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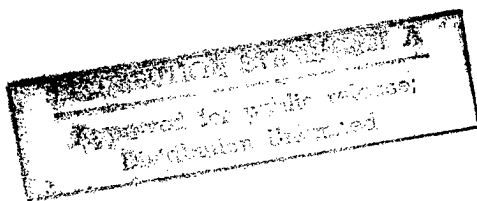
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27 September 1984

# China Report

SCIENCE AND TECHNOLOGY

CHINA ADDRESSES ENVIRONMENTAL AFFAIRS



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27 September 1984

CHINA REPORT  
SCIENCE AND TECHNOLOGY  
CHINA ADDRESSES ENVIRONMENTAL AFFAIRS

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## STATE COUNCIL UPGRADES RULES ON POLLUTION

OW280812 Beijing XINHUA in English 0751 GMT 28 Jul 84

[Text] Beijing, July 28 (XINHUA) -- No new construction projects will be authorized unless they go hand in hand with appropriate anti-dust and anti-toxic facilities. Package blueprints covering factory premises and anti-pollution aids must be submitted to the departments of labor and public health as well as trade union organizations to get their endorsement before construction begins. This decision was made by the State Council earlier this month. The move is designed to improve safety on the job for workers and promote efficiency in industrial enterprises.

The new measures also apply to joint ventures with foreign firms. The State Council urged leading authorities of enterprises and mines to settle the pollution problem while undertaking technical upgrading of the existing facilities, in view of the present situation marked by serious dust and poison hazards. Heavy pollution-causing enterprises with outdated equipment and technology and poor economic results should be closed down, merged with other factories or made to change their range of products to reduce pollution. Dust extractors are mandatory for mining and crushing operations, according to the State Council's decision.

The State Council prohibits the transfer of pollution-prone production lines without protection measures by state-owned enterprises to collectively owned neighborhood or rural industrial undertakings. Officials at the transferring unit will be held responsible if they are found doing so. Anti-dust and anti-toxic facilities must be promptly imported or made domestically to match imported equipment. The State Council called on all departments and localities to pay more attention to anti-pollution work and improve the environmental monitoring system.

CSO: 4010/138

LI PENG CHAIRS ENVIRONMENTAL PROTECTION MEETING

OW120901 Beijing XINHUA Domestic Service in Chinese 1559 GMT 10 Jul 84

[By reporter Ge Daxing]

[Text] Beijing, 10 Jul (XINHUA) -- The newly established State Council Environmental Protection Committee held its first meeting here today to hear reports on the progress made in China's environmental protection work during the last 6 months and to study techniques and policies in preventing and controlling pollution from coal smoke and matters related to the strengthening of environmental control regulations for township and neighborhood enterprises.

Vice Premier Li Peng presided over today's meeting. Responsible persons of Beijing and Tianjin Municipalities and the Ministry of Metallurgical Industry introduced their respective experience in environmental protection work. Beijing's experience of making environmental protection work part of the mayor's job and of mobilizing the masses to protect the environment, Tianjin's comprehensive measures for controlling smoke and dust pollution and the Ministry of Metallurgical Industry's practice of instituting a responsibility system in environmental protection throughout the industry attracted the meeting's special attention.

In his summarizing speech, Li Peng said: Many departments and localities have done a lot of good things for the people in environmental protection during the last 6 months. The experiences of Beijing, Tianjin, and the Ministry of Metallurgical Industry are valuable and should be popularized.

He said: We must not follow the practice of a number of developed countries which try to tackle the problem only after the environment is polluted. At the same time, we must also take into account China's underdeveloped economic conditions. Therefore, in the future, with respect to existing pollution, the basic policy is that whoever creates the pollution will be responsible for treating it. All new construction projects must incorporate environmental protection facilities. The regulations requiring that environmental protection facilities be designed, constructed and operated along with the construction of the main project must be strictly enforced. At present the most threatening pollution comes from coal smoke, polluted water, noise and waste residue. It is necessary to concentrate our efforts on controlling them. Various industries and localities may decide their respective targets of control in light of their specific conditions. Vigorous measures should be taken to tackle pollution problems arising from the current rapid growth of township enterprises. All localities and departments should seriously strengthen environmental management, strive to do as much practical work as possible and truly carry out our national policy in environmental protection.

CSO: 4008/375

NAMELIST OF COMMITTEE ON ENVIRONMENTAL PROTECTION

Beijing ZHONGGUO HUANJING BAO in Chinese 15 May 84 p 1

[Text] Director: Li Peng [2621 7720]

Deputy Directors:

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Li Ximing [2621 6932 6900] [Ministry of Urban and Rural Construction]

Chu Dongwan [6932 2639 1354] [State Scientific and Technological Commission]

Chu Weichen [6392 4850 5256] [State Economic Commission]

Members:

Gu Ming [7357 2494] [Deputy Secretary General of the State Council]

Chi Haibin [6688 3189 3453] [Ministry of Finance]

He Kang [0149 1660] [Ministry of Agriculture, Livestock and Fisheries]

Yang Zhong [2799 6945] [Ministry of Forestry]

Qu Geping [2575 2706 1627] [Ministry of Urban and Rural Construction]

Wen Jiabao [3306 1367 1405] [Ministry of Geology and Mineral Products]

Ma Jie [7456 2212] [National Defense, Scientific, Technological and Industrial Commission]

Zhong Xiang [1728 4382] [Ministry of General Logistics]

Guo Ziheng [6735 1311 1854] [Ministry of Public Health]

Li Guangxiang [2621 1684 4382] [Ministry of Public Security]

Zhou Chuandian [0719 0278 0368] [Ministry of Metallurgical Industry]

He Guangyuan [0149 0342 6678] [Ministry of Machine Industry]

Zhou Ping [0719 1627] [Ministry of Nuclear Industry]

Xie Qing [0673 7230] [Ministry of Coal Industry]

Li Jing [2621 2417] [Ministry of Chemical Industry]

Lin Yincai [2651 3009 2088] [Ministry of Chemical Industry]

Ji Long [1323 7893] [Ministry of Light Industry]

Qian Yongchang [2799 2182 2037] [Ministry of Hydro-electric Power Industry]

He Guang [0149 0342] [Ministry of Labor Personnel]

Luo Yuru [5112 6877 1172] [State Oceanography Bureau]

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12581

CSO: 4008/345

MA HONG ADVOCATES IMPROVEMENT OF ENVIRONMENTAL PROTECTION WORK

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, No 3, 1984

[Article by Ma Hong [7456 3163]: "Strive To Improve China's Environmental Protection Work"]

[No 2, 1984 pp 4-6]

[Text] Because environmental issues are a serious problem confronting the contemporary world, China, and other countries are faced with its challenge. Moreover, it is closely related to many other problems. Therefore, in my work and in my contacts with foreign friends, I have obtained much information about the environmental issue. This information clearly tells us that environmental protection is a major problem with strategic significance in our country's construction of socialist modernization. Whether this problem is dealt with successfully or not will directly affect our future and is related to whether we can realize the glorious objective of constructing a modernized and strong socialist country with Chinese characteristics. Therefore, environmental issues must receive sufficient attention and be treated seriously.

Everyone knows that environmental issues are complex. Here, I shall discuss my simple views on the issues of understanding the functions of the environment, conscientiously protecting the environment, paying attention to historical experiences, strengthening environmental protection work, defining environmental protection objectives, perfecting the indexing system and conscientiously adopting measures to improve environmental work.

I. Understanding the Functions of the Environment, Conscientiously Protect the Environment.

The "environment" which we generally talk about in environmental protection refers to the environment in its broadest sense. It includes a wide sphere, ranging from the top of the troposphere, about 10 km above ground level, to the entire earth surface, about 5 km underground. Its meaning is different from the term "environment" in ecology because "environment" refers to the specific interrelations between things and is not the thing itself. When we speak of "environment," there must be a specific thing as the center and the surrounding space, condition and situation constitute its environment. The "environment" in ecology has living organisms as its center. Living organisms include animals, plants and microorganisms and their environment is the

surrounding non-living condition which is the space formed by the air, water, heat and light of nature and various organic and inorganic elements. In other words, the environment of ecology is only the factor of non-living matter external to the living organism and does not include the living organism itself. It is also opposed to the living organism. But the "environment" referred to in the human environment, environmental science and environmental protection is the space which is full of all forms of living and non-living matter external to human beings but which has man as the center. Why should the study of the environment have human beings as the focus? Because human beings are the master of this earth and are the most active and mobile factor on the earth's surface, moreover man's objective of studying the environment is to obtain a harmonious development between himself and the environment. Thus, the "environment" in environmental science includes not only non-living matter in nature but also everything external to human beings.

From the viewpoint of systems engineering, the human environment is a large and complex system. When we study the environment with man as the center, we are mainly studying the various relationships and laws between man and his environment as well as the state and laws of interaction, through the movement of matter and energy, between the physical system, biological system and socioeconomic system which form the environment. On the whole, the movement of all the components in the environment of the physical system is independent and outside of organic life. They include the lithosphere, atmosphere, hydrosphere and continental glacier. The biological system is formed by all self-renewing organic systems. They include the smallest microorganisms, the biological community and the ecosystem, all of which form the biosphere. The socioeconomic system is formed by man's economic system, social system, political system and information system. No matter whether it is big or small, its input, output and structure are all controlled by man. These three large systems have their individual internal structure and functions. At the same time, there is the exchange of matter and energy between the systems--i.e., interaction. Can we not say that the environmental science we are talking about is the science which studies the structure and functions of all environmental systems and the state and laws of interactions among them as well as how such laws can be applied?

What is the relationship between man and nature, i.e., the aforementioned physical and biological systems? It can be seen from the reproductive process of human society. Marxist economics has told us: "The reproductive process of the economy...is always interwoven with the reproductive process of nature"; "labor is not the use value it produces, i.e., the only source of material wealth," and "labor and the natural world together is the source of all wealth, the natural world provides the material for labor and labor converts the material into wealth." Furthermore, "labor is first and foremost a process between man and nature, initiated by man's own activities and which adjusts and controls the material exchange between man and nature." This is to say that the whole reproductive process of human society which includes the economic and natural reproductive processes is closely united and interwoven together through the matter and energy exchange between man and nature and goes on in a continuous cycle. The ecological environmental system itself

has a very important function: it can self-adjust, operate normally and maintain relative stability and operational balance between man and his ecological environment. But this function has its limits and when they are exceeded, it cannot operate normally thereby contributing to the destruction of the system. Therefore, any factor in the ecological environmental system cannot be increased or decreased endlessly.

In the economic reproductive process of the human world, on the one hand, resources are constantly "taken out" from the natural world to be "put into" the economic reproductive process and through labor, converted into products needed by man; on the other hand, the residue from production and livelihood and from the economic reproductive process of production, distribution, circulation and consumption are constantly released into the natural environment, joining in the cycling of matter and energy in the natural world. To ensure the smooth operation of the economic reproductive process, as far as renewable resources are concerned, raw materials taken out from nature cannot exceed nature's ability to reproduce itself; otherwise, it will lead to the destruction of nature's matter and energy cycles and the depletion of resources. At the same time, wastes discharged into the natural environment cannot exceed the natural environment's capacity; otherwise, it will lead to the deterioration of environmental quality. This shows that the economic reproductive process is closely related to the natural reproductive process. The natural reproductive process is the foundation of the economic reproductive process which in turn is the factor affecting the natural reproductive process. In order to enhance his own material and spiritual civilization, man develops the economy on a large scale, and correspondingly, "takes out" and "puts back" into the environment on a large scale. He constantly extracts raw materials from nature, puts them into the economic reproductive process, and "produces" in the process various discharges to be "put back" into nature. The scope, scale and depth of such complex interactions increase daily with the rapid development of social productive forces and the tremendous scientific and technological progress. Therefore, to proceed smoothly, the economic reproductive process must follow economic and natural laws, i.e., the laws of ecological economy. Otherwise, it will damage the structure and function of nature's ecological balance, destroying the environment. Conversely, this will also harm economic development. This is the opposite and unifying dialectical relationship of mutual dependence, interaction and mutual support between environmental protection and economic development. We should correctly understand and handle this relationship and conscientiously do a good job of environmental protection.

## II. Pay Attention to Historical Experiences, Strengthen Environmental Protection.

The contemporary world faces two major environmental problems: the first is industrial and urban environmental pollution; the second is the ecological destruction of agriculture and rural areas. In general, the first occurs largely in developed countries and the second in developing countries. Our country is a developing country. Our economy is relatively backward and the level of productive forces low; but we have both kinds of environmental problems.

At present, environmental pollution in our country is serious. Environmental pollution not only seriously threatens human health, but also causes huge economic losses.

We can use for reference the lessons of environmental pollution in industrially developed countries. Their lessons are: first, pollution develops faster than industrial development. Second, both the damage from pollution and result of treatment exhibit the phenomenon of delayed action, i.e., from the wider perspective, there is a long period of time from the discharge of pollutants to their appearance in harmful forms, and from the control of these pollutants to the eventual elimination of their harmful influences. In other words, people begin instituting controls only when certain pollution hazards have been detected, but such pollution will probably become worse by the time the pollution control system is completed. Therefore, if there is no prevention beforehand and only treatment afterwards, then every step is taken passively and the cost is high. Third, there is a limit to the environment's capacity, i.e., the ability of the natural ecosystem to absorb the discharge from human activities and to convert them to materials useful or at least harmless to other forms of life. When pollutants are discharged on a large enough scale, the natural absorption mechanism may become saturated. Consequently, wastes from human civilization can accumulate in the environment leading to public harm. Although man does not know the upper limit of the earth's ability to absorb any one kind of pollutant, nor the ability to absorb various pollutants combined together, yet man definitely knows that there is an upper limit which has been exceeded by environmental pollution in many areas. Fourth, it is rather expensive to control pollution. To prevent the destruction of the ecosystem, there must be a way to stop pollution. Of course, strict pollution control does not necessarily mean the complete elimination of pollution. It is very difficult to completely eliminate all forms of pollution because of technical and economic constraints. Economically, the cost of pollution control increases rapidly as pollution standards become more strict. Based on calculations in the West, if a plant is forbidden to discharge any organic wastes, then the cost will be 100 times higher than when it is permitted to eliminate 30 percent of the organic wastes from its discharges. This figure may not be reliable but has definite reference value.

Environmental destruction in China should likewise receive sufficient attention. Everyone knows that the most glaring evidence of ecological damage is the destruction of resources. The destruction and waste of resources in our country is very serious. For example, in the more than 30 years since the founding of the nation, our forest resources have declined on a large scale. It should be pointed out that the present state of our forest resources does not match the needs of our national economic development. The contradiction in the supply and demand of commercial timber, firewood, pulpwood and other forest economic products is very prominent, causing the volume of annual consumption of forest resources to far exceed the volume of annual production. Such contradiction in the supply and demand of lumber in our country is caused by the low level of lumber consumption. With the development of the construction of modernization and the raising of the people's standard of living,



there will definitely be a great increase in the demand for lumber. If effective measures are not taken, the contradiction in supply and demand will be even sharper. The waste of water resources is also very prominent. In agriculture, because of the low guarantee rate of irrigation, and because of an incomplete conveyance system, serious seepage, flood irrigation, etc., the amount of water used in many irrigation areas is many times larger than that which is required. In industry, the rate of recycled water is very low, reaching 50 percent in some cities while most cities have a rate of 20-30 percent, far lower than advanced international levels. Besides the problem of the volume of water, there is also the problem of water quality. At present, our country's annual discharge volume of industrial effluent and urban sewage is about 30 billion tons, most of which is directly discharged into waters without treatment, seriously polluting the water and lowering the utilization rate of poor water resources. The pollution and destruction of soil resources is also very serious. Throughout the country, because of contamination of farmland by the industrial (including commune and brigade-run enterprises) three wastes, there has been a decline of about 10 billion jin in food production which is equal to two-thirds of the average annual increase in food production in the 30 years since the founding of the nation. Because of irrational development and use, vegetation cover such as forests and grassland have been destroyed, causing the degeneration and desertification of the soil. We are one of the countries with the greatest amount of soil erosion. Every year, the loss of such plant nutrients as nitrogen, phosphorous and potassium equals our total annual production of chemical fertilizer and the economic loss is tremendous. Furthermore, the waste of soil resources is also frightening. In general, when a plant is built, and railroads and airports are constructed, the economic benefits of land utilization are increased and this is a necessary path in industrialization. But we should also pay attention to another aspect: i.e., because of the lack of unified land management, many capital construction projects use land uneconomically; they are assigned large land areas but only use little; or they are assigned land early but are late in its utilization; or they use good land when they can use inferior land. Such phenomena are widespread. At present, in our country, the average per capita acreage of cultivated land is only 1.5 mu, less than one-third of the world's average. With the expansion of the scale of capital construction, the continual increase in population and the withdrawal from cultivation and return to forest land or grassland of some steep slopes and desertification of soil the area of cultivated land will continue to decrease; there is a limit to the reclamation of wasteland and the expansion of cultivation. Therefore, the strict control of the reduction of cultivated areas has become an urgent task.

At present, economically developed nations of the world have begun to pay attention to the correct handling of the interrelations among population, resources, environment and development. Besides political and social factors, they consider this to be one of the most important problems related to the health and sustained development of the national economy.

Based on our understanding, the fundamental reason for environmental pollution and ecological destruction in China lies mainly in the attention paid to the development of production in the construction process while ignoring the ecological balance. We stress the short-term and ignore the long-term and fail

to resolve correctly the relation between the development of production and environmental protection. Thus, we have committed many blunders such as polluting the environment, harming development or killing the hen to get the egg and draining the pond to get all the fish. We should learn from these lessons, follow the laws of ecological economic development and consider this to be a major item which should receive special attention in our construction of socialist modernization.

[No 3, 1984 pp 2-5]

[Text] III. Define Environmental Protection Objectives and Perfect the Indexing System

The 12th CPC Congress set clear objectives for China's economic and social development for the year 2000: Under the general policy of improving economic results, we must strive to quadruple gross annual industrial and agricultural output value, raise the people's standard of living to the level of well-off self-sufficiency and establish socialist material and spiritual civilizations. All of these objectives are related to environmental protection, for economic results, and environmental and social benefits are interrelated. If environmental benefits are poor, there will be pollution of or damage to the environment, which certainly will harm economic development and reduce economic results. If environmental pollution and ecological damage are not strictly controlled, we will not be able to quadruple output; and if we persist in forcing production increases, pollution will become calamitous, and the masses would never approve of that. The comparatively well-off standard-of-living target includes both raising material and cultural living standards and improving the environment. And it goes without saying that socialist material and spiritual civilization should include a clean, beautiful and peaceful environment. As Comrade Li Peng [2621 7791] clearly pointed out in his report, China's environmental objectives for the year 2000 are to strive for a basic restoration of the benign cycle in the natural ecology; for clean, beautiful and peaceful urban and rural productive and living environments; and to enable national environmental conditions basically to meet the needs of economic development and the improvement in material and cultural standards of living. These objectives therefore require a marked improvement in the quality of the urban environment, that most old enterprises basically control their pollution, that the serious pollution in key water systems and sea areas fundamentally be abated and that environmental conditions basically become good. If we realize these objectives, we can basically meet the demands of national economic and social development for natural resources and raise material and cultural standards of living to the level of comparatively well-off self-sufficiency.

Environmental protection not only is closely related to general strategic objectives, it is itself a strategic issue. At the Economic, Scientific, Technological and Social Development Strategy Symposium recently convened by the Technological and Economic Research Center of the State Council, everyone was very concerned about environmental protection, and many comrades presented constructive ideas. For example, some comrades proposed a developmental model embodying

China's characteristics; upholding the four basic principles of three-in-one, coordinated development among the economy, science and technology [S&T] and society; and involving unified, comprehensive planning for the "three shengs": social production, the people's livelihood and environmental ecology. Everyone is very interested in this model. For there cannot be true development if there is merely an increase in economic output value without improvements in standards of living and the environment. True development consists of sustained economic expansion, general increases in standards of living and steady improvement in the ecological environment.

In recent years, some Western scholars have raised doubts about the GNP index, which stresses only the strategy of economic growth, as a measure of development. Such scholars believe that the GNP index does not include all of the fruits of labor in society, deal with environmental pollution factors and the effect of ecological damage, consider whether or not income is rationally distributed and thus express the needs of modern society. China for many years has employed as an indicator the gross output value of industry and agriculture. This index represents the amount of production and the rate of growth in industry and agriculture and thus facilitates study of the material and proportional relationships between these two major productive sectors. Yet this index excludes the fruits of labor in other sectors of material production and employs factory accounting procedures, which count many factors more than once and cannot accurately reflect the actual level of economic development. More importantly, this index lacks result and quality indicators, does not consider the effect of environmental pollution and ecological damage and thus does not adequately represent the fundamental objectives of socialist social production. Consequently, both at home and abroad, people are exploring, are studying and hope to establish a complete and scientific indexing system that comprehensively represents economic and social developmental levels and thus can promote the health thereof. Recently, in a study of national resource development strategy conducted at Xishuangbanna, comrades of the Yunnan Economics Institute proposed an indexing system that combines economic, social and environmental results; integrates in a model social production, the people's livelihood and environmental ecology; and includes productive, living-standard and ecological indicators. This system does not entail complex mathematic computations, is easy and convenient to use and better overcomes the aforementioned defects in the GNP and gross industrial and agricultural output-value indicators.

Specifically, this indexing system is comprised of production, living-standard and ecological target indices, which are weighted and aggregated into the composite target indicator of economic and social development. These target indices--abbreviated as the composite, production, living-standard and ecological indicators--are derived through a weighted aggregation of numerous specific target indices. The multipliers represent each of these indices' positions and role in national economic and social development and are determined by the indices' importance. Let us suppose that the production index for a certain locality in a certain year is 1.11, which means that 111 percent of the plan has been fulfilled or that the plan has been overfulfilled by 11 percent. But let us also assume that the standard-of-living and ecological indices are not good, being 0.8 and 0.7 or representing 80 percent and 70 percent plan fulfillment, respectively. And let us suppose that the multipliers for the production, standard-of-living and ecological indicators are 0.4, 0.3 and 0.3, respectively.

We would then obtain a weighted production index of  $1.11 \times 0.4 = 0.444$ , a weighted standard-of-living index of  $0.8 \times 0.3 = 0.24$  and a weighted ecological index of  $0.7 \times 0.3 = 0.21$ . The actually completed composite index of economic and social development would be the sum of these three indicators, or 0.894. This means that although production targets were overfulfilled, the composite index showed an attained rate of only 89.4 percent, and general social results were not ideal, because performance with respect to the plans for the standard of living and the ecology was not good. This line of thinking gives us some insight. Naturally, I suggest that relevant authorities continue studying whether or not this indexing system can be established and whether or not it is worth improving and extending.

