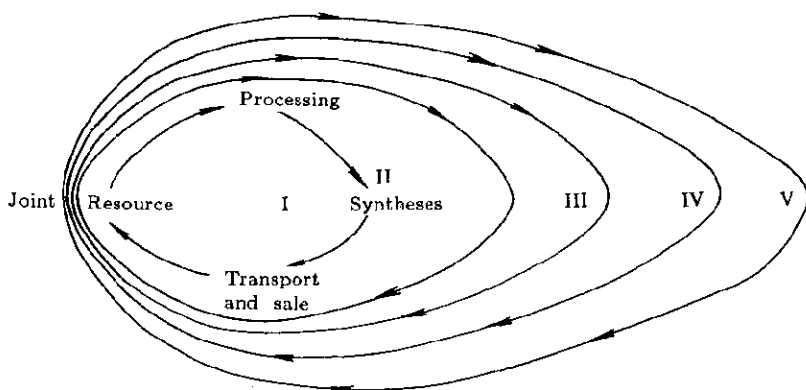


Fig. 2 Illustrative hierarchical structure

world, respectively. I, II, III, IV are interconnected by the joint of resources on the territory, called small circle; III, IV, V are connected and inserted international circle.

Currency of the environmental science in China

1. The development of the environmental science in our country can be divided into three stages, generally based on the scope of study:

Greater environmental survey

Since the beginning of the foundation of the People's Republic of China, the comprehensive surveys of the ecological geography and the natural resources started;

Regional eco-environmental planning and economic construction

Started with 1960s and focused on the medium or low production areas such as the Loess Plateau and the Huang-Huai-Hai region (covering the Yellow Delta, Huaihe Basin and Haihe Basin);

The environmental science work with the elimination of industrial pollution as the main part

Started with the early 1970s and developed rapidly from the control of pollution sources through the multi-disciplinary comprehensive pollution control further to the regionally ecological construction.

2. The study in the environmental science can be classified as the basic research, applied research and development, including the mechanisms of pollutant formation and action, design and improvement of the technologies for pollution control, application and spread of such technologies. They have been carried out by combining theory with practice and by the international co-operation to participate in the study of the global changes programme sponsored by the International Council of Scientific Union (ICSU). For example, the following projects have been conducted: the biogeochemical cycles of carbon, nitrogen, sulfur and phosphorus; the processes of trace chemical exchange between the terrestrial ecosystem and the atmosphere, the green-

house effect, the formation of acidic substances and their effect on crops and the ecosystem, the chemoecological mechanism of lake eutrophication, the biological, chemical and physical processes of groundwater pollution and their control, technologies for wastewater treatment, longterm stationary study of ecosystem and so on. About 6000 experts, including scientists, professors, engineers and other researchers from the Chinese Academy of Sciences, Chinese Research Academy of Environmental Science, colleges or universities, industrial and agricultural sections, local research institutions, and other relevant units, are involved in the above research projects.

Environmental management in China

Administrative system of environmental management can be classified as follows:

State Council's Commission on Environmental Protection, founded in 1984, comprising 39 ministers or viceministers as its members, meetings quarterly to decide major policies.

National Environmental Protection Agency (NEPA), 42 offices in 9 Divisions, over 200 staffs.

Provincial municipal and other EPAs at all levels of the local governments.

Environmental Protection Offices in the Ministries, Commissions, or PLA.

There is also a National Network of Environmental Monitoring, covering 1 National General Station, 30 Provincial of Municipal Central Stations, and over 1400 local stations.

Environmental Research Institutions in China

1. Chinese Academy of Sciences

Research Centre for Eco-Environmental Sciences

Institute of Applied Ecology (in Shenyang)

Institute of Ecology (in Kunming)

Laboratories or groups in over 40 Institutes, e.g. Institutes of Geography, Botany, Hydrobiology, Oceanography and so on.

2. Chinese Academy of Social Sciences

Institutes of Philosophy, Industrial Economics, Law and so on.

3. National Environmental Protection Agency (NEPA)

Chinese Research Academy of Environmental Science

Institute of Atmospheric Sciences

Institute of Water and Soil

Institute of Ecology

Institute of Information

Institute of Environmental Management.

Institute of Environmental Science, NEPA (Nanjing)

South China Institute of Environmental Science, NEPA (Guangzhou)

Chinese Research Centre for Environmental Strategy, NEPA (Beidaihe)

Institute of Environmental Laws, NEPA (Wuhan)

4. Ministries of Industries, Provinces or Municipalities, about 100 institutes concerning the environmental science.

5. National Committee of Education

40–50 research institutes, centres or laboratories in related departments of universities or colleges, e.g., Institute of Environmental Engineering, Qinghua University; Research Centre for Environmental Science, Beijing University; Institute of Environmental Science, Beijing Normal University and so on.

In addition to above, a great number of scientific society concerning environmental management have been founded:

Chinese Society of Environmental Sciences

Environmental Physics Commission

Environmental Biology Commission

Environmental Theory Commission

Natural Conservation Commission

Marine Environment Commission

Environmental Engineering Society

Chinese Society of Environmental Management, Economics and Laws

Environmental Quality Assessment Commission

Environmental Measurement and Monitoring Commission

Environmental Medicine Commission

Environmental Geochemistry, Pollution Chemistry and Geography Commission

Environmental Chemistry Commission

Atmospheric Environment Commission

Other Societies:

Chinese Society of Ecology

Chinese Society of Chemistry

Chinese Society of Chemical Engineering

Chinese Society of Energy

Chinese Society of Pulping and Paper

Chinese Society of Metallurgy and so on

Environmental Education

To popularize the ecological education and enhance the people's awareness of protecting and improving environment, various training courses agencies were organized and a series of departments and colleges were set up.

Chinese College of Environmental Management Cadres, NEPA (Beidaihe);

Changsha School of Environmental Protection, NEPA;

Beijing Base for Conference and Training, NEPA;

Training Centre for Marine Environmental Surveillance and Control, Shandong, NEPA;

Departments of environmental science, engineering, chemistry, medicine and so on in universities, such as Departement of Environmental Engineering, Qinghua University.

Important Environmental Activity

National Conference on Environmental Protection (1975, 1984, 1989)

Legislation:

People's Republic of China's Law of Environmental Protection (Tentative) (1979);

Water Pollution Prevention Law (May 1984)

Atmospheric Pollution Prevention Law (September 1987)

Marine Environmental Protection Law (August 1982)

Forest Law (September 1988)

Grasslands Law (June 1988)

Noise Pollution Prevention Law (October 1989)

Decree Regarding the Strict Conservation of Valuable and Rare Wildlife (April 1983)

Various environmental standards or regulations

Preparation of the national programmes of environmental protection

The Year 2000 National Programme of Environmental Protection Planning

Environmental Protection Plans (1981-1985, 1986-1990, 1991-1995)

Major Academic Activities

Symposium on the Strategy for the Environmental Protection (1986, 1988);

National Symposium on Ecology and Environmental Science (1987);

Pollution Control Technology Conferences.

CONCLUDING REMARKS

The environmental protection and constructions are complicated and relate to many factors with different attributes. They are also critical to the global human existence and thus need the cooperations and efforts between all international governments and scientists, including economic and technical communications as well as undertaking the responsibility to solve environment problems.

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