#### IV. Conscientiously Adopt Measure to Improve Environmental Work

In order to do a good job of preventing environmental pollution, preserving ecological balance, promoting economic development and benefiting the people for many generations, we must continue raising society's, especially all levels of the leadership's, recognition of the importance of environmental protection, so that in practical work the leadership will correctly understand and handle the interrelationship between economic growth and environmental protection, act in accordance with the laws of economics and ecology and, naturally, conscientiously implement all environmental policies and laws. Here, I shall limit discussion to my ideas regarding the need to rely on progress in S&T in environmental protection, to strengthen environmental research, to include environmental protection in planning and to ensure necessary supplies of funds and materials.

##### 1. Environmental Protection Work Must Rely on Progress in S&T

I agree with the view that reliance on progress in S&T should be one of the most important methods of protecting China's environment. That is to say, adoption of appropriate new technology should form the principal means by which to resolve our future environmental problems. Progress in S&T must account for one-half of the quadrupling of China's gross annual industrial and agricultural output value by the end of this century. How big a contribution should progress in S&T make to environmental work? This is a problem that we must consider.

In using S&T in environmental work, we must adopt policies that facilitate both economic development and environmental protection. Whether in the deployment of productive forces or the readjustment of the industrial structure, in the technological transformation of industry and agriculture or in the formation and development of new industry, we must be attentive to this problem and strive to achieve results across the board in the economy, society and the environment.

In recently convened conferences, four strategies have been discussed for the development of China's productive forces. Based on historical experience, we cannot adopt the "imitative" strategy, in which we follow in the footsteps of other countries; the "race to get ahead" strategy, in which we try to catch up with or surpass advanced countries in important fields or even in all fields; or the "closed" strategy, in which we seek complete self-reliance and do not actively adopt or even reject advanced technology from abroad. Rather, we must

adopt a "creative" strategy that is based on China's actual conditions, takes full advantage of all favorable opportunities and directly employs all new world technology that meets our needs. Currently, the world is enthusiastically discussing new developments in global industry that are symbolized by such new technology as microprocessors, genetic engineering, lasers, fiber optics, new type materials and new energy sources. The word is that widespread application by the end of this century of current, new technological breakthroughs or near-breakthroughs will produce further spurts in productive forces and corresponding changes in the structure of industry and society and in lifestyles. We must conscientiously do research, seize opportunities, meet challenges and do an even better job of handling our developmental undertakings in socialist modernization. Naturally, environmental protection must be included in all of this. In order to adapt to the constant changes and new developments in world technology, we must formulate a special, responsive policy and establish a better system of management so that we can absorb as quickly as possible the new world technology we need and can apply and so that we can do a good job in economic development and environmental protection.

Our environmental protection work should be based on need and feasibility and should actively adopt new technology developed in world industry. For example, developed countries are gradually transferring some of their labor-intensive and heavily polluting industries to developing countries; carrying out technological innovation and transformation aimed at automating, saving energy and reducing pollution in such capital-intensive areas as steel, heavy chemical and automobile industries; and are actively establishing new technology or knowledge-intensive industries that are light- or nonpolluting. Faced with these trends, we must combine the technological transformation of old enterprises with an aggressive adoption of such technological products as microprocessors so as to strengthen enterprise management and save resources and energy, control discharge of the three wastes and reduce pollution. When some small backward Shanghai factories that had outmoded equipment installed computers at key points, the factories were able rapidly to increase productive quality, reduce resource and energy consumption and waste discharge and improve economic, social and environmental results. Another example is that of genetic engineering, a symbol of new developments in world industry. This technology can enable grain crops and the bacteria that live on such crop's roots to gain azofication capabilities and to provide nitrogenous fertilizer. And there are indications from abroad that this technology can transform corn into a perennial. When disseminated, such achievements bear great practical importance for the development of agriculture, economizing on energy and materials, soil and water conservation and the preservation of the ecological environment.

## 2. We Must Strengthen Research in Environmental Protection

The world currently confronts many major problems that are enormous in size, are complex and involve many fields. In most cases, these problems cannot be resolved by a single scientific discipline or industry. Only by adopting a multi-disciplinary approach can we reach appropriate answers. For these problems involve parts of natural science, engineering technology and social science. Only by relying on the theoretical guidance of, and the close cooperation and the joint

inquiries and study of the scientists from, the disciplines in these areas can we successfully resolve the various environmental problems that arise in China's socialist modernization. Consequently, close cooperation, comprehensive study and joint assaults on key tasks among natural and social scientists and engineers have become a feature of our present age. I agree with the view stated by Comrade Li Ximing [2621 6932 6900], which is that the science of environmental management, a branch of general environmental science, is a weak link in China. Environmental management itself is a comprehensive discipline involving the economy, law, society and other areas. But at present, very few people who study these areas participate in environmental management research. Consequently, the many theoretical and practical problems encountered in the latter field are not fully or deeply studied, and thus satisfactory answers remain undiscovered. Therefore, I totally agree that, while actively organizing cooperation among natural and social scientists and engineers to initiate environmental forecasting, long-range forecasting, long-range planning and studies or environmental economic and technological policy, we should encourage natural scientists and engineers in all environmental departments to exert themselves and learn something about the social sciences, management, economics and sociology. Similarly, comrades engaged in social science research and management should also exert themselves and learn a bit of natural science and engineering. Through such cooperative efforts in these areas, China's environmental management will surely be raised from theory and practice to a new level in the near future.

In all affairs, preparation ensures success and lack of preparation spells failure. In order to build a strong socialist, modern nation with Chinese characteristics, we must master economic and natural laws, maintain strategic foresight, take into account the general picture and overcome blindness. In accordance with the directives of leading comrades of the CPC Central Committee and the State Council, we have organized and launched forecast research work for "China in the year 2000." The purpose of this work is to provide scientifically based reference material for decision making and policy formulation by the Central Committee and the State Council and for the developmental programs for each locality, industry and undertaking in order to ensure better implementation of the strategic objectives proposed by the 12th CPC Congress. Through the concrete pictorial propaganda in "China in the year 2000," this research work is designed to encourage all the people throughout the country to strive to implement the party's magnificent program. "China's environment in the year 2000" is a sub-topic of this general task, and under the personal attention and guidance of Comrade Li Ximing, much effort has been made and much progress and initial results have been achieved in this work. I hope that all comrades participating in forecast research will continue to strive to complete their tasks as quickly as possible, provide good scientific results and make contributions to China's environmental protection.

### 3. We Must Conscientiously Include Environmental Protection in National Economic and Social Development Plans at All Levels and Ensure Supplies of Essential Funds and Materials

China has a socialist, planned economy. On the one hand, if undertakings, especially important projects, are not included in the plan, they will be hard to manage. On the other, we possess great capacity for intervention in our

planned economy. If plans accord with economic and ecological laws, then a benign cycle in national economic and social development can be engendered. Conversely, if plans do not accord with such laws, a pernicious cycle will result, and damage will befall the ecological environment and economic and social development. Thus we must emphasize including environmental protection in planning and ensuring the funding and material supplies required for environmental work.

Because we were not sufficiently attentive to and lacked adequate understanding of environmental protection in the past, many construction projects omitted anti-pollution devices, which fact is a major reason behind the seriousness of China's environmental problems. We must conscientiously draw on this lesson, strive to strengthen environmental protection work, check the deterioration of the environment in a planned fashion and selectively improve environmental quality. We can imagine that by the year 2000, in industry and the urban environment, we can substantially reduce air, water and other major forms of pollution by controlling waste discharge and through other measures. In the natural environment, the forest cover ratio will increase to approximately 20 from the current 12.5 percent, soil erosion and desert encroachment will basically be checked, natural--especially rare and precious--plant and animal life will receive effective protection and will propagate and exploitation of natural resources will basically be appropriate and rational so that there will be substantial recovery and development of and the beginning of a benign cycle in the damaged agricultural ecosystem. This can be achieved through the effort of every sector. We must abide by the relevant directives of the party Central Committee and, when formulating plans and distributing funds, implement environmental protection and ensure that the channels of the necessary environmental funds and materials remain unimpeded.

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## PAST EXPERIENCE, FUTURE TASKS OF ENVIRONMENTAL PROTECTION

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 1, 1984 pp 2-4

[Article: "On China's Experience and Lessons of Environmental Protection Work"]

[Text] China's environmental protection undertaking has gone through 10 years since 1973 when the First National Environmental Protection Conference was convened under the kind concern and initiative of Premier Zhou. During these 10 years of nationwide environmental protection work we started from scratch, pioneered through arduous conditions, studied continuously, advanced steadily, and have established a definite work foundation, accumulated a lot of experience and obtained good results. However, on the whole environmental pollution in our country still continues to worsen, ecological destruction intensifies and the danger to economic development and the people's well-being is increasing. Environmental problems are becoming serious problems that affect the social tranquility and economic revival of our country. Particularly when we consider the strategic goal of realizing quadrupling the total industrial and agricultural output value, without decisive measures to deal with environmental problems our reviving economy will suffer setbacks, which will directly jeopardize the realization of the magnificent goal of modernization.

It is highly necessary to summarize in earnest our experience and lessons of environmental work in order to study and formulate our environmental strategic policy and development program which suit China's national conditions and to strive for basic improvement of China's environmental protection workers. Based on 10 years of practice, what experience and lessons does China have in its environmental protection work? We believe that primarily there are the following aspects:

1. Achieving mutual coordination and promotion between economic development and environmental protection is a major guiding principle in economic development strategy as well as the basic solution to China's environmental problems.

For a long period of time a major fault in our economic construction is that we have not firmly established environmental protection as a major strategic thinking in economic and social development. In industrial construction, the construction of many projects do not consider destruction of the conditions of natural resources and the ecological environment, causing confusion in the



distribution of industry and the structure of products to be irrational. Take such world famous and scenic cities as Beijing, Hangzhou, Suzhou and Guilin as examples. In the past we purely emphasized on turning them from "consumption cities" into "production cities," made them "small and complete" or "large and complete," did our utmost to develop heavy industry and built high-pollution type plants, resulting in losing control of the character, planning, structure and distribution of cities. Throughout the country, numerous factories with serious pollution problems have been built on the windward side of cities, upper sources of water, water sources protected areas, densely inhabited areas, scenic and tourist districts and wind shelter areas, overlooking the pollution and danger to the environment. We are now faced with this reality: in order to improve the environmental quality of cities, we have no choice but to move those factories which have serious pollution problems and which are located in residential areas, scenic areas and water sources protected areas. Closing down factories that were not easy to build, having to build new factories, spending twice the investment on each factory and losing valuable time are penalties for not caring about environmental protection and thinking only about economic development.

Economic development and environmental protection are two sides of a unified whole; they advance and condition each other. A good environment is the material foundation for economic development while economic development creates conditions for protecting and building the environment. Economic development brings environmental problems while environmental pollution and ecological destruction in turn hinder sustained development of the economy. Therefore, while we must develop and utilize natural resources and develop the socialist economy, we must at the same time protect the environment, increase the ability of resources to regenerate and to be utilized on a continuous basis and promote sustained and stable development of the economy. Particularly under China's socialist system, the basic goal of developing the economy and protecting the environment is to continually satisfy increasing needs in the material and cultural life of the people. Environmental protection is an indispensable component for building a high degree of socialist spiritual civilization and material civilization. We should earnestly summarize past experience and lessons, correctly handle the relationship between environmental protection and economic development and do a good job in building the environment during economic construction in order to promote the realization of the magnificent goal of modern socialist construction.

2. Incorporating environmental protection into the national economy and social development plan is a major safeguard in doing a good job in China's environmental protection.

China is a socialist state that practices a planned economy on the basis of the system of public ownership. Environmental protection is a component in modern socialist construction; it is an issue in economic development as well as social development. By giving full play to the superiority of a planned economy, incorporating environmental protection into the national economic and social development plans and strengthening the state's planned guidance for environmental protection we will be able to effectively control environmental

pollution, prevent destruction of the ecology, and realize planned, proportionate and coordinate development of the economy, society and environment.

However, for a long time in national economic and social development, we have not made environmental protection a strategic goal and included it in the course of a planned economy. First, when certain areas formulate economic, social, scientific and technical development plans and programs they have not done a good job in combining them with local characteristics, formulating the goals and measures of environmental protection, incorporating them into plans and programs and implementing them conscientiously. Second, when they formulate production development plans, some economic departments have not properly made pollution prevention and improvement of the environment the major contents, put forward concrete goals and targets in environmental protection and made arrangement in the annual plans to implement them within a prescribed time period. Further, some enterprises have not stressed the formulation and implementation of pollution prevention programs thereby affecting the treatment of the sources of pollution. With China's economic development still being relatively backward, a major reason why environmental problems are so serious is that environmental protection has not been incorporated into planning.

In the past several years when studying China's development strategy and considering long-term plans, we have increasingly paid attention to the interrelationship of population, resources, environment and development and have started to include environmental pollution in planning. In particular, the Sixth Five-Year Plan for China's national economic and social development has summed up the positive and negative experiences of socialist construction, comprehensively considered the interrelationship of the economy, society and environment, listing environmental protection as a basic task in economic and social development and specially writing a chapter on environmental protection. This has generally incorporated environmental protection into the state plan and plays a positive role in speeding up China's environmental construction. However, we should recognize that we have barely begun to incorporate environmental protection into the Sixth Five-Year Plan and to strengthen planned guidance of the state on environmental protection and there are still many difficulties in implementing it in various areas, departments and enterprises. We must resolve two problems at present. First, establish a system of environmental protection norms and use environmental norms to judge whether enterprises complete one of the appraisal quotas in the state plan. Second, rational solution to the sources for funding environmental protection. On one hand all areas and departments must further implement the sources of funds for environmental protection already specified by the state. On the other hand in state and local plans we must clearly list the proportions of environmental protection funds in various construction funds. These problems must be further studied and resolved in earnest.

3. An effective way to prevent industrial pollution is to proceed from increasing the utilization ratio of natural and energy resources and eliminate the "three wastes" in the production process to the greatest extent.

The technology of most of China's enterprises are backward with outdated equipment, poor management, low efficiency and high consumption of natural and energy

resources. These are important causes for poor economic results in enterprises and are the basic causes of serious industrial pollution. The national total utilization rate of energy resources is under 30 percent, that of steel products is under 60 percent and that of turning raw materials into products in the chemical industry is merely a third. Only a small portion of the elements of numerous paragenetic rare mineral products is utilized while most of them are discharged as "waste." This not only wastes valuable resources but causes environmental pollution hazards.

Through technical transformation in the past several years many enterprises have actively pursued comprehensive utilization to strengthen their management and increase the comprehensive utilization rate of natural and energy resources. Not only have they effectively reduced environmental pollution but clearly increased economic results. On 29 December 1981 Premier Zhao Ziyang wrote important comments on the Anshan Iron and Steel Corporation's experience on "self-reliance, comprehensive utilization of natural and energy resources and treatment of the 'three wastes'," striking home the crucial point of China's problem of industrial pollution and pointing out the direction and way to prevent it. Based on the experience of the Anshan Iron and Steel Corporation and other enterprises, the basic way for China to prevent industrial pollution should be: (1) Eliminate the "three wastes" in the production process as much as possible through technical transformation; (2) actively pursue comprehensive utilization and turn the "three wastes" into resources; (3) carry out the necessary purification treatment so that the "three wastes" can meet the state's discharge standards; (4) combine with the reorganization of enterprises, incorporate environmental protection into the enterprise system of economic responsibility and strengthen environmental management. Practice has proved that this is an effective way to protect and improve the environment and develop production at low cost and with fast results. It symbolizes that China has opened a path which suits its national conditions and to solve industrial pollution problems.

4. We must treat agroecological environmental protection as a strategic focus in environmental protection.

The agricultural environment is the condition which 800 million peasants in China rely on for survival and is their foundation for agricultural production. For a country like ours which has a large population and a relatively small arable area, protecting agricultural resources and safeguarding ecological balance is a basic national policy and has a profound significance for China's economic development and national prosperity.

However, for a very long period of time because we did not follow nature's ecological law but one-sidedly stressed "growing grain as the key link" and blindly destroyed forests in reclaiming land, abandoned animal husbandry to cultivate grain and reclaimed land from lakes, we have caused a great deal of soil erosion, soil desertification, and climatic variation and have severely destroyed the agroecological balance. Not only has this hindered production in forestry, animal husbandry and fishery but also grain production thereby creating the vicious cycle between reclamation of wasteland and poverty. This

is a very big lesson. Precisely as leading comrades of the Party central Committee have pointed out, if problems develop in our countryside in the future most likely they will not concern the system of ownership but the destruction of the agro-ecology.

The key to protecting the agroecological environment is active protection of agricultural resources, such as land, water and biological resources. A great deal of practice has proved that destruction of agricultural resources is basic destruction which concerns the whole situation and has long-term effects. Once agricultural resources are destroyed it will be rather difficult to recover them and some may never be recovered. If we wait until then when we are forced to treat the problem we will not only miss the opportunity but will have to pay a greater price. Therefore, our environmental protection work must urge China's agriculture to follow nature's ecological law, rationally utilize natural resources, take the course of overall development in agriculture, forestry, animal husbandry, sideline production and fishery and gradually build an agroecological system with a beneficial cycle.

5. Strengthening environmental management and perfecting the system of environmental management is the most positive, realistic and effective measure to solve China's environmental problems.

The reality confronting China's environmental protection at present is: first, environmental pollution and destruction is quite severe and we can no longer allow it to continue unchecked. We should learn the economic lessons of foreign countries and try our best to avoid the detours they have taken. Second, China's economy is still undeveloped and has financial difficulties. For quite some time to come we will not be able to gather large amounts of funds to spend on environmental protection like industrially-developed countries. Under such conditions, the most positive, realistic and effective measure is to strengthen environmental protection, perfect the system of environmental management and strengthen the environmental protection apparatus. In particular we must combine professional management of economic departments in charge with comprehensive management of local governments, adopt overall measures, give full play to the functions of environmental management departments in unified planning, organized coordination and supervision and inspection, and conscientiously carry out strong, effective and overall environmental management by adopting legal, economic and administrative measures. Only in this way can we control pollution and destruction of the environment and open a path of environmental protection that suits our national conditions and national strength so that we can make basic improvement in China's environmental conditions with little money spent.

Past experience, if not forgotten, is a guide for the future. The basic interests of the Chinese people lie in preventing pollution and protecting the environment which concern the survival and development of the Chinese nation and should be considered a basic national policy. Ours is a developing country whose economy remains relatively backward but whose environmental pollution and destruction are already quite severe. This determines that

China's undertaking in environmental protection will be long-term, arduous and complex. On the basis of earnestly summarizing a decade of experience and lessons, we should adopt decisive and effective measures, unite, struggle arduously and strive to create a new situation for environmental protection. While developing our economy, we should basically improve China's environmental conditions and make our motherland more magnificent.

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## ENVIRONMENTAL GOALS, POLICIES OUTLINED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 1, 1984 pp 5-7

[Article by Li Jinchang [2621 6855 2490], assistant researcher, Technical and Economic Research Center, State Council: "We Must Be Concerned About the Environment--Sidelights On the Conference On the Strategy for the Overall Economic, Social, Scientific and Technological Development"]

[Text] In order to realize the long-range strategic development goals determined by the 12th Party Congress and build a strong, modern socialist state with Chinese characteristics, in October last year the Technical and Economic Research Center of the State Council held a conference on the general strategic principles for the study of the overall economic, social, scientific and technological development in China. By the papers and materials (a total of 89 articles) they submitted, the speeches they (43 people) delivered and group discussion sessions, the more than 120 specialists in natural science, engineering technology, social science and other fields put forward a great deal of profound and constructive views. The representatives paid close attention to the issue of China's environmental protection, stressed its strategic significance and proposed numerous policies and measures.

### I. Seriousness of Environmental Problems

The delegates believe that currently China's environmental problems are very serious and are primarily manifested in two areas: environmental pollution and ecological destruction. In environmental pollution, China's present conditions are equivalent to the level of industrially developed countries in the 1950's and 1960's when environmental pollution spread unchecked. For example, in 1981 air pollutants discharged in China were more than 40 million metric tons, of which sulphur dioxide was more than 18 million metric tons and China was one of the countries with the highest quantity discharged. In addition to other serious hazards, it has caused acid rain over extensive areas south of the Chang Jiang, and the damage has been serious. The density of particles in the air of urban areas is high and the number of smoggy days increases each year. Further, in 1982 China discharged 31 billion metric tons of waste water, polluting 25 percent of the nation's fresh water resources and 91.4 percent of the groundwater in cities. Each year 430 million metric tons of residue is discharged nationally and 5.4 billion metric tons have been accumulated over the years in an area of approximately 400 square meters.

Noise pollution in large and medium-sized cities is very serious and traffic noise in Beijing and Hangzhou is worse than that of Tokyo, Japan. Environmental pollution not only seriously endangers the health of the people but creates enormous economic loss. Ecological destruction is currently an even more serious environmental problem in China. For example, annual grain production is reduced by about 10 billion jin because the area of arable land polluted by the industrial "three wastes" (including rural commune- and brigade-run enterprises) is more than 40 million mu nationally. Due to irrational development and utilization which destroy forests, pastures and other vegetation and cause desertification and erosion in an area as big as 1.5 million square meters, over 5 billion metric tons of soil is eroded annually. The plant nutrients it contains such as nitrogenous, phosphorous and potassium materials are equivalent to the annual total volume of chemical fertilizer nationally produced. From the above conditions, the problems of environmental pollution and ecological destruction have become a key limiting factor in China's socialist modernization and a major issue that must be properly resolved.

## II. Strategic Policy for Environmental Protection

A strategy is a law for the overall situation, a high degree of summary of the general goal and policy. When we study and formulate the strategy for China's overall economic, social, scientific and technological development we must take environmental protection strategy into consideration and give play to its rightful function in order to achieve coordination and sound development of the economy, society and environment and build a strong, modern socialist state with Chinese characteristics as soon as possible. In his opening speech at the conference, the secretary general of the State Council's Technical and Economic Research Center and the director of the Chinese Academy of Social Science Comrade Ma Hong [7456 3163] discussed a six-point guiding ideology in studying and formulating China's strategy for overall development based on the series of instructions of the Party Central Committee, State Council and leading comrades of the Party Central Committee. Four of the points particularly concern the issue of environmental protection. He pointed out: "We must never be solely concerned with immediate benefits and jeopardize those that are long-term. We must pay more attention to the development and utilization of resources as well as the protection and improvement of the environment. We must make preventing environmental pollution, maintaining the ecological balance, promoting economic development and benefiting future generations a guiding principle in China's socialist modernization." He also pointed out that "In this regard, leading comrades of the Party Central Committee have given a lot of important instructions from preventing environmental pollution and ecological destruction to treasuring and rationally utilizing every inch of land; from afforestation and making the motherland green to planting trees and grass and preserving the soil; from formulating the forestry law and environmental law to including environmental protection in the Sixth Five-Year Plan; and from proposing plans for agricultural, forestry and water conservancy projects not merely for 10 or 20 years to considering their development for 50 years, 100 years or even longer. This reflects our party's great insight and its strong sense of responsibility for

the country and people. Above and below 9.6 million square meters of land and extensive territorial waters is the natural environment which our country and people depend on for survival and development. While developing industrial and agricultural production and raising the living standard of the people, we must give full play to the role of the more economically developed areas as well as active support to the more backward areas; transform as well as suit nature; develop and utilize various resources as well as strongly care for each type of resource and protect the ecological system in order to ensure continual utilization and sound development and never do anything foolish like killing the goose that lays the golden eggs." Many delegates strongly agreed with Comrade Ma Hong's speech. They felt that we have already been rightfully punished for some of our actions that violated natural law by stressing only production and disregarding ecology in the course of developing the economy in the past. We should learn from these experiences and lessons, make preventing environmental pollution, protecting the ecological balance, promoting economic development and benefiting future generations as one of our basic national policies, and must give consideration to economic, social and environmental results as a whole.

### III. Development Pattern and System of Norms

In accordance with the series of instructions of Deng Xiaoping and other leading comrades of the Party Central Committee, Comrade Ma Hong suggested that "China's strategy for overall development should have the following three basic characteristics: first, it has Chinese characteristics and cannot copy patterns of other countries indiscriminately; second, it upholds the socialist path, continually perfects the socialist system and fully gives play to the superiority of socialism and cannot engage in capitalism; third, it must realize modernization, cannot lag behind and must strive for rapid development and progress." Such a strategy of overall development can essentially safeguard sound and sustained economic, social, scientific and technological development of China which includes environmental protection. The director of the Association for Research on China's Future, Comrade Du Dagong [2627 1129 0361] proposed a "three in one" pattern of development strategy, that is, one which has China's characteristics, upholds the "Four Basic Principles" with three in one economic, social, scientific and technological coordinate development and with overall balance among social production, the people's livelihood and environmental ecology. Everyone was inspired.

An overall and comprehensive system of norms which reflects the demands of the goals of the party's development strategy and measures the level of the country's development has major significance in determining China's strategy for overall development and strengthening the state's planned guidance for economic, social, scientific and technological development which includes environmental protection. For a long period of time China has primarily used the norms of total industrial and agricultural output values to indicate the level of economic development and rate of growth, but such norms do not include all social achievements, do not indicate the substance and demands of environmental protection and cannot fully reflect the goal of socialist production. Moreover, because the factory method is used in calculations, there is still



the factor of deceptive duplication of figures. Some comrades have therefore put forward the idea that we proceed from China's actual conditions in setting up and perfecting a comprehensive system of norms which will include the factors of environment and ecology. This tentative idea consists of 4 major categories and 30 items of norms including the norm for comprehensive level; the norm for satisfying the basic needs in the material life of the people; the norm for satisfying the basic needs in the spiritual life of the people; and the norm for ensuring social safety, which more adequately reflect the substance and demands of environmental protection. Other than this, the eight individual norms which China has been using to evaluate enterprises do not make demands on environmental protection, which facilitated enterprises in one-sided pursuit of production output and sales volume thereby overlooking environmental protection. We can consider using multiple norms that include such substance as treatment of the "three wastes," implement the method of rating by points and conduct overall, comprehensive evaluation of the activities of enterprises.

#### IV. Strategic Goals of Environmental Protection

China's present work in environmental forecast began not long ago and does not have sufficient data for quantitative analysis. It would be difficult to accurately determine China's environmental strategic goals. The director of the Environmental Protection Bureau of the Ministry of Urban and Rural Construction and Environmental Protection, Comrade Qu Geping [7798 2706 1627], made a preliminary study on the strategic goals of China's environmental protection on the basis of China's actual conditions including economic strength, technological level and existing data. In his opinion, there are three options in China's environmental strategic goal:

The first target is to continue to maintain the measures that control pollution and protect the environment at the present level (the proportion of environmental expenditure in the national total industrial and agricultural output value is about 0.4 percent). In pollution for instance, the average industrial dust removal rate will be maintained at the current 70 percent or so. This way, by the end of this century, suspended particles in the air of northern cities will exceed secondary national environmental standards by about 4 to 15 times, close to or reaching the level of the world-shaking London smog incident. The removal rate of sulphur dioxide will be maintained at the current level. By the end of this century the national annual discharge rate of sulphur dioxide will increase from the present 18 million metric tons to 40 million metric tons. The density of sulphur dioxide in the air of northern cities will increase 2.23 times, which will be generally higher than the level of industrially-developed countries at the time when environmental pollution spread unchecked. The recycling rate of water used in industry will be maintained at the present level. By the end of this century the annual volume of waste water discharged will reach 96 billion metric tons, a threefold increase over the present. The sewage treatment rate will be maintained at the present level. Polluted fresh water resources will increase from the 25 percent of the national and annual total value of runoff to about 70 percent. The utilization rate of industrial residue will be maintained at the present

19.3 percent. By the end of this century the annual discharge of waste residue will reach 900 million metric tons, more than double the present level. The area of land affected and pollution hazards will be more serious. As a further example, China's natural environment has been severely destroyed and is in a vicious cycle. If we continue to maintain the present level of environmental measures, under the conditions of quadrupling the total annual industrial and agricultural output value by the end of this century, the destruction of the natural ecology will be even more serious.

The second target is to control the growth of pollution with focus on improving environmental quality (the proportion of environmental expenditure in the national annual industrial and agricultural output value will be about one percent, more than twice that in the first target). This demands that in environmental pollution, the total quantity of pollutants under control does not exceed the present level, the quality of air and water will reach secondary standards respectively. In concrete terms, it demands that by the end of this century, industrial dust removal rate must be above 96 percent, sulphur dioxide removal rate above 42 percent, recycling rate of water used in industry above 80 percent, sewage treatment rate above 75 percent and utilization rate of industrial residue above 50 percent. In the natural environment, it demands that the forestation rate increase from the present 12.7 percent to about 20 percent, soil erosion and desertification be brought under basic control, comprehensive prevention be carried out in agriculture against plant diseases and insect pests, toxic and hazardous substance in the agroecological environment be brought under control, and wild animals and plants particularly rare species are effectively protected and enabled to breed. When these goals are realized, the environmental quality of most cities and the quality of important bodies of water will be tangibly improved, the natural environment will recover and develop to quite an extent. An agroecological system with a beneficial cycle will be built up initially so that the environment and economy will develop more coordinately, providing a cleaner and more comfortable environment for the people.

The third target is that the quality of the urban and rural environment meet the requirement that the natural ecology and the people's health are in no way jeopardized, in other words, the quality of air and water must both reach primary standards. This demands that we must not only control pollution with results but also drastically reduce the load of pollution, reach a forestation rate above 30 percent, that soil erosion and desertification are effectively controlled, the agroecology recovers its fine state, wild animals and plants are comprehensively protected, rare living species are enabled to breed and develop thus building an ecological system with a beneficial cycle which suits the needs of human survival and industrial and agricultural development, has vitality and develop coordinately. To realize these goals, the needed environmental expenditure is approximately more than three percent of the total annual industrial and agricultural output value.

Obviously, the first target is too low. It will do great harm to people's health and national economic growth, violate the basic purpose that socialist modernization is to benefit the people and cannot be accepted by the people.

The third target is too high. It is hard to attain with our national economic strength and technological level. Protecting the environment by sacrificing or slowing down economic development also violate the basic interests of the people so that it is unacceptable. The second target is more suitable and can be regarded as moderate, tending toward the high side. Although there are still many difficulties in achieving this, it can be reached if we exert our efforts. The delegates agreed with this view.

#### V. Chief Measures in Environmental Protection

The delegates generally believe that in order to solve China's environmental problems, basically we must comprehensively consider the interrelationships among the environment, resources and economic development. In particular we must correctly handle the mutual relationship between economic development and environmental protection, combine immediate and long-term interests, partial and general interests so that the economy, society, science and technology may develop coordinately. As discussed by the delegates, the chief measures in environmental protection which China should adopt include:

(A) Continue to increase the understanding of environmental protection by the whole society particularly leaders at all levels so that in actual work the relationship between economic development and environment protection will be properly placed and people will abide by objective economic laws and follow the ecological law of nature.

(B) Conscientiously include environmental protection in economic and social development plans, ensure the necessary sources of funds for environmental protection and achieve coordinate planning and construction of environmental facilities and economic projects.

(C) To deal with environmental pollution and ecological destruction, we should carry out the guiding principle which centers on prevention, combining prevention and treatment and implementing comprehensive treatment. In industry, it is essential to have rational distribution and to implement the principle of "three simultaneous efforts" in construction.

(D) Carry out technical and economic policies that benefit environmental protection, unify environmental benefits with economic and social benefits, and depend on adopting related new techniques to resolve environmental problems in the future. For example, not only can genetic engineering techniques enable grain and cereal crops to attain nitrogen fixation through rhizospheric bacteria and the crops themselves, accordingly there are indications abroad that corn can be turned from an annual into a perennial. If this is successful and popularized, it will have a major, real significance in developing agriculture, economizing energy resources and raw materials, preserving the soil and safeguarding the ecological environment.

(E) We must carry out the guiding principle of comprehensive utilization of resources. Not only must we develop them rationally but also to use them rationally and use the discharge from production and everyday life as

resources, recover them for use, repeatedly use them, turn what is harmful into something beneficial and turn waste into something valuable.

(F) We must strengthen environmental management and carry out the system of environmental responsibility. Whoever pollutes, jeopardizes or damages the environment will be responsible for cleaning up the pollution and compensating for the loss, and such payments will be used as a major source of environmental funds.

9586

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## PRIMARY TASKS OF ENVIRONMENTAL PROTECTION EXAMINED

Guangzhou HUANJING [ENVIRONMENT] in Chinese No 1, 1984 pp 2-5

[Article by Hou Jianqiu [0186 0494 4428], Chairman of the Board of Directors, Guangdong Provincial Association for Environment: "Problems That Need To Be Addressed in Environmental Protection"]

[Text] For the past 10 years a great deal of work has been done and good results have been achieved in environmental protection in Guangdong Province, just as in the whole country. These results are: In some places the pollution level has been brought down; in other places pollution has been controlled. However, due to reasons, such as the influence of ultra-"Left" thoughts, lack of understanding, etc., environmental protection has not been making quick progress, and there are still a lot of problems. For example, we have not been able to prevent effectively some new pollution sources, or control some old ones. Some toxic and hazardous substances accumulated for many years in some places are still causing harmful pollution, in some instances even have potential threat. The destruction of the natural environment is also accelerating. There is severe soil erosion. Ecology is in a state of imbalance; and disasters are frequent. To solve the present environment problems at an accelerated pace and change the situation in our environmental protection, which is unsuitable to our construction of the four modernizations, some problems in understanding need to be resolved.

Environmental protection and development of production.

Environmental protection is necessary for the development of production. If we go against natural laws, we pay a penalty. Environmental protection and development of production have a relationship of unity of opposites. The two of them are sometimes contradictory. However, the nature of their contradiction is neither of a change with one growing and the other declining, nor entirely a relationship of interaction or promoting each other. Some people say that only if we develop production can we protect the environment. Such a view can easily lead to the old capitalist road of production first, environmental protection later; pollution first, control later. I am in favor of the view that only environmental protection can develop production, because it is tenable both from the overall long-term and the immediate and partial points of view. Though sometimes production can make progress without consideration for the environment, such production cannot be lasting. To say the least, the outstanding debts of pollution have to be paid back, even paid back double. The relationship between

the environment and production is one of source and course, fish and water, mother and child. As the State Council's Document No 27 of 1981 pointed out, "the environment and natural resources are basic conditions for the existence of the people and material sources for developing production and economic prosperity." "Environmental protection is where the people's basic interest lies." Thus, at any place and any time, in the process of planning and production we must not forget the people's basic interest, and the environmental condition necessary for the people's existence.

Economic and technological backwardness and environmental protection.

Some people say that our country is poor, our science and technology are backward; environmental protection can be enforced only after economic prosperity and scientific and technological development are attained. My view is just the opposite. The poorer we are, the more successful we must be at protecting the environment. Actually, a large amount of the "three wastes" discharged by industry is a waste of resources and energy. This is what some scientists call "spending money to buy pollution." During the mid-1970's, each year 38,000 tons of various kinds of oil flowed away with effluent from the Maoming Oil Industrial Company. Later the company spent 3 million yuan on investment to transform three old pollution control facilities, and recovered most of the runaway oil. The oil concentration in waste water was cut 90 percent. This good work not only conserves resources but also reduces pollution, so why not go ahead with it! Good environmental protection is actually one way to wipe out "poverty." Furthermore, with the "three wastes" controlled, we can accelerate the development of science and technology. Naturally in controlling the "three wastes" we face a question as to what measures to take and how to gear the measures to local conditions. For example, in urban sewage treatment, some people only emphasize the use of oxidation ponds, soil treatment and sewage irrigation. They say that sewage treatment plants consume too much investment. However, it is impossible to rely on oxidation ponds, the conditions required and the existing drawbacks are difficult to overcome. Under the circumstances, I think we should choose advantageous plans by comparing the figures. Tianjin Municipality is building a sewage treatment plant with a 83,830,000 yuan investment which can treat 260,000 tons of sewage. Its annual operation cost will be 9 million yuan. At first glance, one might find the funds used tremendous, but if they set higher requirement for the quality of the treated water, it can be re-used in industry and agricultural irrigation; so even if the treatment cost per ton will reach as high as 0.3-0.4 yuan, it will still be much cheaper than the cost to divert water from the Luan He and Huang He. In Tianjin where water resources are in short supply, building of sewage treatment plants is indeed worthwhile. In terms of ways to treat the "three wastes," measures must be suited to local conditions. Comprehensive calculations have to be made, not only taking economic results, but also the environmental and social benefits into consideration.

Environmental management and pollution control.

Over-emphasizing the backwardness of our national economy, some people want to replace pollution control with strengthening environmental management, stating that it was wrong in the past to emphasize pollution control. They claim that good environmental management can solve most of the pollution caused by

enterprises. A recent survey conducted by Comrade Ling Xiaoyun [0407 7197 7189] of the Ministry of Light Industry, more than 100 light industrial enterprises in five trades have proven that 70-90 percent of the pollutants in light industry are usable resources, and only about 30 percent of them are due to mismanagement. Most of them are by-products that should be comprehensively utilized and re-sources that can be recovered. The survey indicates that strengthening environmental management can only solve a small part of the pollution problem, the large part must be solved by pollution control and comprehensive utilization. Also, environmental management does not mean no expenses. In order to put an end to those vapors, oozes and leaks, we must strengthen maintenance, and thus must spend on materials and labor. Such expenses cannot be spared. Saving small money may cause waste of big money. The Wuxi County Electrochemical Plant, in addition to upgrading its maintenance system, has replaced the pipeline at key sections and the spare parts of regular steel with stainless steel, and greatly reduced the maintenance workload. Its rear workshops can engage in more profitable production. This is the model of knowing how to spend small money to gain big profits. Furthermore, many technical transformation projects, such as renewal of equipment, technological innovations, technological reforms, application of new materials and products, etc., are all related to environmental protection. No matter whether they are considered as environmental management or pollution control, in a word, with certain funds spent, we can achieve various results, such as environmental protection, energy and resource conservation, increase of production output and quality, lowering cost, and improvement of working conditions, etc. Therefore, we can see that spending itself is not an offense. It is the question of whether or not we ought to. We should not totally oppose spending because we are poor. Naturally, with all sorts of facilities installed, we must strengthen our management. Otherwise, we cannot make the most of these facilities and they will become a waste. While management is important, control cannot be ignored either. Management is the prerequisite of control; control is the basis for management. One should not be emphasized at the expense of another.

The definition of the "three wastes" control and the steps to be taken.

Control of the industrial "three wastes" should be understood in a broad sense. It begins with strengthening enterprise management--technological management, business accounting, etc., continues with comprehensive recovery, comprehensive utilization, and ends with unharmed purification treatment. The first links in the waste control chain have less spending but more results. They should be dealt with forcefully. However, we must not consider the part of purification treatment just purely spending money, and stress the difficulties and neglect pollution control. We must combine all links in the pollution control chain, making overall calculations, transferring the profits gained from consumption reduction and comprehensive recovery to the latter part, the purification treatment. This way, the treatment cost can be partially or mostly made up. There may even be surplus after the offset, which will help accelerate the "three wastes" control. This is called "do the easier ones first, the difficult ones later; eat fat meat first, chew the bones later." In allocating funds for pollution control, we must have priorities set according to importance and urgency, and we must do it step by step. For more than 10 years the Shenyang Chemical Plant has invested 3 million or so yuan on pollution control. Each year it earns more

than 800,000 yuan profits, from which 500,000 yuan is retained each year as funds for environmental protection. Thus, it has a source of funds for some difficult pollution control projects. As some cities are considering building sewage treatment facilities, effluent from plants will not have to be treated until it entirely reaches the discharge standard. It can be discharged to the sewage treatment plants to be further disposed comprehensively. This is the last important step in the process of sewage disposal. However, we must continue to implement the principle of "whoever pollutes is responsible for treatment." Plants must pay for the treatment expenses based on quality and quantity, this can also prompt the enterprises to strengthen their waste control, such as in their business accounting, comprehensive utilization, and water conservation, etc. Pollution can be eliminated during the production process. The principle "whoever pollutes is responsible for treatment" and comprehensive control are not contradictory. We must not rashly abrogate anything because of comprehensive prevention and control.

#### Environmental Protection and Environmental Improvement

These two are related, but different concepts. As the two concepts are often mixed up, it has been argued that we must develop production first, only then can we protect our environment. The logic that developing production inevitably brings pollution and production should be allowed to destroy the environment is undoubtedly wrong. If production and pollution develop at a direct ratio, production itself will be rejected. Thus, while we develop production, we must also protect conscientiously our environment. In examining the feasibility of a large construction project, we must also assess its impact on the environment, investigating whether it is feasible, whether it will damage the environment, whether we can take measures to prevent pollution and damage. Environmental protection is the objective, not the means. Fresh air, clean water and non-toxic food undoubtedly are extremely important. It is correct to say that only developing production can improve the environment, because rudimentary surroundings cannot satisfy the people's wish for a happy life. However, a happier life must have an unpolluted environment as its basis. Environmental protection means guaranteeing that people have a "clean and safe" environment; environmental improvement requires the environment to reach the objective of "excellence and comfort."

#### Environmental Protection Cannot Be Ignored

Environmental protection is to protect the whole ecosystem. Protection of urban ecology and agricultural ecology cannot be separated from the whole ecosystem. Within the ecosystem, forest ecology is the principal part and is the key to maintain the ecological balance. Scientists believe that there is no soil erosion in mountain areas of virgin forest closings. When the canopy density is greater than 0.3, the forest solidifying capability can make the occurrence of today's accelerated soil erosion difficult. The solidifying capability of a closed forest can reach 38.8 tons per mu. If we take 0.4 yuan for each ton as the value for solidification by slope protection done by engineering methods, the value of forest solidification is 154 yuan per mu. Solidified soil can conserve water. Along with soil solidification, each mu of forest can conserve 404 tons of water, worth 142 yuan. These two functions of the



forest are much greater than its functions as timber (16.24 yuan per mu annually), as fuel (32.33 yuan per mu annually), as slash-and-burn cultivation and fertilizer (0.31 yuan per mu annually). Thus, we can see how great the forest's functions are. It can play roles that are difficult for various engineering projects to do. However, China's forest cover area is only 12.7 per cent. When we travel around the country, we rarely see green and luxuriant forests. Even in southern Guangdong Province that is richly endowed by nature, the forest resources are on the verge of exhaustion. How to afforest our barren hills is, therefore, a very important question. I believe that besides implementing the policy on forestry and the principle of active economy, with hill plots assigned to households and mobilizing the masses to afforestation, the state must invest to build forest farms in places with large barren hill areas that individuals and collective communal brigades cannot manage. The Yinzhanao Tree Farm of Guangdong, declared a national forest park, has received from the state a total of 3.2 million yuan of investment. After 20 years of management it has a 90,000 mu tree-covered area. In addition to the forest's overall functions, its timber alone is valued near 20 million yuan. Therefore, from a long-term point of view, it is an important strategic decision. No matter how poor we are and how difficult it is, we must live frugally and try and find some money for afforestation.

#### Environmental Protection Organizations and Their Functions

What are the responsibilities of an environmental protection department? There has been, for 10 years, endless debate on this. Actually, the answer was clearly provided long ago. The State Council's No 158 document of 1973 stipulates: "We must set up capable environmental protection organizations, giving them the responsibility of overseeing and inspection." Chapter 4 of "Environmental Protection Law" also concentrates on the environmental protection organizations and on their functions. At a conference in Nanjing, Minister Li Ximing [2621 6932 6900] outlined the main responsibilities of environmental management departments: organizing coordination and supervising investigation. Therefore, environmental protection departments are those that carry out overall management, and the way they work is to oversee and inspect, following the principle of "whoever pollutes is responsible for control." We should not centralize the two tasks of overseeing and controlling in the environmental protection departments. Successful control can be done only by asking units that discharge pollution to be responsible for treatment. Otherwise, they do their disposal, you do your control, "eating from the same big pot," and control will not be carried out. A traffic policeman is responsible for directing traffic, seeing to it that vehicles and pedestrians follow traffic rules. He criticizes and educates the offenders, even imposes penalties. Like traffic policemen, environmental protection departments bear the responsibility to supervise and investigate and to protect legally the interests of the state and the people. To serve the "four modernizations," we must protect our environment effectively, otherwise we cannot begin to talk about serving the four modernizations.

#### Environmental Protection Based on National Conditions

There is a lot of debate on this issue, but what actually is environmental protection based on national conditions has not yet been described. Since the 3d Plenum of the 11th Party Central Committee, production has been developing

in a fast and forceful way. If we do not emphasize control of the "three wastes" while developing production, as production quadruples, pollution will also quadruple, even doubling pollution will be disastrous. So what is the way out? The only way out is control. West Germany's population and area are about the same as Guangdong's. Its gross output value in 1981 was nearly 30 times more than Guangdong's gross industrial and agricultural output value; however, the quality of its environment is better than ours. The industrial area of the Ruhr has only 6-9 tons of dustfall each month on every square kilometer. Without forceful efforts, it would be impossible to have such a highly developed economy and good environment. Drawing on the experience of foreign countries and looking back on the road we have taken I believe that the way to protect the environment should be: "With overall planning, rational distribution, comprehensive utilization, and turning harm into good, we must rely on the masses, with everyone setting out to work, to protect the environment and benefit the people." "Industry and agriculture, urban and rural areas, production and living, economic development and environment protection are to advance together, and develop in a coordinated way." "The design, construction and operation of the "three wastes" control facilities must be carried out simultaneously with the principal part of new building projects, otherwise, construction will not be allowed." "Whoever pollutes is responsible for control." In addition, in the spirit of "self-reliance and arduous struggle" and with the measures to "strengthen management and promote control by management," we must firmly avoid the old capitalist road of polluting first and controlling later.

Materialists believe that it is impossible to do a thing, to complete a project without certain conditions, and without certain material basis. It is impossible to accomplish the "four modernizations" without environmental and resource protection, without preventing pollution by the industrial and domestic "three wastes," without rational distribution of industry and agriculture, or without maintaining the ecological balance. It is also impossible to protect the environment and prevent pollution damage without spending. This spending is a necessary derivative expenditure. I hope that everyone will unite on the principles of the directives and laws on environmental protection put forward by the party Central Committee and the State Council, and conscientiously study the directives of our leading comrades of the central authorities, such as "Give priority to pollution control expenses, or else there will be no end of trouble for the future"; "pay attention to environmental protection. Money has to be spent sooner or later, better sooner than later"; and the directive to set environmental protection as one of our strategic tasks, etc. We must have a correct understanding of the relationship between environmental protection and production development, make efforts to open up new prospects in environmental protection, and make due contribution to the promotion of the overall and stable continuing growth of our national economy.

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## IMPLEMENTATION OF ENVIRONMENTAL PROTECTION POLICY EXAMINED

Beijing ZHONGGUO HUANJING BAO in Chinese 22 May 84 p 2

[Article by Zhang Jingde [1728 2529 1795], He Shuchang [6320 2579 2490]:  
"Basic Policy of Environmental Protection Must be Seriously Enforced."]

[Text] After the Second National Conference on Environmental Protection, most provinces, cities and autonomous regions have successively convened environmental protection conferences to comply with the spirit of the national conference and go all out to bring about a breakthrough in environmental protection work.

### Strengthening Leadership; Improving Environmental Protection Organizations

Responsible comrades in all provinces, municipalities and autonomous regions take environmental protection work very seriously. Not only do they attend or address environmental protection conferences, but they also strengthen environmental protection leadership and organizations. Jiangsu Province has suggested that the governor be held responsible for environmental protection in the entire province; while mayors and county magistrates should be made accountable for environmental protection within their own jurisdictions. Every successive administration, including mayors and county magistrates, should contribute to the environmental quality of their area.

The overwhelming majority of provinces, municipalities and autonomous regions have set up environmental protection commissions and increased the staff of their environmental protection management organizations, research institutes and monitoring centers. Fujian Province has changed the Environmental Protection Office of the provincial Department of Urban and Rural Construction and Environmental Protection into the Bureau of Environmental Protection. In addition, it has identified 14 key coastal counties where monitoring stations will be built. Gansu Province has restored the provincial Bureau of Environmental Protection to its first-class position. Zhejiang Province has decided that all its nine municipalities should set up their own environmental protection bureaus. Qinghai Province has set up an environmental science research institute as well as a nature-reserve inspectorate.

Heilongjiang Province has set up an environmental protection commission. An Zhedung [1344 2182], chairman of the commission and vice governor, called and

presided over its first meeting on 9 April which approved the duties of the commission, the division of labor among its members and its meeting schedule. It also heard reports on the implementation of the spirit of the provincial environmental protection conference and assignments for this year. After due consideration, it asked the provincial government to promulgate the "Decisions Concerning the Strengthening of Environmental Protection Work."

#### Furthering Public Understanding of Environmental Protection Work

Environmental protection is one of China's basic state policies. Many leading provincial party committee members and government officials have suggested that the implementation or otherwise of this policy be upgraded to one which involves being consistent with the policies of the Party Central Committee. Li Ruihuan [2621 3843 3883], mayor of Tianjin, told the fifth municipal environmental protection conference, "We work hard from dawn to dusk, day after day. Why? Ultimately, to serve the people and fulfill our responsibilities to them. But think again. Suppose our hard work results in polluting the environment. We would then have created a long-term hazard, one which is more terrifying than the atomic bomb, as Premier Zhou Enlai had said, and which would jeopardize people's health. Should such a scenario come to pass, would we really have achieved our purpose?" He emphasized, "We must tackle environmental protection the way we diverted water from the Luan He To Tianjin, and build a more civilized, clean and modern city."

Li Chang'an [2621 2490 1344], a deputy secretary of the Shandong Provincial Chinese Communist Party Committee, has said, "Population, resources, the environment and the economy are all interrelated and interact with one another. That's why environmental protection must be considered a basic state policy. That's why we must clarify our strategic thinking to combine economic development with environmental protection."

Delegates to the Qinghai provincial environmental protection conference believed that although that province was not highly industrialized, pollution had become relatively serious. As a result, the importance of and necessity for environmental protection work must be understood in terms of its strategic value in the construction of a socialist civilization and material civilization. The Chang Jiang and Huang He, both world-famous rivers, rise in Qinghai Province. We must not pollute the source of a river.

Wang Rongzhen [3769 5554 6297], a vice chairman of the Guangxi Zhuang Autonomous Regional People's Government, said, "To open up a new phase in environmental protection in Guangxi, we must begin by thinking ecologically as well as economically. It is an one-sided approach which considers only production and construction while ignoring environmental protection. We must solve environmental pollution and ecological destruction in the process of economic construction, and integrate economic results with environmental and social ones."

## Short-term Measures and Long-term Planning

The Qinghai provincial environmental protection conference has decided that all cases of pollution in the province be investigated, and that 14 enterprises which have been serious polluters be reorganized and required to clear up their problems by a specific date.

Addressing the second Zhejiang provincial environmental protection conference, Vice Governor Wu Minda [2702 2404 6671], who is also a deputy secretary of the Zhejiang Provincial Chinese Communist Party Committee, put forward five proposals and emphasized that planning guidance for small-town enterprises must be strengthened. Zhejiang Province currently has 80,000 small-town enterprises, which make up a strong pillar of the rural economy. They must be actively supported and promoted in accordance with the spirit of Document No 1 issued by the central government this year. But we must also note that many small town enterprises right now have a serious pollution problem. We must urge existing enterprises to install treatment facilities as soon as possible, and provide proper planning guidance for new enterprises. We should give priority to industries which cause little or no pollution and which serve the production and living needs of the people in villages and small towns. Construction materials enterprises in these localities must adapt their operations to local conditions and refrain from indiscriminate extracting and mining. Nor should they destroy farmlands. Only by protecting the environment can we ensure a future for small-town enterprises.

In his address to the second Yunnan Provincial Environmental Protection Conference, Vice Governor Zhu Kui [2612 1145] stressed the principle of holding the polluter responsible for treatment and the developer responsible for protection. He believed this principle represented a feasible approach towards preserving a variety of natural resources.

Jiangsu Province has set up an environmental protection technological equipment company to unify the management of the entire province's environmental protection work in terms of planning and production. Jiangsu Province is the red-crowned crane's second home. To ensure its survival through the winter, its habitation and its reproduction, the provincial government has authorized the establishment of a nature preserve for rare animals around Yan City and along the coast. Moreover, a management office has been set up and workers assigned.

Shanxi Province has been setting goals for itself. By 1990, old industries which have caused serious pollution in the province will have been treated, while no new pollution would be allowed. Pollution in the rural environment will have been brought under control. An all-out effort will be made to bring about a basic improvement in the overall provincial environment by the end of the century, so that it will meet the basic criteria of cleanliness and beauty and will perpetuate itself, to the benefit of all.

12581  
CSO: 4008/345

## SERIOUS FUNDING FOR ENVIRONMENTAL PROTECTION URGED

Beijing ZHONGGUO HUANJING BAO in Chinese 29 May 84 p 1

[Editorial: "Allocate Funds for Environmental Protection Seriously"]

[Text] The State Council has allocated funds to finance the prevention and treatment of environmental pollution and other related work. This decision ensures that environmental protection work will be strengthened and that economic construction and environmental protection could proceed in tandem.

The effective control of environmental pollution and ecological destruction inevitably need certain funds and materials. The comrades in some units may pay lip service to environmental protection. Confronted with a real problem, however, they plead fiscal stringency and do nothing. What is at issue here is not only money, but also the question of whether or not environmental protection should be tackled even while we try to modernize. Should we take the approach of "pollute now, treat later?" Or should we insist that environmental protection and economic construction be coordinated? This is an important question involving our guiding ideology. In their industrialization, many economically advanced nations ignored environmental protection with the result that pollution ran rampant and became a public hazard and a glaring social problem. Only then were these countries forced to invest large sums of money in treatment. Even they now admit that they have learned a painful lesson from this "pollute now, treat later" approach. So have we. Many old enterprises lack pollution-control equipment. When they are expanding, rebuilding or introducing a new technology, many plants fail to consider environmental protection from the viewpoints of site selection, technological line, and technical planning, etc. When construction funds fall short, pollution-control facilities are got rid of right away. After the plant goes into operation and becomes a serious polluter, the people who operate it then have no choice but [to] take remedial measures, which is both expensive and time-consuming. Leading cadres in the central government have already pointed out, "Pollution treatment funds should be a priority. Otherwise, there will be no end of trouble in the future.... Since we have to spend this kind of money sooner or later, we better spend it now. The sooner pollution is treated, the less expensive it is. It is more economical to deal with the problem early, when the plant is being built, than to take remedial measures later. This truth has been borne out by numerous facts. China presently still faces many financial problems. Our construction funds are limited and our enterprises continue to be strapped for cash. It is certainly difficult to

go in for environmental treatment on a large scale. Nevertheless, we could and should devote part of our funds to environmental protection in a rational way.

Another perceptual problem hindering funding for environmental protection is the view that treatment for environmental pollution involves input but has no output, and does not improve economic results. This is a partial view. Improving economic results is one of the central objectives of China's present economic work. This objective is common to both economic construction and environmental protection work. Economic results should be integrated with environmental and social ones. In order to increase its economic results, an enterprise must develop production, which, in effect, is consistent with environmental protection. From the standpoint of increasing economic results, environmental pollution is a waste of material and energy resources. An important reason why the growth of economic results have been hindered is that such useful resources are discharged into the environment to no purpose and turned into pollutants. Many enterprises which have been progressive in environmental protection work managed to combine environmental pollution treatment with technological transformation and the conservation of water and energy. Instead of reducing their economic results, these enterprises have made very good returns on their investments. This achievement is possible under most circumstances. Moreover, we must take note of social economic results as well as economic results specific to an enterprise. We should allocate environmental protection funds by taking into account the overall situation and in a spirit of responsibility to the people.

The funding decisions of the State Council regarding environmental protection are completely in line with China's current realities. The problem now is to carry them out in earnest. In particular, planning departments and economic management departments at all levels must budget for environmental protection construction and equipment, and must include the costs of environmental protection construction, equipment and materials in budgeting their fixed assets when they consider a new project, or the expansion, rebuilding or technical transformation of an existing project. Enterprises and their responsible departments, which are charged with pollution treatment, must see to it that funds designated for replacing, altering and modernizing environmental-protection equipment are actually spent for such purposes. They should not tolerate small enterprises and small-town enterprises which pollute the environment as they please. Nor should they accept the misguided argument that while one may have money to build a plant, one may not have the money to treat pollution. Stringent requirements should be set to make sure that the environment is protected at the same time as the economy is rejuvenated, and that pollution is tackled even while factories are going up. Finance departments and environmental protection departments at all levels should be held responsible for supervision and management. They should let enterprises keep enough funds to protect the environment. They should also subsidize the latter for that purpose if circumstances justify. They should collect all effluent discharge fees due. They should ensure that the various funds earmarked for environmental protection are actually spent, and in a worthwhile way, in order to boost economic, social and environmental results.

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## INCREASING FUNDS FOR ENVIRONMENTAL PROTECTION URGED

Beijing ZHONGGUO HUANJING BAO in Chinese 24 Apr 84 pp 1, 2

[Article by the Department of Industry, Transportation and Finance of the Ministry of Finance: "Financial Departments Must Actively Support Environmental Protection Work"]

[Text] The prevention of pollution and the protection of the environment not only concerns human existence, human health and the well-being of later generations, it is also directly related to the future of the four modernizations. At the Second National Environmental Protection Conference held not long ago, the party and state listed environmental protection as a basic national policy and mobilized the party and the people to emphasize it.

At present, our environmental protection work has many shortfalls. Pollution by the "three wastes" is serious. To protect the environment successfully, we must mainly rely on policy, scientific management, propaganda and education and mobilizing forces on all sides. But we must have the necessary capital to carry it out well. China is a developing socialist nation. Carrying out environmental protection work must proceed from our actual conditions. At present, our economy is backward, with temporary financial difficulties. Key energy and transportation projects must be carried out, science, culture and education must be developed, the people's livelihood must be gradually improved, and capital is needed in all sectors. The state cannot provide that much money at once for use in environmental protection. Under this situation, act according to our abilities, use less money to do more, actively support the treatment of the "three wastes" in actual public finance and financial affairs, and strengthen environmental protection.

Our public finance and financial affairs departments at each level must follow the spirit of the instructions of the Central Committee and related state regulations to strengthen environmental protection work, find channels of capital for environmental protection, develop resources and economize, and actively do the work well by taking the initiative.

1. The public finance departments at each level must join with the State Planning Commission and the State Economic Commission to conscientiously review new construction projects, expansion projects and rebuilding projects. Each unit must submit environmental impact statements before construction. Facilities to prevent pollution and other public hazards must be simultaneously



designed, constructed and put into operation with the main project. The "three simultaneous efforts" must be strictly implemented. The discharges of hazardous substances must comply with standards stipulated by the state. The capital needed to treat pollution and protect the environment must be conscientiously included in investment plans for fixed assets so that capital, materials and equipment can all be guaranteed. This is a fundamental measure to control new polluting sources and a key link that must be emphasized. Only in this way can new pollution be effectively stopped. Otherwise, after we have controlled old pollution this year, new pollution will occur next year, and this will surely create a vicious cycle of environmental pollution. This not only will hinder economic construction, it will harm human health. In this regard, the public finance and financial affairs departments at each level must coordinate with concerned departments to do the work well so that the capital, materials, equipment and construction forces needed in environmental protection can be implemented. We must urge concerned departments and units to honestly use the capital provided by the state for environmental protection in treating environmental pollution, and fully use this fund. For example, the Environmental Protection Department and the Public Finance Department of Jingzhou City set up a construction bank to popularize centralized heating and large area heating. In 1979, they began ordering newly built residences and office buildings to provide centralized heating and large area heating. The construction bank would not provide funds to those projects that did not provide centralized heating and large area heating. During the implementation of this policy, it did not accept bribes and did not make private deals. It vigorously promoted the development of centralized heating and large area heating in Jinzhou City. For 4 years, the city built 63 residential and office buildings on 375,000 square meters and 40 boiler rooms less than previously. This not only saved the state an investment of 2.4 million yuan, but also saved expenses for land, fuel and materials, and reduced pollution by smoke and dust, and the noise level of blowers.

2. The public finance departments at each level must coordinate with the State Economic Commission and the supervisory departments to closely combine efforts with the technical transformation of enterprises, and implement measures to prevent pollution. It is a way to combine the simultaneous implementation of treating pollution of old enterprises and technical transformation of old enterprises with less investment and great results. Six 8-ton rotary furnaces of the No 1 Plant of the Shanghai Steel Works originally had a capacity of 480,000 tons, beginning in 1982, more than 40 million yuan were used for technical transformation. By the end of June 1983 they were converted to three 15-ton oxygen top blown rotary furnaces with capacity reaching 500,000 tons, and facilities for smoke and gas purification, coal gas retrieval and surplus heat utilization. They conserved 13,000 tons of coke, 6,780,000 kilowatt-hours of electricity, 28,000 tons of steel and iron, 30 million cubic meters of coal gas a year, and eliminated 6 yellow dragons. The profit that year was 12 million yuan. The Capital Iron and Steel Company and the Anshan Iron and Steel Company have realized outstanding results in this aspect. To encourage the enterprises to carry out anti-pollution measures well during technical transformation, we must find channels for funds. The state has clearly stipulated that a definite percentage of the funds for renewal and transformation controlled by the public finance system, economic commissions and supervisory departments, must be allocated each year for use in preventing and controlling environmental pollution. We must insist on thoroughly implementing this.

3. Public finance departments at each level must join environmental protection departments to manage and use subsidies for environmental protection well. The State Council has stipulated in its notice on levying fees for discharging pollutants that the funds collected be included in the budget as a subsidy for environmental protection. Of the funds collected, 80 percent must be returned to the enterprises for use in measures of comprehensive treatment of polluting sources and environmental pollution, 20 percent can be used to purchase monitoring equipment and instruments for environmental protection departments and to supplement a shortage in operating funds. The proper use of this fund will encourage enterprises to hasten the steps in treating pollution. The public finance and financial affairs departments at each level must join with concerned departments to urge enterprises to use new technology, new techniques, and new equipment to build up environmental protection so that the effort will be technically advanced and economically rational. We must urge enterprises to honestly use subsidies for environmental protection to treat polluting sources, for regional comprehensive control and for the purchase of monitoring instruments and equipment needed in environmental protection. Fushun City adopted a contract method to use discharge fees for established projects, established technology, established percentage quotas, established responsibility, and established dates of completion. There were awards and penalties. It prevented some enterprises from wanting only money but not treating pollution, or using this fund for other projects and delaying anti-pollution projects year after year, thus hindering discharge fees from developing their proper role. The measures carried out by Fushun City are worth promoting.

The public finance departments at each level must urge enterprises to honestly use the profits kept according to regulation for anti-pollution projects to treat the "three wastes" for the exact purpose of treating pollution and protecting the environment. To encourage the enterprises to actively treat the "three wastes" and develop comprehensive utilization, the ministry of finance and the former environmental protection leading group of the State Council have stipulated that the profits from all products produced for developing comprehensive utilization to treat the "three wastes" need not be submitted to the state for 5 years. Instead, the profits shall be kept by the enterprises to continue projects for environmental protection. Recently, the state reaffirmed this policy and pointed out clearly that after the enterprises implement the measure of changing taxation into profits, this regulation will not change, and it will be implemented continuously. This is an important measure to benefit the state and the people, prevent pollution, and protect the environment. The public finance departments at each level must urge enterprises to manage and use this fund well, guarantee that it will not be misused or be used for other projects under the guise of treating pollution, and prevent this fund from being misused.

4. Some comprehensive projects to prevent environmental pollution in large and medium sized cities can be carried out in combination with urban capital construction by using funds allocated from urban construction maintenance funds according to state regulations. For example, the reform of the urban energy structure and the treatment of sewage and hazardous waste must be actively supported so that the urban environment can be gradually improved.

In general, we must conscientiously implement the environmental protection policies stipulated by the state and treat the "three wastes," strengthen the channels of funds for environmental protection work, contribute efforts to prevent and control pollution, protect the environment, improve ecological conditions and stimulate the building of the four modernizations.

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CSO: 4008/385

## MAJOR REFORM IN ENVIRONMENTAL MANAGEMENT EXAMINED

Beijing ZHONGGUO HUANJING BAO in Chinese 22 May 84 p 1

[Editorial: "Major Reform in Environmental Management"]

[Text] The recent State Council decisions on environmental protection work have been taken on the basis of China's cumulative experience in this area. They have significant implications for the development of China's environmental protection work and the acceleration of socialist modernization and construction.

Environmental protection is a basic national policy in China's modernization. Although the nation's agricultural and industrial development has not yet reached an advanced state, environmental pollution is a serious problem, and much damage has been done to the natural ecology. Industrial pollution has spread from cities to small towns and villages. The ecological conditions of forests, grasslands, rivers, lakes and seas are getting worse by the day. If this situation is not turned around as soon as possible, not only will the people's health be jeopardized, but environmental resources and conditions essential to agricultural and industrial production would also be destroyed, which, in turn, would hinder the smooth progress of the "four modernizations."

As the causes of environmental problems lie in economic construction and social development, so must their solutions. Consequently, environmental protection depends, first and foremost, on strengthening environmental management, and harmonizing the relationship between economic development and environmental protection so that the two can move ahead together. To realize these improvements, we must reform the environmental management system and eliminate its current structural weaknesses in order that it may keep pace with economic and social developments. The State Council has set up an Environmental Protection Committee to provide leadership and coordinate environmental protection work nation-wide. At the same time, it has clearly demanded that the State Planning Commission, the State Economic Commission, the State Scientific and Technological Commission, the Ministry of Agriculture, Livestock and Fisheries, the State Oceanographic Bureau, the Ministry of Public Health, the Ministry of Economic and Trade Relations with Foreign Countries, the Ministry of Tourism, and other relevant departments and military units set up environmental management offices are to work out an integrated balance among economic planning, production and construction, and environmental protection; and properly manage the environ-

mental protection work pertaining to their department or system. Only in this way can we build up a management system based on cooperation and a division of labor.

Environmental management is a major government responsibility at all levels, and a highly integrated one at that. But no management is possible without an administrative organization and personnel. Governments at all levels should take practical measures to set up an environmental protection organization that could provide effective supervision and coordination to replace the present weaknesses in management. In making these organizational moves, the governments should comply with the spirit of the Party Central Committee, which has held that integrating, coordinating and supervising departments in economics and technology should not be undermined as a result of organizational reform.

Reform is a prerequisite for environmental management, while an organizational setup is the institutional guarantee for the proper execution of a job. In the final analysis, it is people who get things done. The decisions by the State Council to strengthen environmental management at all levels, including the setting up of environmental management organizations, and the construction of environmental monitoring stations and scientific research institutes, are based on the special needs of environmental protection and proceed from the circumstances facing the nation. China's level of economic development is not high. With only limited financial and material resources, it cannot afford to devote a large amount of funds to pollution treatment projects. As a result, we must fall back on tougher management and supervision to solve a large number of environmental problems. If only the leaders of all departments and localities really make environmental protection one of their priorities and include it in their agenda, thereby fulfilling their responsibility to the people; seriously carry out the State Council decisions; set up an environmental protection organization for their department or locality as soon as possible, or reform it to make it effective and rational, then environmental protection in China could shift into full gear from its present basis.

The State Council's decisions are a big boost to the environmental protection front. Environmental protection departments at all levels should take advantage of this situation and come to grips with the task in a practical way, so that they can play an effective role in supervision and guidance, be helpful to the government at the appropriate level, and work hard to turn a new page in environmental protection.

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CSO: 4008/345

LU JIAXI ADVOCATES ESTABLISHING NATIONAL ENVIRONMENTAL RESEARCH CENTER

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 1984 pp 7-9

[Article by Lu Jiaxi [1687 0857 6932]: "Environmental Protection and Improvement Must Rely on Scientific and Technological Progress"]

[Text] During China's economic construction, the environmental pollution and ecological destruction that already exists is likely to become more severe. It is only when we develop fully the superiority of the socialist system, rely on scientific and technological progress, earnestly absorb the bitter lessons of developed capitalist countries, and handle well the interrelationships between man and nature, and between economic growth and environmental protection during the harmonious development of society, economy, and science and technology that we will be able to avoid detours, prevent and eliminate environmental pollution and ecological destruction and build a beautiful living environment conforming to our national conditions.

Under the vigorous promotion and concern of the Party Central Committee and the State Council, our country's environmental protection science and technology and environmental protection work have shown relatively rapid development in recent years and have also attained better results.

In the early 1970s, environmental pollution in China attracted attention; but because of a lack of research on environmental problems, we could only propose striving for the target of fundamentally solving environmental pollution by the mid-1980s. Later, with the development of environmental research, we have learned more about the complexity of environmental science and technology and the difficulty of the task to control environmental pollution.

Environmental protection involves various aspects of the development of the national economy and society, such as the exploration and utilization of natural resources and energy, the protection and improvement of man's living environment and health, and raising the level of the national economy and technology. It also involves the correct handling of the mutual relationship between these complex factors and the historical background, present conditions and future changes of environmental quality.

Environmental scientific and technical work is the fundamental basis and means for understanding and solving environmental problems. Its scope is vast and

and its content complex, with a lot of natural laws to be understood and scientific fields to be explored. From the national environmental scientific research tasks in which we have participated and for which we are responsible, we have realized that it will be difficult to complete research work on important environmental problems if we rely only on a single discipline or department. Its completion will have to rely on strongly organized scientific research contingents having a strong comprehensive nature and on the alliance and cooperation of many disciplines and departments. In the past, good examples of significant scientific research projects completed through coordination and cooperation with sister units include the evaluation of environmental quality in the western suburbs of Beijing, the study on protecting the water sources of the Guanting reservoir, oil pollution in the Bo Hai and Yellow Sea, control of pollution in the Yaer Hu, research on the biological purification of pesticides, the chemical and geographical study of mercury pollution in the Ji Canal and environmental studies on the Beijing-Tianjin-Bo Hai area.

At present, environmental and ecological problems which are related to the exploration and utilization of energy and which have obvious practical significance are also an example requiring comprehensive study. In order to realize the "quadrupling" of national economic output, the main energy source needed is coal and we must burn high sulphur content coal. When such large quantities of oxides of sulphur, carbon and nitrogen (i.e.,  $SO_x$ ,  $CO_x$ ,  $NO_x$ ) enter the environment, they will lead to changes in air quality. The international problem of acid rain has also appeared in our country and the study of the mechanism of the formation of acid rain requires the study of such fields as atmospheric pollution chemistry, boundary surface chemistry and reaction kinetics. As for the movement and transportation of acid rain, we need the study of such fields as atmospheric physics and meteorology. All these are only part of the basic tasks in the study of acid rain. Many research studies deal with the impact of acid rain on the environment and ecosystem: acid rain can directly or indirectly affect forest growth and the output of agricultural crops, lead to the acidification of soil, lakes and rivers which affects the growth and development of various types of life on land and in water and accelerates corrosion of urban and rural buildings and historical artifacts thereby causing huge economic losses, and directly endangering human health. Such studies require the participation of workers in many branches of science such as geology, biology, chemistry and medicine. Our country has a vast territory, its natural regions and types of ecological environment are complex and there are big differences between regions. Even if the acidity and amount of acid rain are the same, the environmental and ecological impact on different areas may not be the same; sometimes the effects may be contrary. We should advocate the viewpoint of one dividing into two and seeking truth from facts, i.e., in certain areas and under certain conditions, sulphur in the rainfall may be beneficial to the growth of agricultural crops. But this should not be the basis for our not controlling  $SO_x$  and discharging it at will. This only points to the need to deal with the specific natural environment and organize to carry out in-depth study. The environmental problem of coal mining is also very prominent. Open coal mines usually leave behind a scene of devastation and rough wasteland. At present, there are regulations in foreign countries which stipulate that the environment of mining areas must be reconstructed, and this is to be done immediately every year and on every parcel of land,

not after the mining has been completed. Therefore, some of the mining areas are rebuilt into high yield forests, and others are turned into reservoirs or farmland. Such research work can attract the participation of workers from such disciplines as zoology, botany, soil, water conservancy and geology. Since our country is extremely low in the average per capita acreage of farmland, it is very important that we should fully use land resources.

Changes in the environment and ecosystem brought about during the exploration and utilization of energy and natural resources such as the denudation of forests, soil erosion, decline in soil fertility, sharp decreases in cultivable land, expansion of desertification, deterioration of grassland, and the study and solution of environmental ecological problems such as the near extinction of considerable number of living species, shortage of water resources and the increase in volume of sewage cannot be completed by any single department or system. Scientific research work should be socialized. We hope to strengthen trade and inter-departmental cooperation; not only do we have to organize the cooperation of various branches of natural sciences from the basic to application in exploration and popularization, we also have to use the cooperation between natural sciences, technical sciences and social sciences. Environmental problems are ecological problems; they are also social and economic problems and we must use the laws of ecology to mediate the relationship between human activities and social and economic development. The trend toward multi-departmental and multi-disciplinary cooperation in comprehensive studies reflects the highly comprehensive nature and subjective requirements of environmental protection scientific technology and environmental sciences. It also promotes the formation of environmental scientific and technical contingents and the evaluation of standards.

Environmental protection work permeates various departments in the national economy and is closely related to man's livelihood and health. To a certain degree, a good ecological environment reflects a country's level of development. We are a developing socialist country at the high tide of socialist construction. Therefore, we must strengthen environmental laws and environmental management, eliminate pollution and improve the environment while new enterprises are being constructed and old enterprises are being technically transformed. To a large extent, environmental pollution is also caused by the irrational exploration and utilization of natural resources and the rational exploration and comprehensive utilization of natural resources can prevent and reduce environmental pollution and ecological destruction. Practice in and outside our country proves that environmental protection and improvement can never be separated from scientific and technological progress. Broadly speaking, environmental science is a comprehensive subject. As in the case of environmental protection work, the development of environmental science and technology is the duty of the whole society and a responsibility which cannot be shunned by any department or area. The problem is that it should be carried out at different levels and fields so that there will be division of labor but also coordination. We cannot be like a swarm of bees, otherwise, we will waste manpower and material and will not obtain the true results of environmental protection.

In order to realize the strategy of "developing the economy and environmental protection simultaneously and achieving the unity of economic results, and



social and environmental benefits" as well as to thoroughly implement our country's general environmental protection policy of "overall planning and rational distribution, comprehensive utilization and turning harm into good, relying on the masses and everybody working together, environmental protection and benefitting the people." Based on the spirit of strengthening cooperation and leadership and adjusting the whole country's structure of environmental protection science and technology, we propose that a national environmental research center be established under the National Science and Technology Commission. The central leading group will be composed of personnel sent by concerned departments and establish a general administrative body with personnel appointed by various departments and committees and no additional staff. The jurisdictional relationship of research units of various departments participating in the center will remain the same. The responsibilities of the national environmental study center will be: to formulate, revise and implement plans for the development of national key environmental science and technology; to decide, coordinate and manage key scientific research topics and evaluate the results; to distribute and manage a national development fund for environmental protection science and technology; and to organize the training and movement of scientific and technical personnel and international scholarly exchanges. This idea has been proposed by specialists participating in the national planning for environmental protection science and technology and I fully agree.

I propose that we further clarify the division of labor between scientific research agencies under various systems to guarantee even better cooperation and relations so that the overall comprehensive ability can be raised to even higher levels. The national environmental protection system stresses the study of national and regional environmental protection policies, standards, laws, environmental quality and monitoring, and local environmental research institutes take care of individual areas. The system of the Chinese Academy of Sciences stresses the study of basic environmental and ecological theories and their application as well as new environmental protection technologies. The Academy of Social Sciences stresses the study of population and environment, resources and environment and environmental economics and environmental laws. Institutions of higher learning stress the study of application, engineering and exploration of new technologies as well as intellectual development. The various industrial ministries (bureaus) under the Party Central Committee stress the study of pollution prevention in their respective trade, comprehensive utilization, and technology as well as monitoring pollution sources and the study of industrial economy and environment. Other departments such as Public Health, Forestry, Water Conservancy, Meteorology, and Oceanography should also unite to develop their work and research. Henceforth, practice will make division of labor even better and more concrete.

I hope that the departments in charge of environmental protection work will devise ways to mobilize the enthusiasm of all departments and regions to support and help different types of environmental research units in other systems and organize a mighty force. We should focus on our country's environmental protection problems, pay attention to making in-depth planning, strengthen the division of labor, and with one mind, successfully protect our living environment for the benefit of future generations during our construction of socialist modernization.

## USE OF COMPUTERS TO STORE ENVIRONMENTAL INFORMATION URGED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 1984 pp 10-12

[Article by Wu Jin [0702 6930], Wu Jingxue [0702 2529 1331] and Yu Shendong [1342 2182 2639]: "The Establishment of an Environmental Document Archive and the On-line Retrieval of Environmental information in China"]

[Text] In the pursuit of environmental information, retrieval is a very important link. In the past, we mainly used manual checking of literature and cards, which was inefficient and time-consuming. In particular, we have not established an archive for Chinese environmental documents, causing difficulty for environmental scientific, technical and management personnel. In order to change this backward situation, with the cooperation and vigorous support of sister units such as the data transfer and the computer center, and the joint efforts of comrades in the inquiry section of the information office at the Environment Chemistry Institute, a Chinese environmental document archive has been finally set up and on-line retrieval service has also begun. This has won praise from its users and has greatly accelerated the exchange of information.

Computer information retrieval means to use a computer to print out, in accordance with the demands of scientific and technical personnel relevant items from several tens of thousands of abstracts, for use by scientific and technical personnel. At present, the Environment Chemistry Institute has five types of document archives. Their specific contents are as follows:

### I. Chinese Environmental Archive (CEA)

Chinese Environmental Archive is a mechanical retrieval archive using Chinese characters for processing. It collects articles related to the environment written in Chinese by our scientific and technical personnel and published in publications at various levels (domestic and international circulation, domestic circulation and internal). Its holding is divided into 21 categories and it has begun trial service for domestic users.

Briefly, the contents of the Chinese Environmental Archive include: 1. environmental policy and legislation; 2. environmental economics and management; 3. environmental quality assessment; 4. environmental monitoring; 5. environmental simulation and model; 6. environmental pollutants; 7. environmental chemistry; 8. environmental chemical analysis; 9. biology and physiology;

10. ecology; 11. environmental medicine; 12. environmental problems of oceans, lakes, river beds and water bodies; 13. urban and suburban environmental problems; 14. environmental problems of communication and transportation; 15. energy problems; 16. industrial environmental problems; 17. technology for treating industrial pollution; 18. botany and agriculture; 19. environmental problems of forestry, animal husbandry and fishery; 20. atmospheric physics, meteorology and weather; 21. computer and numerical value computation; 22. other.

## II. Pollution Abstracts (PA)

The contents of pollution abstracts include:

1. Fresh water pollution: including the study of pollution at specific and general sources, supply of water for cities, biological impact of pollutants on fresh water living organisms, monitoring and chemical analysis of pollution in water bodies and sediment.
2. Marine pollution: this mainly involves the impact of oil spills, coastal waste, industrial and urban discharges and heat discharge in the marine environment.
3. Toxicology and human health: focus mainly on the toxicology of such environmental pollutants as pesticides, heavy metals, industrial and agricultural chemicals and their influence on humans, animals and plants; also includes public and industrial health and the handling and transportation of toxic materials.
4. Sludge and effluent treatment: methods to treat industrial waste, urban sewage and sludge and effluent chemistry.
5. Noises: research on industrial, construction, transportation and urban noises; standards and control as well as monitoring methods and equipment.
6. Air pollution: including the monitoring and analysis of air pollutants, methods to control air pollution, equipment emission standards and dispersion models of pollutants.
7. Land pollution: mainly the accumulation, stability and biological settling of pollutants in the soil environment, especially the impact of pesticides, insecticides, sludge and air pollutants on soil, plants and animals; also the impact of mining, irrigation and soil erosion.
8. Waste management: the treatment of industrial and urban waste and toxic chemicals; recycling of waste and recovery of energy.
9. Radioactive pollution: Mainly the study of radioactive effects of nuclear engineering and the transportation, handling, and report of the incidents involving nuclear waste; nuclear medicine and the monitoring and methods to control radioactivity.

10. Environmental regulations: including social, legal, governmental environmental policies and regulations; international agreements; review of environmental impact, research plans and environmental education.

Pollution abstracts were first published by the American Environmental Protection Agency (EPA) in 1970. Each year, it collects 6,000-7,500 abstracts based on more than 300 kinds of journals. The Environmental Chemistry Institute began to introduce abstracts magnetic tapes in 1979.

### III. Environmental Abstracts (EA)

The scope of disciplines covered by environmental abstracts is basically the same as pollution abstracts, although environmental abstracts place more emphasis on the impact of environmental problems on society such as environmental theories, policies, legislation and management. Also, it includes urban planning, environmental regulations, population problems, environmental ethics, nature protection, food contamination and patents.

These are especially suitable for units and technical personnel involved in the study of such problems as environmental management and environmental information.

About 10,000 environmental abstracts are collected every year.

The Environmental Chemistry Institute began to introduce environmental abstracts magnetic tapes in 1981.

### IV. Energy Information Abstracts (EIA)

The abstracts deal with problems such as energy economics, energy sources and storage, solar energy, electricity production and its transformation, transportation and storage; nuclear energy and thermal nuclear energy and their fuel processing, transportation, consumption and protection; new energy sources, energy policy and planning.

Seven thousand abstracts are collected every year.

The Environmental Chemistry Institute began to introduce energy information abstracts magnetic tapes in 1982.

### V. International Environmental Information Sources Inquiry System (INFOTERRA).

#### 1. International Environmental Information Sources Inquiry System (INFOTERRA).

INFOTERRA which is subordinate to the UN Environmental Planning Bureau was founded in 1975. Up to now, it has registered more than 10,000 environmental information sources from all over the world and our country has registered nearly 200 items. INFOTERRA publishes "Survey of International Environmental Information Sources" every year.

We began a computer retrieval service for users in July 1981.

One of the functions of INFOTERRA is to discover domestic and international counterpart units so that direct communication can be facilitated.

## 2. Scope of INFOTERRA's Information Sources Exchange.

The scope of INFOTERRA's information source exchange is extremely wide and includes almost everything. In general, it can be divided into 26 categories.

1) Atmosphere and weather; 2) ocean and bay; 3) fresh water; 4) supply and use of energy; 5) soil utilization and misuse; 6) food and agriculture; 7) manufactured chemicals and biological preparations and their processing; 8) physical energy phenomena (noises, agitation and radioactivity); 9) toxic substances; 10) renewable and non-renewable resources; 11) human health and welfare; 12) population, residential zones and living conditions; 13) recreation and leisure; 14) technology and industry; 15) transportation; 16) management and planning; 17) socio-economic results; 18) education, training and information; 19) laws and policy; 20) key terminology in a subject; 21) pollution; 22) disasters; 23) monitoring and evaluation; 24) wild animals and plants; 25) protection of nature; 26) effluent.

We have recently purchased "Toxicity and Toxicology Abstracts" and it will be available shortly.

The use of computers for retrieval is basically a result of the tremendous increase in the quantity of information and material. This method not only accelerates the speed of retrieval but also raises the utilization possibility and effectiveness of the potential messages in the archives, i.e., it can make a pile of dead material come alive and enable it to "talk" with man. We can ask the archives all kinds of questions and in using certain documents, we can be completely free from the concepts of the subject's terminology to carry out retrieval.

## The Future of Our Scientific Information Research Work.

At present, our country is diligently constructing the four modernizations. Industrial and agricultural production, and communication and transportation will progress rapidly and on a large scale. Naturally, the impact on the environment will correspondingly increase sharply. In order to develop modernized production, prevent pollution and strengthen research on environmental science and environmental protection work, the realization of the modernization of environmental scientific and technical information work is an urgent task.

In foreign countries, the research and development of new methods for environmental scientific information work and the advance of new technology are rapid. In particular, since the widespread use of computers in the 1960's, the pace of modernization of environmental scientific information work has accelerated. As of today, it has developed to the point of the creation of scientific information network technology which combines the three aspects of environmental scientific information work--computers--modern information communication technology. Its modern standards can be summed up in three parts: 1) The computerization of environmental scientific information work; 2) the compression of the storage of environmental scientific information data; 3) creation of a transmission network for environmental scientific information.

In short, the modernization of environmental scientific and technical information work is to set up entirely new technology and scientific management method for information work through the integration of computer technology, modern communication technology and optical space-saving technology.

Now, to explain in detail these three parts as follows:

1. The computerization of environmental scientific information work.

At present, the realization of the modernization of information work in other countries is due mainly to the appearance of computers, especially as a result of on-line retrieval. In this regard, our environmental scientific information retrieval work has only just begun. In order to rapidly surpass advanced international levels, we should, based on our current work in environmental information systems, quickly set up the national environmental science archives and scientific data bank to publicly serve the many environmental scientific workers.

2. The compression of the storage of environmental scientific information data.

The increase in the volume of publication of environmental scientific information books and materials has created shortages in library space, paper used in publications, and managerial work has become daily more difficult. Even with computer retrieval, we can only get second-hand documents, i.e., article abstracts and cannot get to the originals. Therefore, space-saving technology has been widely used. At present, some periodicals in the world, besides publishing regular printed copies, also manufacture reduced versions for circulation. Colored data has been compressed and published and people are now intensifying research work to improve the compression of materials. Some people have even predicted that the compression of materials will gradually replace printed materials by the year 2000; even if both coexist, there will be a greater reliance on products that are reduced. Current research in laser storage will bring an even brighter future for space-saving technology. In China, work on data reduction began early, but it was not widespread and was confined to large and mid-size cities. We are even more backward in the work to reduce environmental scientific information data; it has not yet received the attention from those concerned.

3. A transmission network for environmental scientific information.

In recent years, the prominent feature of the modernization of environmental scientific information work is the integration of computer technology and communication technology, forming a computerized information retrieval network. Through different kinds of network, terminals at different locations and distances, once they are connected to the network, can rapidly use the information stored in any one of the computers in the network and the different services it provides. This greatly facilitates and expands the use of different information sources by the user, achieving the sharing of resources. Correspondingly, the increase in the computer's capacity for information storage and the elevation of the computer's utilization efficiency will not only accelerate the speed of information transmission but also, as a whole, greatly save investment.

At present, there are several computer transmission networks in the world. Most of them are in the United States with some in Western Europe and Japan. Those on a large scale involve the largest continents on earth and through satellite microwave transmission and underwater cables connect the whole world. As for this kind of work in environmental scientific information research, our country is a blank. It should attract the attention of a large number of environmental protection workers.

In sum, if we can be good at humbly absorbing the advanced experiences of foreign scientific modernization and at the same time seriously sum up our own experiences and lessons in environmental scientific information work, we believe that in the process of rapidly marching toward the four modernizations, our environmental science and technology will progress with leaps and bounds in the direction of rapidly surpassing advanced international levels. Our environmental scientific information work will also leap with giant steps towards automation and modernization, i.e., computerization, space-saving technology, and network building.

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ROLE OF ENVIRONMENTAL STANDARDS IN ENVIRONMENTAL PROTECTION WORK EMPHASIZED

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in  
Chinese No 3, 1983 pp 19-20

[Article by Guo Shiqin [6753 1102 0530] and Duan Wude [3008 2976 1795]:  
"Fully Develop the Role of Environmental Standards in Environmental Protection  
Work"]

[Text] Everyone knows that, in the process of industrial development and protecting the environment, the advanced capitalist countries have in the main followed tortuous paths. We are a developing socialist country and should seriously sum up the positive and negative experiences and lessons of other countries, bring into play the superiority of the socialist system, pay full attention to environmental protection and pollution prevention diligently developing production, and walk the road of putting prevention first. The 12th Party Congress established the glorious goal of quadrupling gross annual industrial and agricultural output value by the end of the century, and the rapid expansion of industrial and agricultural production in the next 20 years will bring a series of environmental problems. In order effectively to protect the environment, the state must adopt important policy measures, adjust proportional relationships in national economic planning and vigorously prevent the national ecology from deteriorating. Yet it is also very important that we should establish sound environmental laws, regulations and standards to prevent new environmental pollution and to promote pollution control. Here we shall discuss mainly the role of environmental standards in environmental protection work.

At present, the environmental standards which already exist in our country can generally be divided into three categories. The first consists of environmental quality standards, which seek to protect human health and to provide good living and production conditions and which set maximum permissible levels for various pollutants in the environment. The second category consists of discharge standards, which establish the maximum allowable pollutant volumes or concentrations that can be discharged from sources of pollution so that environmental quality standards can be met. The third category includes health- or technological-design standards, which set the design requirements for production equipment and purification and treatment facilities so that the discharge and environmental quality standards can be met. Obviously, environmental standards are important means by which to check



pollutant discharge effectively and to promote pollution control by the sources thereof. Such standards also provide an important basis for the study and appraisal of environmental quality and the evaluation of industrial treatment and other related facilities. Therefore, environmental standards are an important method of effectively protecting the environment, controlling pollution and carrying out environmental management.

In recent years, people have realized that economic development and its accompanying environmental problems represent a pair of contradictions. It is inevitable that human activities should cause a certain degree of change in the environment, and the greater the scale of man's material production, the more serious environmental problems will become. While desiring the growth in production, we cannot, at the same time, avoid causing changes in the environment; nor can we think that, in order to protect the environment, we should consciously slow down economic development. But we can never tolerate sacrificing the environment in order to expand the economy. Practices within and outside our country have proved that production growth and technological advances will cause environmental problems but that, at the same time, these bothersome environmental problems must also be solved through the production growth and technological advances. We can only use this developmental viewpoint to examine the problem. From this perspective, economic development and environmental problems are opposites but also form a unity. We must both rapidly carry out economic development and protect the environment. As someone has suggested, industrial and agricultural production should be raised and the pollution from the "three wastes," lowered. This is one of the first problems we confront in implementing the four modernizations. At the very least, there are two things which must be done to solve this problem. The first is that the state must adopt important policy measures in national economic planning and first handle well the relationship between economic growth and environmental protection so that the country's economic development will follow natural ecological laws. This includes things that any one department, including environmental protection agencies, cannot do individually and that require close coordination among the various departments. Second, we must establish sound environmental laws, strengthen control and use various means to check environmental pollution and damage that might be engendered through industrial and agricultural development. This is our objective in studying and formulating environmental standards.

There are a few questions that warrant attention as we study and formulate new environmental standards and enforce existing standards.

1. The leniency or severity of the standards and the technological and economic feasibility thereof. There are two opinions regarding the leniency and severity of environmental standards. The first, which proceeds from the objectives of protecting human health and preventing environmental pollution, advocates making standards more severe. The other opinion, which takes into consideration technological conditions and the economic costs of adding facilities for the purification and treatment of pollutants, favors more lenient standards. If these two opinions are to be unified, we must first resolve two problems of understanding. The first is to resolve the contradiction between long-term and short-term benefits and partial and total interests and to correctly understand "benefit" and "drawbacks." The second is to

consider both the necessity and the technological and economic feasibility of environmental protection, to weigh the relative importance of and reduce the divergence between "benefits" and "drawbacks" and to determine a critical point where the least economic cost will bring the greatest environmental results.

2. The study and formulation of environmental standards should be closely integrated with our country's conditions. Our country's territory is vast and conditions are complex. There are great regional differences in weather, geography, hydrology and living organisms, and environmental self-purification capabilities and capacities vary. Moreover, the levels and density of industrial and agricultural development are uneven, with agriculture, forestry, animal husbandry and forestry receiving different emphases. Based on these concrete conditions, localities should formulate environmental standards that are suited to local characteristics; if leniency is appropriate, then standards should be lenient; if strictness is appropriate, then standards should be strict. This approach will both facilitate enforcement of the standards and conform to economic rationality. In the past, there were cases where one standard was applied universally without paying attention to local differences or even where foreign standards were rigidly copied. Such standards are inappropriate to our country's conditions, cannot satisfy our needs, develop many difficulties in implementation and cannot play their proper role.

3. We have to pay attention to conditions relating to the enforcement of environmental standards and strengthen management of and revision work for these standards. The study and formulation of standards is an important task, but completion thereof does not mean that all our work is done. The standards have to be continuously tested in practice, and when problems are discovered, we must promptly revise the standards, supplement certain items or correct target indices. Only thus can we enable the standards to play their role well. Therefore, the revision of standards is as important as their study and formulation. Furthermore, to ensure enforcement, we must formulate detailed regulations governing the implementation of the standards; clarifying the responsibilities and authority of the polluting, polluted monitoring departments; and establishing concrete methods of relating to the collection of fees, rewards and fines, inspection and monitoring. At present, our country's environmental standards are not sound, and inadequate attention has been given to the actual implementation and the work of revising existing standards. This situation should be changed quickly.

4. We must correctly carry out the system of collecting fees for the pollutant discharge. Our country's Environmental Protection Law clearly stipulates: "A fee shall be levied, based on volume and concentration and in accordance with regulation, on pollutants whose discharge exceeds the standards set by the state." The collection of fees for excess pollutant discharge is designed to eliminate pollution and protect the environment and provides a powerful economic method by which to compel enterprises to control the "three wastes." Payment of these fees should be recorded as product costs and linked to enterprises' profits and the benefits of workers and staff. Otherwise, once the fees are collected, the misconception that it is

legal for enterprises to discharge pollutants will arise. Practice has proved that we must correctly implement the system of collecting fees for pollutant discharge in order to reverse the passive attitude of some industries that are insensitive to the control of the "three wastes" and to put an end to the unreasonable situation in which those enterprises that actively control the "three wastes" suffer financial losses while those that do not, make out like bandits. At present, there is great resistance to this system, and the problem is a two-sided one. The first aspect concerns fee levels, and the second is that some people confuse the fees with fines, thus creating resentment. Fee levels should be based on the state's relevant regulations as well as local characteristics. The levels both should not be too high and should enable the fees to play their proper role. Generally speaking, the fee standards should not be lower than the normal operating costs for treatment and purification facilities, the fees for pollutants that exceed discharge standards and threaten most local environments should be set higher, and progressive surcharges should be imposed on enterprises that for years exceed discharge standards and fail to institute pollution control. The collection of fees for pollutant discharge should be distinguished from fines. The former is the general regulation for exceeding discharge standards, and any enterprise that exceeds these standards must pay a fee. Fines are economic sanctions and punishment for units that violate environmental protection laws, rules and regulations, which pollute and damage the environment and threaten people's health. Fees and fines differ in nature and should be strictly distinguished in implementation.

Environmental protection is a long-term strategic task and forms one of the basic tasks in our country's four modernizations. Environmental protection standards provide a powerful means by which to protect the environment and control pollution. Every comrade should actively publicize the meaning, nature and content of environmental laws, rules and standards and make his own contribution to the creation of a beautiful and comfortable living and productive environment.

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LEGAL METHODS OF DEALING WITH ENVIRONMENTAL CRIMES DISCUSSED

Beijing ZHONGGUO HUANJING KEXUE [ENVIRONMENTAL SCIENCES IN CHINA] in Chinese  
No 4 21 Aug 83 pp 71-76

[Article by Jin Ruilin [6855 3843 2651] and Cheng Zhengkang [4453 2973 1660]  
of the Department of Law, Beijing University: "An Analysis of Crimes Relating  
to Environmental Damage"]

[Text] In the drafting of various environmental protection laws in recent years, the implementation of the provisions of Article 32, Section 2 of the (Trial) Environmental Protection Law of the People's Republic of China" (abbreviated as "Environmental Protection Law" below), namely the question of how to determine the criminal responsibility of those who seriously pollute and damage the environment, has become a focus of debate, and opinions thereon diverge widely. Some comrades believe that, in view of the extreme seriousness of environmental pollution and damage in our country, if strict legal measures are not adopted, this pollution and damage will be difficult to control. For this reason, these cadres argue, we must add environmental crimes to our criminal laws, and until these laws are formally revised and the revised regulations are clearly defined, provisions for criminal punishment should be incorporated into existing, separate environmental protection regulations, so that these regulations may be strictly enforced in order to effectively crack down on criminal environmental activities. Other comrades believe that "in order to avoid confusion, special provisions for criminal punishment should not be established in separate regulations which lie outside of the criminal code." And these comrades contend that "in China's legislation, there is no precedent for establishing special provisions for criminal punishment in separate regulations." In these debates, the latter opinion has usually prevailed. Thus the various individual environmental regulations merely copy the wording employed in the Environmental Protection Law, which reads, offenders' "criminal responsibility will be determined according to the law." This type of general statement is not conducive to enforcement of the Environmental Protection Law and separate regulations, does not facilitate crackdowns on criminals who seriously pollute and damage the environment and thus cannot uphold the proper sanctity of the law and undermines the prestige of the socialist legal system. Currently, individual environmental protection regulations are being drafted in our country, and preparations are being made to revise the Environmental Protection Law. And at the Third National Criminal Trial Work Conference, criminal-law comrades proposed all sorts of excellent

recommendations on how to improve and supplement China's criminal legislation. Thus we must provide clear, theoretical answers to the following questions. Should the environment be given legal protection? Is there a need to protect the environment through criminal law? Does the crime of damaging the environment exist? What is the definition of such a crime? What constitutes such a crime? What is the appropriate punishment therefor? Do provisions exist in our country's criminal laws that could be applied to environmental crimes? Is there a need to improve our criminal legislation system as it relates to environmental crimes? What system should be adopted? What questions should we pay attention to in establishing criminal legislation relating to environmental crimes? And the like. Resolution of these problems will contribute to the development of China's criminal law, making it more comprehensive and systematic, and to the development of our country's young environmental law, facilitating the establishment of strict and enforceable environmental protection regulations that meet objective realities so that our environmental protection work will enter a new stage in legal development. This article will present some viewpoints on the above questions.

#### I. The Environment Has Already Been Accorded Protection by the Laws of Our Country but Requires Protection Through Criminal Law

People have long come to believe that the essential elements of the natural environment are inexhaustible and do not belong to anybody and therefore that the principle of occupancy--the prepossession of things that belong to nobody, a concept which in civil law is applicable to (monetarily) valuable property--is also appropriate for such environmental elements. According to this reasoning, occupants can use environmental elements freely and without compensation (except when strictly in violation of civil regulations, in which case the occupant should be held liable). This concept and this principle have been calamitous for the natural environment. During industrialization, the capitalist pursuit of excessive profits has caused especially severe pollution and damage to the environment, which has nurtured mankind and provided mankind with unlimited benefits. The broad masses have carried out a mammoth struggle against this behavior, which passes pollution onto them. During this struggle, new legal theories have been presented, namely, those of "public property" and "public trust," according to which, the essential elements of the natural environment, such as air, water, sunlight, and scenery, as well as the environmental elements created by man, such as roads, shipping channels and residential areas--all of which are things man cannot live without--are not "unowned property" which individuals can occupy but public property belonging to the entire citizenry. The state is entrusted by the entire people with the authority to manage the environment, a legal relationship like that which obtains between a trustee and a trustor. The trustee is obligated to preserve the property entrusted to him by the trustor, and damage to said property constitutes a violation of the right of the trustor. Without the agreement of the trustor (the people), the trustee (the state) cannot arbitrarily take action on said property (the environment). Otherwise, the trustor may take legal action against the trustee for abuse of the trustor's position and for failure to fulfill the obligations of the trustee. At the same time, trespass upon common property is an offense against all common proprietors thereof,

and anyone of these proprietors may represent the entire proprietorship and file suit against the trespasser. From these concepts has evolved the theory of the "environmental rights," which means that citizens are entitled to live in clean and suitable environments. The people of many countries have engaged in long struggles to gain these rights, which were formally recognized in the declaration passed by the Human Environment Conference in Stockholm in 1972. Since then, many countries have also provided for environmental rights in their constitutions or amendments thereto, making such rights basic rights, like those to liberty, the pursuit of happiness and property. In the world today, the environment has won legal protection in every country.

Our country's 1954 constitution specified that those important environmental elements having economic and cultural values, including natural resources, cultural relics and historical sites, are to be owned by the entire people. This denies the unowned concept for some environmental elements and thus also denies the applicability of the "principle of occupancy." In the 1978 constitution, our country formally declared for the first time that the environment is to be protected by law. Article 11 of that constitution states that the state shall protect the environment and natural resources and prevent and eliminate pollution and other hazards to the public. The new constitution published in 1982 further stipulates that mineral reserves, water, forests, mountains, grasslands and other natural resources are all to be owned by the state, namely, by the whole people. The state shall ensure rational utilization of natural resources and protect precious animals and plants. And usurpation or destruction of natural resources by any organization or individual using any means is prohibited. In this manner, although our constitution does not clearly provide for environmental rights, it has made the protection of the environment and natural resources and the prevention and elimination of pollution and other public hazards important functions of the state. Thus the law of our country has extended protection to the environment, which includes natural resources and other important elements (such as air, water, sunlight, natural scenery, etc.) that are not monetarily valuable. All serious, wrongful acts of polluting, destroying and damaging the environment constitute violations of the law and should receive appropriate legal sanction.

As required by the constitution, our country formally promulgated the Environmental Protection Law in 1979. This law concretely defines the legal concept of the environment and clearly states that the atmosphere, water, land, mineral resources, forests, grasslands, wildlife, historic sites, scenic sightseeing areas, hot springs, convalescent areas, natural preserves and residential areas are important environmental elements that are subject to protection by the law.

Since the environment has come under the protection of our country's laws, the state, which represents the entire people in managing and protecting the environment, has the authority to adopt the measures necessary, including legal (such as administrative law, civil law and criminal law), to the performance of that function. Our country's experience has proven that reliance on persuasive education alone, without adoption of the necessary legal measures, including punishment, is insufficient to protect the environment and natural

resources. The problems we encountered in implementing the Forestry Law and the Aquatic Resources Propagation and Protection Regulations are proof of this. Among the various legal measures, we should, of course, adopt those of administrative law first, because to protect the environment we must first strengthen state control. The most vigorous and effective method is to establish administrative laws and regulations that conform to conditions in our country, differentiate responsibilities, establish appropriate procedures and set strict and clear punishments and rewards. This will facilitate determination of the responsibilities of the state, units and individuals in the protection of the environment and natural resources; formation of an environmental control network that is coordinated vertically and horizontally; and places environmental protection work under the overall control of the state. Then, we can apply civil law to protect the environment. The civil laws concept of the system of ownership, trusts, trespass, exacting compensation for damages and the obligation to exercise due caution are effective weapons in environmental protection.

However, we should also note that while civil law includes a procedure by which one may seek removal of obstructions and which can be employed to prevent pollution, the great majority of civil remedies--such as restitution to the status quo and compensation for damages--can be effected only after harm has actually occurred. This is contradictory to the principle of "an ounce of prevention is worth a pound of cure" in environmental protection work. Moreover, some serious destruction of the environment constitutes criminal behavior and exceeds the remedies of administrative and civil law. Thus we must employ special preventive, educational and disciplinary criminal laws to protect the environment. And the state should use criminal law as an essential measure in the management and protection of the environment. Under present conditions, the use of criminal law to fight pollution of and damage to the environment and natural resources will enable our country's environmental protection work to make great advances and will put an end to the situation in which criminals who damage the environment escape their legal responsibilities and in which victims lack strong and effective protection. Only when those who have no regard for law and order, have no concern for people's lives, wantonly pollute and damage the environment receive their just and necessary punishment can the spread of environmental crimes be stopped, criminal elements be reformed and the citizenry educated.

The use of criminal law to protect the environment has become an important question attracting the attention of the international criminal law and environmental law professions. The United Nations looks upon the poisoning of the environment as an international crime. The 12th meeting of the International Criminal Law Conference held in Hamburg in September 1979 also conducted a special discussion of this question. And most countries already employ criminal law to protect the environment.

## II. The Objective Existence of Environmental Crimes, Their Definition and the Establishment of Their Existence

What is a crime? Article 11 of our country's Criminal Law Code provides a scientific and complete answer to this question. A crime has three

characteristics: (1) It is harmful to society; (2) it constitutes an offense, either deliberate or accidental; and (3) it violates criminal law and is subject to criminal punishment. Some comrades analyze these three major characteristics mechanically, believing that, since only acts violating criminal law constitute crimes, those acts for which no clear provision exists in the Criminal Law Code thus are not crimes. Moreover, such cadres believe that outside of the code, other laws cannot incorporate special provisions for criminal punishment. There are two major errors here: (1) These cadres have equated "criminal law" with the Criminal Law Code, a separate compendium of laws and regulations. This equation is inaccurate, for "criminal law" refers to all criminal legislation. And (2) the viewpoint these cadres maintain, "if not clearly specified in the law, an act is not a crime and therefore not subject to punishment," is equivalent in principle to "nullum crimen nulla poena sine lege," a theory advanced by the capitalist class in its struggle against feudalism during the 18th century. This theory is contrary to Marxism and has even been discarded by the capitalist class.

We should understand the three major characteristics of crimes on a comprehensive, scientific and dialectical basis. Here, the harm suffered by society is decisive and is the basic characteristic of crimes. Whether or not such harm exists and, if it does, the magnitude of that harm are the keys to the determination of whether or not an act constitutes a crime. In analyzing an act, we should first determine whether or not it is harmful to society, whether or not that harmfulness is serious enough to constitute violation of criminal law and warrant criminal punishment and whether the act was deliberate or accidental. This is the approach we should take, instead of placing priority on ascertaining whether or not the act is defined as unlawful in criminal law and then determining harmfulness. Thus, in deciding environmental criminality, we should first determine whether or not specific acts of serious pollution of and damage to the environment and natural resources are harmful to society. Then we should analyze the subjective factors relating to the perpetrators of such acts and the degree such harmfulness must attain before the acts warrant criminal punishment.

Let us take the case of the Suzhou People's Paper Mill as an example. The person held responsible in the case caused 28 tons of sodium cyanide solution to be spilled into the river, polluting a large area, killing many fish and mollusks and endangering the health of the people. Is this type of behavior harm to society? In the case of the Xingcheng County Water Company, a chlorine-gas leak damaged nearby trees and crops and caused more than 100 persons residing at the Forestry Sanitorium (this is a convalescent area) to suffer acute poisoning. Does this type of behavior constitute harm to society? And do illegal tree cutting in scenic and watershed forests, destruction of scenic spots and historical sites, indiscriminate catching of endangered wild animals, discharging large quantities of oil into the sea, dumping large quantities of oil into the sea, dumping large quantities of wastes into rivers and lakes, abuse of toxic and radioactive substances, emitting unbearable noises (or noise exceeding tolerable limits) which are harmful to human health, and the like constitute harmfulness to society? I believe that no one would deny that such acts do harm society, and they are clearly unlawful when they



seriously pollute and damage the environment, endanger citizens' health or even cause injury or death, or cause severe private- and public-property losses. Whether deliberate or accidental, such acts obviously constitute crimes, and the persons responsible therefore should receive criminal punishment. Thus the crime of damaging the environment exists objectively, and to deny that existence on the basis of the fact that the crime is not so defined in the Criminal Law Code is erroneous in theory and harmful in practice.

When speaking of environmental crimes, we refer not only to those that damage environmental elements that are monetarily valuable--such as land, forests and wild animals and plants--but also to crimes that damage elements that are not so valuable but are particularly important to the lives of the people--such as air, water, sunlight and peace and quiet--and natural scenery, which can only be computed in terms of cultural and enjoyment values.

In defining environmental crimes, most people tend to include only those crimes that damage environmental elements that are tangible and monetarily valuable--such as illegal tree cutting and fishing, animal and bird poaching and destruction of historical sites--and ignore the crimes that affect air, water, sunlight and natural scenery. Yet these elements are indispensable and actually form the major targets of environmental protection. And although the Criminal Law Code does not yet accord these elements such status, this lacuna represents a shortcoming in the law, which must be corrected, and cannot be employed as a basis for arguing that damage to such elements does not constitute a crime.

Environmental crime may be defined as the pollution and destruction of the environment and natural resources, either deliberately or accidentally, causing severe damage thereto, endangering people's physical and mental health or causing much public- and private-property loss.

The major elements that comprise environmental crime are:

1. The object of the crime: violation of citizens' personal rights, environmental rights, public or private ownership rights usufruct, etc., as a result of damages caused to the environmental elements defined in the Environmental Protection Law.
2. The objective requisites of the crime: pollution and destruction of the environment and natural resources, which causes serious damage to environmental elements, endangers the physical and mental health of citizens or causes serious threat or damage to much public and private property.
3. The subject of the crime: the natural person who committed the crime and who should bear criminal responsibility according to the law; sometimes may also be the legal person (including factories, enterprises, government agencies, etc.).
4. The culprit must have subjectively, which means either deliberately or accidentally, committed an offence. There is no criminal responsibility if the damage suffered is a result of irresistible force or unforeseen events.

It should be pointed out that treatment of legal persons as subjects of crimes contravenes the traditional criminal-law theory that only natural persons can be held so responsible. This point, however, serves precisely to underline the special nature of environmental crimes. Fallacious is the notion that, since criminal law ignores the responsibilities of legal persons, environmental and other (such as commercial) laws also cannot consider legal persons subjects of crimes. The authors intend to discuss this issue further in another article.

Another important feature of environmental crimes is that they may cause injury to several objects at the same time and in such cases are hard to classify. We therefore believe that the "crime of damaging the environment" should be established as a separate type of offense.

### III. Views on the Provisions in Our Country's Criminal Law Code That Relate to the Environment; Concrete Charges for Environmental Crimes and Appropriate Punishment

Our Criminal Law Code already contains some provisions relating to the environment, which, however, are dispersed under several categories. Examples are Articles 105, 106 and 115 of Chapter 2 (crimes endangering public security); Articles 128, 129 and 130 of Chapter 3 (sabotage against the socialist economic order); Article 156 of Chapter 5 (trespass); Articles 174 and 178 of Chapter 6 (disturbance of the administrative order of society); and Article 187 of Chapter 8 (misconduct in office). All these provisions undoubtedly have had a positive effect on environmental protection. However, because environmental protection is a new field in our country, we lack both legislative and judicial experience in this field, and existing laws obviously require further study and improvement. (1) Many lacunae exist, and many serious environmental crimes--such as serious pollution of the atmosphere and of water, emission of high intensity and sustained noise and vibration, wanton disposal of wastes that damage the environment and destruction of the environment in residential areas, have not been made targets of criminal sanction. Thus the Criminal Law Code has played only a minor role in environmental protection. (2) Environmental provisions are not treated systematically under their own heading in the code but are scattered through several chapters. (3) Criminal punishments have not been taken into appropriate account. Perusal of the code reveals that existing laws provide for relatively light punishment for environmental crimes, and such punishment is not commensurate with the harm caused by these crimes to society. Even worse is the fact that these laws do not treat acts that potentially may harm the environment as criminal offenses deserving punishment. Yet this latter consideration is exactly the point that should be emphasized in environmental protection and is like the theft of railway ties. Even if trains have not actually overturned (not occurred), the offense should be punished when the theft reaches the point at which they may be caused to overturn. And such punishment should not be the same as that meted out for ordinary crimes of theft, that is, measured by the value of the ties stolen. This "germ of a crime theory" should be employed in environmental protection, for all acts that could lead to large-scale, serious environmental pollution and damage, and punishment should be meted out, as in the case of

railway-tie theft, in accordance with that potential harm. Moreover, in cases in which environmental crimes have already been accomplished, the resulting social harm and losses should not be assessed solely in terms of monetary value; cultural and enjoyment values should also be considered. For instance, if either the welcoming pine of Huang Shan or the yulan magnolia of Tanzhe Temple is cut down, such a crime should not be punished according to the value of the lumber obtained from either tree. Similarly, the poaching of pandas, swans and golden monkeys cannot be punished according to the value of these creatures' meat or skins or of the live animals themselves. Of course, it is difficult to evaluate and employ cultural and enjoyment values as bases for meting out punishment. However, this problem should not be used as an excuse to ignore these values but instead should serve as a spur to further study. Also, in cases of water and air pollution, we cannot use the substances (such as the 28 tons of sodium cyanide solution and the tank of chlorine gas) spilled, discharged or leaked as bases for determining punishment but should focus instead on the harm or loss incurred. We believe that we should address the aforementioned defects in the Criminal Law Code, undertake necessary revisions of the code or adopt other measures in order to improve our country's criminal legislation for the protection of the environment.

We believe that "crimes of damaging the environment" should at least include: (1) air pollution, (2) water (including inland waters and oceans) pollution, (3) emission of noise and vibration, (4) emission of obnoxious odors, (5) soil pollution, (6) indiscriminate catching, killing or picking of wild animals and plants, (7) destruction of forests, (8) destruction of grasslands, (9) destruction of mineral resources, (10) destruction of scenic spots and historical sites, (11) destruction of natural preserves, (12) destruction of specially designated natural scenery, (13) destruction of aquatic resources, (14) unlawful use of radioactive and toxic substances, (15) contamination of food and beverages and (16) use of facilities and equipment potentially harmful to the environment.

Appropriate criminal punishment may be decided on the basis of the magnitude of the damage suffered by society. We believe that all punishments specified in the Criminal Law Code are applicable.

#### IV. Improve Criminal Legislation Relating to Environmental Crimes

In order to strengthen our struggle against the crimes of serious pollution to and destruction of the environment and natural resources, we believe that we must immediately improve our country's criminal legislation concerning environmental protection.

Foreign criminal environmental law generally consists of three parts: (1) relevant chapters and articles in criminal codes and laws, (2) separate criminal laws and regulations, and (3) special provisions for criminal punishment in separate environmental protection laws and regulations. For instance, in addition to the provisions concerning environmental crime in her "Code of Criminal Law," Japan also promulgated the Punishment of Crimes of Pollution That Seriously Endanger Public Health. And in her separate environmental

protection laws and regulations, such as the Water Pollution Prevention Law and the Agricultural Chemical Law, there are special provisions for criminal punishment.

Our country's Criminal Law Code is not a formal code. We have only that and some special criminal laws and regulations. This in itself illustrates that our criminal legislation is still in the development stage. Using this as a pretext, some comrades argue: "except for the Criminal Law Code, other laws and regulations (including environmental protection laws and regulations) lack the authority to incorporate provisions for criminal punishment." This interpretation is groundless. Since the founding of the People's Republic, in order to punish certain specially defined crimes, our country has promulgated a few special criminal laws and regulations, such as the "Regulations Regarding the Punishment of Counterrevolutionaries" and the "Regulations Regarding the Punishment of Corruption." Even after promulgating the Criminal Law Code, our country has issued a number of special criminal laws and regulations, and our constitution does not stipulate that such laws and regulations cannot incorporate special provisions for criminal punishment. The problem lies in the fact that the notion that separate laws and regulations cannot (or lack the authority to) incorporate such provisions is generally accepted and has even been put into practice, which point is evidenced by the fact that the provisions were excluded from in the Forest Law and the Environmental Protection Law, which instead employed "criminal responsibility is to be investigated and affixed according to law" and similar wording. The above notion will impede improvement and systematization of our system of legislation and thus allow acts causing serious social damage to escape the punishment they deserve. The notion has already rendered some laws and regulations toothless, damaged the prestige of the socialist legal system and caused dissatisfaction among the masses. Is this fact we face not a painful one? In addition, it should be emphasized that, even though the Criminal Law Code includes the "crime of damaging the environment," the breadth of social relationships covered by the code precludes detailed provisions concerning any one object of a crime. Thus we must still formulate, with reference to the codes special provisions for criminal punishment and incorporate these into separate criminal and other laws and regulations, which we can then use to supplement and improve the code. For instance, the recent decision to crack down on serious criminal activities in the economic area supplements and makes more concrete the code's provisions concerning economic crimes. We believe that such improvements are especially necessary in environmental protection. One task facing workers in environmental and criminal law is to strengthen study of criminal legislation dealing with environmental crimes and, by supplementing and revising the Criminal Law Code to formulate special laws to punish such crimes and special provisions for criminal punishment that can be incorporated into separate environmental protection laws, so that our country's legislation on environmental crimes can be systematized and our environmental laws and regulations, strictly enforced.

## V. Conclusion

Above, we emphasized the role of criminal law in environmental protection because that role has thus far not been very effective. It should be pointed

out, however, that criminal law is neither the only means of protecting the environment nor a panacea. Attention should be given to the following problems.

1. Environmental pollution in our country is becoming increasingly serious, due basically to poor management, backward economic technology and ineffective propaganda education. After all, criminal law is limited in effect, cannot eliminate the basic causes of environmental offenses and also has only limited deterrent force (including sanctions and educational influence). Overemphasis of criminal law will cause us to forget that we should adopt more administrative legal measures and adversely affect our environmental protection work. Therefore, the urgent task facing China's environmental legislative work is to formulate administrative laws and regulations for environmental control that accord with our country's conditions.
2. We should employ more administrative and less criminal punishment. By strengthening sanctions against minor offenders, we can generally prevent serious environmental pollution from occurring. Thus we must employ more administrative punishment in handling minor crimes. Criminal punishment should be used only against those offenders whose crimes are serious, where circumstances are odious, where great harm has been done and especially against offenders who seek petty selfish gain without regard for the consequences, thereby causing serious pollution, destruction of the environment and major damages.
3. We must strengthen study of civil remedies, especially those having preventive and remedial effects, so that the civil law can play its proper role in the fight against pollution and destruction of the environment.
4. Standards of administrative, civil and criminal responsibility for environmental pollution and destruction must be studied, so that crime and punishment will be commensurate with each other.

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## ROLE OF ECOLOGICAL ECONOMICS IN ECONOMIC CONSTRUCTION

Beijing RENMIN RIBAO in Chinese 26 Mar 84 p 5

[Article by Song Pei [1345 1014]: "National Symposium on Ecological Economics"]

[Text] From 14-21 February 1984 the Economics Institute and the Agricultural Economics Institute of the Chinese Academy of Social Sciences, the Bureau of Environmental Protection of the Ministry of Urban and Rural Construction and Environmental Protection, the Chinese Society of Ecology, and the China National Committee on "Man and Biosphere" held in Beijing a national conference on the science of ecological economics, as well as the inaugural meeting of the Chinese Ecological Economics Society. Some important ideas were brought up at the meeting.

(I) From the high plane of the strategic principles of China's economic construction we recognize the importance of developing ecological economics.

China's particular national situation determines that environmental protection is a basic state policy. In the first place, China is a country where people share a small amount of biological resources, where serious regard for ecology and meticulous protection of the environment is a fundamental prerequisite for developing agricultural production. Second, China's environment has been seriously damaged, and preventing further deterioration of the ecological balance, as well as to constantly improve them, are important conditions for promoting the continued development of China's economy. Third, China's socialist modernization needs both a material culture and a spiritual culture. Serious regard for the ecological balance and establishment of a beautiful and clean environment are important objectives for China's socialist modernization. Fourth, the aim of developing China's economy is to improve the people's livelihood and protect their health, as well as to create benefits for future generations. These are the requirements of basic socialist economic principles, and the basic difference between socialism and capitalism. The goals of developing our economy have determined the methods for China's modern development, and we want to place maintenance of the ecological balance and protection of the environment in a position of simultaneous development with economic construction. Environmental protection is a basic state policy, and developing research on ecological economics will provide a theoretical basis to carry out this basic state policy.

(II) Developing comprehensive research is an inexorable trend in the development of China's economy and science.

An ecological system has particular characteristics, therefore we must pay attention to all beneficial results during economic construction, including both natural results and economic results, as well as the results that are produced by their integration. Following the development of economic construction and the demands for obtaining the greatest economic results, China's economic sphere is already posing more and more comprehensive and overall research topics, for example the problem of economic results in the economic coordination regions, the problem of management system for counties under the control of cities, the problem of development in small cities and towns, etc. In the area of agricultural economic research, for some time now we have been inquiring into the problem of the development of agriculture in the narrow sense (planting) toward agriculture in the broad sense (agriculture, forestry, animal husbandry, by-products, and fishing). Recently, the problem of studying the rural economy has again been posed from the view of agricultural economics. With all of this, and speaking from the significance of ecological economics, these are all objective demands for developing comprehensive research and for obtaining the greatest overall results from the ecological system. Various ecological systems are themselves whole and complete, but our management structures are established according to separate departments. Research work is also mostly carried on by separate specialized units, and this is one important reason why many problems have been around for a long time but could not be solved. This situation has raised the necessity to strengthen comprehensive research and consequently has caused research on ecological economics to be put on important agendas.

From the point of view of scientific research, the development of both economics and ecology is a requirement for production and economic construction. The role of research results in ecology and other natural sciences on economic construction is certain, but their implementation is often limited by certain economic conditions. Whether the possible technological benefits provided by the scientific research results of ecology will become actual economic results and truly play a role in economic construction is a question having to do with the integration of science and economics. At the same time, the long-term practice of workers in economics, through both positive and negative experiences, have recognized that economic construction cannot depart from the natural environment. Adoption of economic measures and the economic results obtained, will grow and decline in accordance with the influence they have on the natural ecological balance. In order to avoid these kinds of unilateral economic results and truly obtain the greatest overall economic results, points up the necessity for combining economics and ecology. This kind of joint necessity is a basis produced by the science of ecological economics, and the roles of both will complement each other in the organic combination of ecology and economics.

Development of comprehensive research on ecological economics should pay attention to the economic results produced by the combination of different ecosystems, and the intersection of two or more ecosystems will produce peripheral effects. The integration of the practice of economic construction with this

principle of ecology demands that we emphasize that various economically integrated departments research the economic questions relevant to them. Chiefly there is the exchange between industry and agriculture, the exchange between town and village, the exchange between land and water, etc. For example, waste residue from the food industry can be used to develop suburban animal husbandry and fishing, setting up a free form ecology--economic system between industry and agriculture, and between town and village, organizing a fixed foodstuff link, increasing the organisms that can take part, and striving to obtain even higher economic results. In processing urban trash, we want to develop and utilize natural resources and set up an exchange of materials and energy between industry and agriculture, and between towns and villages, to be the guiding ideology, since large cities need suburban agriculture of a definite scope, which can also take ecological economic theory as its basis.

(III) Pay attention to the unification of economic results and ecological benefits.

Mankind's economic activity cannot escape the influence of natural forces, as the great amount of practice with the pros and cons of our economic construction has proven, but only when this economic activity meets the requirements of the natural ecological balance can the anticipated economic results be guaranteed; otherwise, it will cause economic losses, even to the extent of bringing long term, disastrous consequences. In carrying out modernizing economic construction we want to pay attention to both economic results and ecological benefits and bring about unification of the two.

Sometimes economic results and ecological benefits are contradictory and if we only pay attention to short-term or partial economic results that will destroy the ecological balance, thus harming the long-term, overall results. But the two can still be unified. When we consciously recognize the role of economic laws and ecological laws and make them meet the demands of objective economic laws as well as meet the demands of objective natural laws, we can attain comprehensive optimum economic results.

At this meeting some basic theoretical problems of ecological economics were also discussed, chiefly: the object of study, the mission, the nature, and the status of the discipline, as well as its relation to other disciplines.

The conference elected Xu Dixin [6079 3321 2450] director of the Chinese Ecologic Economics Society, and Ma Shijun [7456 0013 7486], Wang Gengjin [3769 5087 0093], Shi Shan [4258 1472], Sun Shangqing [1327 1424 3237], Yang Hanxi [7122 0698 3556], Qu Geping [2575 2706 1627], Chen Daisun [7115 1486 1327], Li Xianfa [2621 2009 3127], Hou Xueyu [0186 1331 3558], and Liu Suinian [2692 9536 1628] as assistant directors.

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## IMPORTANCE OF ECOLOGICAL ECONOMICS FOR MARINE FISHERY EXAMINED

Beijing RENMIN RIBAO in Chinese 9 Apr 84 p 5

[Article by Wang Songpei [3769 2646 7198]: "Developing Marine Fishery Based on Ecological Economics"]

[Text] China's marine fishery has made considerable progress since the founding of the People's Republic, despite many obstacles. While fishing capability has increased rapidly, the output of the industry has actually declined because of the damage inflicted on marine fishery resources by over-fishing. This makes it imperative that we re-examine marine fishery from the viewpoint of ecological economics.

### Marine Fishery is Essentially Ecological Fishery

Man's oldest forms of livelihood were fishing and hunting. In China, people along the coast have been fishermen generation after generation. But history shows that people still do not really understand the nature of marine fishery. This ignorance is an important reason for the damage we have done to fishery resources and our inability to develop marine fishery rapidly and steadily. The Zhoushan fishing ground in Zhejiang Province is China's major fishing ground and enjoys unique natural advantages. Since liberation, the tools of production have been continuously modernized. In the early 1950's the fisherman's fishing tool was a wooden junk, and there weren't too many of them. Today, in their place are 5,926 motorized fishing boats. Fishery productive forces are represented by production tools have certainly increased year after year. However, the output of the industry has shown a steep downward trend in recent years, after a sharp increase in the 1950's through the 1970's. A major county in that fishing area is Putuo. In 1952, its fishing output was 680,000 dan. The average annual figures for the 1950's, 1960's, and 1970's were 1.22 million dan, 1.97 million dan, and 3.11 million dan, respectively. Its output in 1980 was 3.32 million dan. However, more recently its output has dropped from 3.17 million dan in 1981 to 2.83 million dan in 1982 to 2.43 million dan (estimated) in 1983. Zhoushan's situation is representative of China's marine fishery. Some coastal areas have fared even worse.

The basic problem is that in their ignorance of the special characteristics of marine fishery production, people have taken a wrong approach towards its development and exploitation, resulting in the destruction of marine fishery resources. For a long time now, our approach towards fishery production has been based on the following two perceptions:

1. Marine fishery is simply fishing in the open sea. In accordance with categories established by the production department, people have been catching fish in much the same way as they have been removing coal and other minerals from the ground.

2. Fishery resources are inexhaustible: "Where there is water, there is fish; increase the number of ships, and you increase production." That just about sums up our second perception. Guided by this thinking, the development of marine fishery production inevitably shows a single-minded concern to increase fishing tools. But there came a point at which the burden placed on fishery resources proved to be more than the latter could bear. From that point onward, resources declined and fishery output dropped.

The development of marine fishery must take into consideration the natural state of fishery resources. There is a significant difference between marine fishery resources and those in extractive industries.

1) Marine fishery resources, like resources in excavation industries, are limited. As a result, we must stress economy and effective utilization in both areas.

2) The targets of marine fishery are living organisms, both plants and animals. As they are renewable resources, they differ from those in extractive industries. The economic reproduction of fishery is related to nature's reproduction, subject to the laws of nature as well as those of economics. Only by preserving the ecological balance of the natural reproduction of fish could we maintain the long-term economic stability of the industry and produce even greater economic results. The renewability of marine fishery resources gives the industry its special ecological quality. With this understanding in mind, we can proceed to establish the following ideas on marine fishery production:

1. We must establish the concept of fishery ecological balance. Like other living organisms, marine fish species live in certain ecosystems. Only if the balance of the systems is maintained, can the species reproduce successfully. Only then can we utilize them economically.

2. It must be made clear that the targets of marine fishery should be sexually mature fish. As fish develop by stages, so does their economic value to the industry. In marine fishery, we achieve the optimal results, both economic and ecological, by catching sexually mature fish after they have laid eggs, not immature fish or adult fish which have not laid their eggs. People who care only about the size of their catch and fish indiscriminately, irrespective of the life stage of the fish, are effectively killing the goose that lays the golden egg.

3. We must establish the concept of making use of the ecological habits of fish. Every fish species has its own growth and migration patterns. Therefore, the marine fishery industry is clearly seasonal and varies from place to place. Based on their understanding of the ecological habits of some of

the major economic fish species, China's fishermen have banned fishing during certain times of the year and in certain areas. At the same time, they have also made good use of the flood seasons of the various species. All these perceptions are in line with the principles of ecological economics. Violate them wilfully and the fishery industry would suffer.

#### Co-ordinate the Relationship Between Fishing Tools and Marine Aquatic Resources

Since China's marine fishery depends mainly on fishing, the development of fishing tools has tremendous implications for the growth of marine fishery. But fishing tools cannot be developed in isolation. Productive forces involve a variety of elements, production tools, which provide the technical basis for the development of marine fishery, being only one of them. Another important element is marine fishery resources. As the objects of labor in the fishery industry, fishery resources form the material basis for its development. Only by coordinating these two elements could we increase the industry's production. Since liberation, collective fishery in the Zhoushan area has successfully upgraded their fishing tools through mechanization, motorization and expansion. The modernization of fishing tools has significantly improved fishing capacity, made full use of fishery resources, and rapidly increased the output of the four economic fish (large yellow croaker, little yellow croaker, hairtail, and cuttlefish). Average production during the 1960's jumped 6.5-fold over that in 1951. At the same time, however, the continuous increase in fishing tools and their irrational use have created an imbalance between them and marine fishery resources in the Zhoushan area, as shown in the following three ways: 1) over-concentration on the four major economic fish, which are relied on to supply the bulk of the yield, and failure to utilize other fishery resources; 2) in seeking to expand their operations year round with no regard for seasonal variations, fishermen catch and kill a large amount of young fish. The result is that fishery resources are not fully utilized; 3) operating in areas where fishing is prohibited, fishermen catch many young fish and parent fish about to lay eggs, thus denying them a chance to reproduce and multiply; 4) owing to the damage suffered by fishery resources in the Huang Hai and Bo Hai in recent years, fishing fleets along the six coastal provinces and the one coastal municipality have concentrated on the Zhoushan area. Economic fish in this area are the object of competition among three countries and five sides (China, including Taiwan, North and South Korea, and Japan). The presence here of a large number of fishing tools armed with modern technology has spelled disaster for its fishery resources. The common result of all these practices is over-fishing: marine fishery has been taking from the ocean more than the fish can replace through reproduction. In disturbing the ecological balance, we have also endangered fishery resources.

Fishery production in the Zhoushan area has taught us the following lessons:

1. We can place only so heavy a burden on the ecosystem. We may increase our fishing tools and exploit fishery resources only within the limits imposed by the capacity of the ecosystem.
2. The ecosystem of marine fishery is dynamic. When and where to fish must be geared to changes in the growth patterns of the fish. In the past we

ignored this special characteristic and blindly put forward the slogan, "transform a slack season into a peak season." All fish, including young and immature ones, were caught. In our ignorance, we also advocated, "Fish where there is fish." Operating in the wrong place and at the wrong time, we caught a large number of gravid parent fish. Through our misuse of fishing tools, we have caused the destruction of fishery resources.

3. The ecosystem of marine fishery is diverse and extensive. We should work hard to increase new fish species and develop and exploit mid-ocean fishery resources. The four major economic fish are popular but there is only a limited quantity of them in off-shore waters. With an increasing population and a growing economy, we must also continuously improve the people's standard of living. Under these circumstances, we should broaden our vision and realize that a variety of ecosystems exist in the vast expanse of oceans, and that we must discover and exploit new fishery resources. We must also understand that distant waters as well as neighboring seas are host to the many ecosystems favorable to marine fishery. Some of these systems are mid-ocean extensions of the ecosystems for the well-known economic fish, while others give rise to entirely new fish species. We have explained above why the modernization of fishing tools must be coordinated with the state of fishery resources. On no account, however, should we therefore conclude that mechanization should be rejected or limited in the fishery industry. Modern production methods and technologies are crucial to the development of marine fishery production. The problem at hand is not one of over-mechanization, but one of interpreting mechanization too narrowly to mean only increasing the fleets and nets used in fishing a handful of species in coastal waters. We should "strike out" into the open seas in the direction of new fishery ecosystems, and develop untapped fishery resources.

#### Improve Marine Fishery Management Based on a Knowledge of the Ecosystem

Besides ensuring that the various productive forces in the fishery industry are harmonized with one another, we must seek to strengthen management and promote productivity. Our work in this area should also be based on a correct understanding of marine fishery.

Marine fishery production is commodity production. The Zhoushan fishing ground is China's major base for the production of fish, which is a commodity. A proper purchasing policy would do much to ensure that the nation's and people's need for fishery products is met, that the productive initiative of the numerous fishermen along the coast is mobilized, and that the development of marine fishery is promoted. However, some of our old practices in fishery products purchase should be examined and improved.

Two sets of problems exist in the Zhoushan area. For some time, the proportion of fish that fishermen are required to sell to the state has been too high. During the past few years, that proportion has been 60 percent, to be in force for 5 years. The target has been based on the average annual output from 1976 through 1978. But the 1970's were 'golden years', as the local people put it, when output was comparatively high. In addition, 1978 saw a bountiful harvest in black scrapper in mid-ocean waters, which helped push the annual output to

the second highest level in history. In the past few years, fishery resources have been depleted and fishery output has fallen sharply. After fulfilling their obligation by selling to the state the required 60 percent of their catch, fishermen are often left with next to nothing. This is an disincentive to them.

Second, fishermen are still rigidly limited in what they can sell to the government, namely, the four economic fish, plus butterfish, Chinese herring, Spanish mackerel and eel. Substitution with other fish is not permitted. As a result, the four economic fish continue to be the focus of the fishermen's operations, and there is no relief in the pressure on them. These practices partly explain why, even while fishery resources are declining, no effective measures exist to stop their destruction.

The ideological origins of this state of affairs lie in a mismatch between the subjective and the objective. In recent years, there has been a sharp change in China's offshore fishery resources, in output, and in the kinds of fish caught. But no corresponding changes have occurred in purchasing regulations. The proportion of state purchase in the Zhoushan area has lately been lowered, which should facilitate a recovery in fishery resources and encourage the fishermen to be more enthusiastic producers. Since 1971, that area has successfully experimented with scad and mackerel fishery, which proved to be popular with the general public. State purchases should include scad and mackerel, which would enable the ecosystems of the four major fish to recover. Such a purchasing policy would produce even greater economic benefits.

From the standpoint of ecological economics, improving the management of marine fishery in order to gain greater economic results is a multi-dimensional approach. Changing the purchasing policy is only one of them. To sum up, we can see that the development of marine fishery still faces many problems. But there is also a good deal of potential awaiting our exploitation.

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## SMALL TOWN DEVELOPMENTS MUST PROTECT ENVIRONMENT

Beijing RENMIN RIBAO in Chinese 9 Apr 84 p 2

[Article by Lai Yuqun [6351 3768 5028]: "Don't Repeat the Old Mistake of 'Pollute Now, Treat Later'"]

[Text] Small-town developments must focus attention on preventing environmental pollution and maintaining the ecological balance from the beginning. They must not repeat the old mistake of "pollute now, treat later." This is the recommendation made by experts at the second convention of the Chinese Ecological Society recently held in Guilin, Guangxi Province.

The experts said that in the wake of the development of a commodity economy in rural areas, small-town enterprises and constructions throughout the country were entering a new developmental phase. It has been estimated that by the end of this century, 40 percent of China's 400 million strong rural labor force will have joined the industrial, commercial, service, scientific, cultural and educational sectors in small towns. The total small-town population of the entire nation is expected to reach 250 to 300 million. It is significant, therefore, that experts today urge small towns to stress environmental protection and ecological balance in their developments.

They pointed out that some cities had neglected to prevent environmental pollution during construction, and suffered severe losses as a result. Examples abound of such losses. In its blind pursuit of industrial development, Guilin, whose scenic beauty is unequalled anywhere else on earth, has built many factories which are serious polluters. Consequently, the city in recent years has been forced to close, suspend, consolidate or reorganize 38 factories (workshops) inside the city and along the upper reaches of the Li Jiang. It has also spent 37 million yuan to build a treatment plant to process the 'three wastes' (waste gas, waste water and industrial residues) produced by industry, and domestic sewage.

Suzhou, known as a paradise on earth, also has serious environmental pollution problems due to the construction of steel plants, paper mills and nitrogenous fertilizer factories. The Suzhou He has been reduced by pollution to a black, filthy and foul-smelling river. The experts suggested that in developing small-town enterprises and projects today, we must not follow Guilin's and Suzhou's old ways. They advised the localities to pay attention to the following:

--Before plans are drawn up and seriously implemented in any town, experts and personnel concerned must first examine the distribution of factories, the utilization of energy, the layout of transportation networks, and the water supply system.

--Polluting industries must be kept out of villages. At present, some cities invariably want to move polluting industries to small towns in order to escape the scrutiny of environmental protection departments. This situation must not be allowed to happen in future. Cities should get rid of pollution at its source.

--A recycling system for organic wastes should be set up at small towns. For example, the straws and waste residues of a variety of crops can be processed into a culture medium to cultivate edible fungi. After the fungi are picked, their roots can be used to feed domestic animals. Animals wastes can be used in the making of methane. The dregs of a methane-generating pit feed earth-worms which, in turn, are fed on by poultry. Not only does this kind of repeated recycling increase social wealth, but it also reduces pollution in small towns.

--Rural energy development must be properly handled. Depending on local circumstances, solar energy, wind power and small hydro-electric power stations should be developed. We should try to replace firewood with electricity, popularize the use of stoves which economize on firewood, and fell as few trees as possible. This measure is important in maintaining the ecological balance in small towns.

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## ENVIRONMENTAL PROBLEMS, CONTROL MEASURES IN MINING

Beijing ZHONGGUO DIZHI [CHINA GEOLOGY] in Chinese No 1, 1984 pp 28-30

[Article by Tang Ninghua [0781 1380 5478] of the Beijing Municipal Bureau of Geology and Mining: "Environmental Problems Brought on By the Exploitation of Mines"]

[Text] Although China is rich in mineral resources and has a long history of mineral exploitation, the treatment of mineral wastes has not yet been upgraded high enough to achieve comprehensive utilization of its mineral resources. Consequently, huge quantities of useful resources are discharged as wastes, this is not only a tremendous waste of resources but severely pollutes the environment. Even geothermal energy, "a comparatively clean" source of energy, has begun to pollute the environment as it is being more extensively exploited. These are serious problems confronting China's mineral exploitation which call for urgent solutions.

### I. Water Pollution

Water pollution refers to pollution of the surface and ground water by large quantities of wastes (mainly liquid wastes) discharged during mining and ore sorting. According to the statistics of concerned departments, China discharges into its natural rivers and lakes about 500 million cubic meters of ore cleaning and sorting sewage yearly. It takes more than 10 cubic meters of clean water to dilute and render harmless one cubic meter of normally treated sewage. One cubic meter of untreated sewage can pollute about 25 cubic meters of clean water. If the 500 million cubic meters of sewage were collected and discharged into the rivers, it would pollute a river with a flow rate of 360 cubic meters of water per second.

The major pollutants in the coal mine sewage include such organic chemicals as sulphites, flotation agents, flocculants and coal sludge. According to the statistics of the Ministry of Coal Industry, only 19 percent of China's coal sorting plants keep the density of suspended matter in their sewage within the state standard of 500 ppm. As a result, sewage discharge from the coal sorting plants have polluted many rivers in China.

The sewage of metal mines contains mostly metallic elements, such as Cu, Pb, As, Zn, Cd, Al, Fe, etc. This is due to the chemical composition of ores'



surrounding rocks. According to statistics, one ton of lead or zinc ore takes 4.5-6.5 cubic meters of flotation water which contains as much as 20-50 grams of cyanogen. When the untreated mining sewage is discharged directly into the nearby streams, it will pollute the surface and ground water of the adjacent areas.

Acidic mining sewage is the most harmful. The coal beds in East China, Henan, Guangdong and Guizhou are high in sulphur, and the pH value of the mining sewage is only 2-3. The pH value of sewage discharged from iron and manganese mines is so low that it reduces the output of fish and shrimps in the rivers and also grain production, a cause of conflict between industry and agriculture. The mines have to pay fines from year to year for discharging excessive pollutants.

Now, the impact of mining sewage on the environment is closely watched by the departments concerned, some mines do put the sewage through neutralization, oxidation, reduction or flocculation before discharging it into any body of natural water. Damage to the environment caused by mining sewage can be reduced if we strengthen management, control the volume of discharge, and manufacture better flotation agents.

## II. Air Pollution

Air pollution refers to particulates produced by mine surface drilling, blasting, transportation and gangue mining; the emission of toxic gas by gangue ores; and the radioactive gas from metal mining which pollute the air and impair human health.

Although the working condition inside the mines of China today is better than it was before liberation, safety measures are still not good enough. Dust and toxic gases in coal and metal mining still pose a threat to the health of the miners.

Environmental pollution by spontaneous combustion of gangue is widespread and serious. China produces about 70 million tons of gangue yearly, and there is a stockpile of 1.1 billion tons. These stockpiles of gangue take up too much space and pollute the adjacent rivers and air.

Most of China's coalbeds, including 40 percent of the state-controlled and key mines, contain gas. In addition to the threat of gas explosion, gas poisoning is likely to occur where ventilation is poor.

The Shanxi coalbeds are high in sulphur content. Since the heating value of gangue can reach as high as 3500-4900 kilocalories, spontaneous ignition is very likely to occur. As most of the mines are in the valleys where air does not circulate easily, smog often results from air stagnation and temperature inversion. The extent of SO<sub>2</sub> pollution is bound to mount when coal production increases and more pit-side electric generation stations are built.

The harmful gases associated with the mining of non-ferrous and rare metals are SO<sub>2</sub>, NO<sub>2</sub>, CO and ferrous compounds which are harmful to the miners' health.

Radioactive pollutants, mainly hydrogen and radon, associated with uranium mining are very serious health hazards to humans.

The  $H_2S$  present in geothermal water is a strong corrosive gas. Normally, the permissible amount of  $H_2S$  in the air is 0.01 ppm, and is harmful to human health if the density is over 10 ppm.

### III. Ground Surface Deformation

Cave-in, mud-rock flow, landslide, subsidence etc., induced by mining are direct threats to mineral production and the safety of mines and the residents of the mining area. There are two causes of ground deformation: the imbalance of the surrounding rocks of the mined space on the one hand and the dredging or flooding of the mining pits in the sub-surface karst regions on the other. An incident of the former category occurred in a mining area of the Northeast where 50 percent of the whole area had been excavated. The subsidence was so severe that the entire mine had to be abandoned because the buildings, factories, water pipes, roads and farmland had been destroyed. In some South China sub-surface karst areas the limestone is under a thin (less than 30 meters) overburden of sand and clay. When the mining pits are dredged or flooded, the subsidence of the quaternary overburden forces the surface to cave in. According to related documents, the cave-in usually occurs along a fault where limestone karst caves develop due to the convergence of surface and ground water.

Environmental pollution and decay are a dangerous threat to mankind. The experience of China and foreign countries proves that environmental deterioration is directly caused by outmoded production technology, poor management and the lack of environmental legislation. Actually, environmental pollution is a waste of energy and material resources. Therefore, instead of seeking simplistic and passive solutions to the problem of environmental pollution, it should be combined with the conservation and comprehensive utilization of energy. In this way, the environment is protected, and natural resources are conserved to meet the needs of national economic growth.

At present, the focus of China's environmental protection is on treating and utilizing the "three wastes" of urban industry. The protection of the mining environment has not drawn as much attention as it deserves. This oversight will not only cause the environment that people rely on for existence to deteriorate and sow seeds of disaster for future generations but also limit the pace of developing mineral resources, and seriously affect China's modernization. Work in the following areas must be strengthened in order to successfully protect the environment of mining areas.

1. Formulate a mining environmental protection program. According to the provisions of China's "Environmental Protection Law," "When a national economic development plan is formulated, measures for environmental protection and improvement must be included and conscientiously implemented, while methodical and measured solutions to the existing problems of environmental pollution and other public hazards must also be found." Consequently, these requirements must be met by any exploitation of mineral resources. That is to say, in order to do away with piecemeal and perfunctory responses, mining environmental protection programs, including the major targets, measures and funding, should be incorporated in the plans for the development of mineral resources, and conscientiously carried out.

2. Step up mining environmental geology work. Before we constructed the existing mining facilities in China, we did not do any environmental geology studies. Nor did we recognize the importance of environmental geological studies until we ran into a problem or when a problem had become too hot to handle. To prevent problems before they arise, any newly constructed or expanded mining facility must carry out a preliminary evaluation of its environmental quality, which should include the following:

(A) The basic conditions of the environment: the formation, structure and chemical composition of the mineral beds and the surrounding rocks, as well as the hydrogeology and engineering geology factors of the mining region and its adjacent areas.

(B) Investigation and analysis of the sources and media of pollution: Types of natural sources of pollution and sources from exploitation, the pollutants and the characteristics of their migration and changes, the capability and speed of environmental self-purification, and the method to compute and indicate pollution indices.

(C) Investigation and analysis of geological disasters: the type, scope and characteristics of geological disasters, and the occurrence of geological disasters and developing trends during mining operations.

(D) The evaluation of environmental quality: the background, current condition and developing trends of the environment; the changes in composition and content of the pollutants in relation to time and locale, and their impact on industrial and agricultural production, human health and the ecological environment; and environmental quality standards.

(E) Environmental monitoring: the distribution of monitoring stations, the items and methods of monitoring, and the discharge standards of the "three wastes" by mining.

(F) Plans for environmental treatment: the projects, methods, measures and anticipated results of treatment.

3. Strengthen management. Since most environmental problems are due to poor management, the basic measure to successfully protect the environment is to strengthen management. In addition to meeting the requirement of the "three simultaneous efforts"\* and the control of new sources of pollution, any mining construction must include environmental protection as an integral part of its management, subject to periodic evaluations leading to the establishment of an environmental management system.

4. Strive for comprehensive utilization, recycle waste material, turn waste into valuable products, and fully use mining resources. The potential for the comprehensive utilization of the "three wastes" from mining is great, and is an important measure and way to quadruple the output of China's mineral resources

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\*Principle of designing, constructing and operating antipollution equipment simultaneously with the principal part of new building projects.

by the year 2000. We can draw on the successes of some mining areas. For instance, the utilization rate for gangue at the Jiaozuo Mining Administration of Henan was 70 percent and the value of output was 8 million yuan in 1981. By comprehensively treating its coal washing water, the Wuyang mine at Lu'an has not only reduced pollution of the Zhang He but also made it easier for the residents nearby to get water for drinking and irrigation. Since China pays more attention to the treatment of the "waste liquids" from uranium mines, the waste liquids after treatment virtually meet discharge standards. This serves as an example of reducing pollution and the recovery of mineral resources.

5. Upgrade technological equipment and improve working conditions. China's outmoded mining equipment and low-level technology are one reason for the excessive discharge of the "three wastes" and environmental pollution. It is imperative to adopt technology that produces little or no pollution to reduce the discharge of the "three wastes" as much as possible, and carry out technical transformation in various areas of production.

In a word, environmental protection in mining is extremely urgent, and we must take warning from industrialized countries that first pollute and treat later. Uniform programs of environmental protection and production expansion should be considered simultaneously before launching extensive exploitation of mineral resources. We believe it is entirely possible to create an excellent environment fit for the exploitation of the mineral resources.

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CSO: 4008/142

## WAYS, MEANS TO TREAT INDUSTRIAL DUST

Beijing HUANGJING BAOHU ENVIRONMENTAL PROTECTION in Chinese Nos 7-8, 1983

Article by Xu Hongtao [1776 7703 3447]: "Ways and Policies in Dealing with the Harmful Effects of Industrial Dust"

[No 7 pp 10-12]

Text/ A number of China's present industrial enterprises are backward in techniques and technology, their equipment is obsolete and they are poorly managed. In the production process, large quantities of dust and smoke are emitted. According to preliminary statistics of the power industry, building materials, metallurgical industry and the engineering industry, about 14 million tons of dust are emitted every year into the atmosphere. This is an important factor for the serious waste of resources and energy, it is also one important cause of air pollution.

The data from monitoring done in 1981 show that in 50 northern and southern cities, statistically covered, dust exceeded the standards in 100 percent of the cities, and particles in 100 percent of 27 northern cities and 71 percent in 21 southern cities. It shows that particulate pollution in China is serious, and that emissions from industry are the main source of that pollution. It is self-evident that it has become an extremely important task to summarize all technological ways to control harmful industrial dust and to explore technological and economic policies to that effect.

### I. The Present Conditions of Harmful Dust and Technological Ways to Control It

#### (A) The Power Industry

Present conditions: There are almost 1,000 boilers for thermal power plants throughout the country, with a total capacity of 150,000 to 160,000 tons per hour and a total annual coal consumption of 130 million tons. Because the power plants mainly burn low-grade coal with high ash content, they accordingly use pulverized-coal furnaces and cyclone furnaces. In addition, their dust abatement equipment is at the level of the 1950's and 1960's, the technology is obsolete and inefficient, causing annual emissions of particulate matter in the atmosphere to reach more than 6.8 million tons. Moreover, because existing oil-burning power plants have been given a time limit to convert to coal-burning, and the installation of dust abatement equipment cannot catch up with this development, the smoke and dust emitted into the atmosphere by the power plants of certain cities will probably increase.

In the last 10 years, much work was done by the electric power system to improve dust removal installations and the control of smoke emission. From 1973 on, the wide use of Venturi-tube wet separators was tried on boilers of generating units of between 12,000 to 250,000 watt capacity, and dust elimination rose to over 96 percent efficiency. Moreover, on medium and small boilers of 35 tons per hour and 130 tons per hour capacity, the inclined-rod grid, water film dust precipitators were used instead of ordinary water film dust removers; efficiency reached 96 percent, and this method also solved the clogging problem. In 1980, we were also successful in trials with a wide open horizontally installed trough-type electrostatic dust collector which, when used at 4 power plants, showed 99.6 percent efficiency, and we gained experiences in achieving greater cleanliness than with the electrostatic resistance smoke abatement.

Recently, the electric power departments used high-efficiency electrostatic dust arrestors, which raised economic results, reduced air pollution and provided new experiences for technical transformation of our domestic power plants. For instance, the operation of the 350,000 kilowatt generating unit at the Baoshan Power Plant is saving 350,000 tons of coal per year compared with similar power plants elsewhere and the density of smoke and dust emission is within the limits of the national standards.

#### Methods of Technological Control

1. Raising the ratio of thermoelectricity to production. In our thermal power plants of over 50,000 kilowatts, heat and power plants account for 24 percent of all plants, but account for about 10 percent of the total power, which is too small a proportion. Because a number of large hydroelectric power stations and mine mouth power plants will start contributing power to a great power network during the period of the Sixth 5-Year Plan, the power situation in some big and medium cities in North China will be eased, and the ratio of thermoelectricity to production will be raised from the present 10 percent to 20 percent, which can save almost 10 million tons of coal per year and reduce smoke and dust emission by 510,000 tons.

2. Popularize high-efficiency dust collection technology. (a) Power plants that use ordinary water film dust collectors, which account for 54 percent of the total boiler capacity, shall, wherever water capacity permits, gradually use high efficiency wet separators and also raise the utilization rate of recycled water. (b) Old plants which use the common dry dust collectors, which account for 22 percent of all plants, and the large and medium units that do not meet the standard shall as far as possible use electric dust collectors, baghouse precipitators or any other high efficiency dust-collecting equipment. (c) Oil-burning units that have no dust-collecting equipment, accounting for 24 percent of all boilers, they certainly should install high-efficiency dust-collecting facilities if and when they switch to coal. Units that waste energy and cause serious pollution shall be gradually eliminated.

#### (B) The Building Materials Industry

Present conditions: Cement, glass, ceramics, asbestos and other building materials emit large amounts of dust in the production process, the most serious pollutant being cement dust. Large and medium-size cement plants emit dust

amounting to 10 percent (which includes 1-2 percent of cement) of the cement production. The 49 large and medium-size cement plants annually recover almost 1 million tons of dust, but still emit 1.5 million tons (in which cement accounts for 120,000 tons). Small-scale cement plants emit dust at the rate of about 5 percent of their output; they emit about 3 million tons annually. In 1981, the total dust emission from the entire Chinese cement industry was 4.33 million tons. In the large and medium-size cement plants there is a fairly large amount of dust collection equipment; dust collectors have been installed in about 120 of the 137 rotary kilns, but due to poor management or the limited capacity of the equipment (quite a number of the dust collectors were overloaded), only one-fifth meet the emission standard, the rest exceed the standards, some by several or even scores of times.

In the last few years, the building materials industry has done some work in combining dust elimination with technical transformation, for instance, pneumatic conveyance, etc., and achieved some success. The Beijing Asbestos Products Plant installed self-regulating baghouse precipitators and met the emission standard.

#### Technological Ways of Control:

1. For the waste gas at the lower end of the rotary kiln, a high efficiency common electric precipitator should be installed, or a glass fiber bag counter-current dust remover. For the waste gas at the lower end of kilns in dry production, because dust particles are stronger than resistance, a wetting tower must be installed in front of the electric precipitator.
2. For waste air from cement packing, cement crushers and raw material crushers in a dry-process cement plant a baghouse precipitator should be used, including countercurrent baghouse precipitators, mechanical vibrators and pulsators, etc.
3. Dust elimination for waste gas from the raw material sintering machines. Large and medium-size enterprises can use ordinary electric precipitators. Small-size enterprises can use multitubular cyclone cleaners or water membrane precipitators.
4. Dust removal from waste gas of the vertical kilns of small cement plants. In light of the local situation, one may use sedimentation chambers, water membrane precipitators and electric precipitators. The control technologies in this field still require further research in order to select the most economical and suitable dust collection equipment.

#### (C) The Metallurgical Industry

Present condition: the metallurgical industry emits annually 2.52 million tons of smoke and dust, of which 2.28 million tons come from the iron and steel industry and 0.24 million tons from the nonferrous metal industry. Due to deficient control in some enterprises, the dustfall in some factory areas is as high as 400 tons per km<sup>2</sup> per month (in some special cases over 1,000 tons) and the density of dust from some operational units is several hundred milligram per m<sup>3</sup>.

Since the promulgation of the "Environmental Protection Law," quite a number iron and steel enterprises have begun a large number of environmental protection projects. In 1981 alone, smoke control projects numbered 574, and 60 percent of these were completed that year. Compared with 1980, there was a 10 percent decrease in smoke emissions. Key iron and steel enterprises built almost 30 additional sets of high efficiency dust collection equipment for the lower ends of sintering machines, and recovered over 100,000 tons of iron dust. To prevent secondary pollution, most enterprises installed liquid-seal, chain-type scrubbers. Venturi turret wet scrubbers were installed in 38 oxygen rotary furnaces and most of the rotary furnaces met the smoke emissions standard. As for the use of electric precipitators, some good results have been achieved, for instance at the Anshan Steel Works open-hearth furnace a 78 m<sup>2</sup> twin chamber electrostatic precipitator has been installed which is 99.8 percent effective, density at the outlet being 20 milligram per m<sup>3</sup>. In 1981, key nonferrous metal enterprises had 130 electric precipitators, 1,003 other kinds of dust collectors and 148 smoke and dust elimination projects.

In recent years, we imported the idea of comprehensive control design and advanced environmental protection technologies that could be used in our country in large-scale iron and steel plants, and we have already begun technical transformation in key points by stages and in groups in certain backward and seriously polluting sintering blast furnaces, open-hearth furnaces and electric furnaces, reduced the harm from smoke and dust to a large extent and achieved outstanding economic and environmental results.

#### Technological Ways of Control:

1. To greatly reduce the waste of energy, we should digest and absorb the experiences and technologies from the comprehensive smoke and dust control practiced at the Wuhan, Baoshan and North China steel works.
2. Select appropriate precipitators based on different working procedures.  
(a) Large sintering installations will have less dust emission at the upper end than at the lower end. At present, most of the plants use multitubular cyclone dust collectors and results have been good. At the lower end, because of the higher density of dust, an independent control will not affect production, and an electric precipitator could be suitably employed. (b) In the gas purification at oxygen open-hearth furnaces and rotary limekilns, it is best to use electric precipitators. (c) The ore and coal transporting systems, sintering plant material systems, small blast furnaces, steelmaking electric furnaces should use various kinds of baghouse precipitators. (d) Coking plants, scrubbers at blast furnaces, steelmaking rotary furnaces, ferroalloy furnaces should use wet separators for gas purification. (e) Coal loading at coke ovens should use the new technology for dust elimination by ammonia water spraying.

#### (D) The Engineering Industry

Present condition: foundries of the engineering industry are one of the main polluters. According to 1978 statistics, the engineering system has about 5,000 cupola furnaces and over 580 electric-arc steelmaking furnaces with an annual output of 3.1 million tons of castings. For each casting 56 kg of dust are



emitted, or an annual emission of 170,000 tons. The processing furnaces used by the coal industry are another major source of pollution. Over 6,000 sand casting furnaces, over 900 annealing furnaces and over 9,000 casting furnaces emit large quantities of smoke and dust by their combustion of coal and seriously pollute the environment. In addition, the dust pollution by makers of grinding wheels, emery wheels, electric batteries and insulators is also very serious, especially the corundum used for grinding wheels is dangerous to health and difficult to control.

In the last few years, the engineering industry has concentrated on a few control projects, and in about 40 enterprises state emission standards for dust and poisonous materials have been basically met. The foundries concentrated on control at 12 plants, including the Automobile Factory No 1 and partially met, or nearly met state standards. Since 1977, the engineering system emphasized scientific research on the prevention of air pollution. Besides manufacturing multitubular cyclone dust collectors, they also tested wet separators in the cupola furnaces, and without fluorite addition, came close to state particulate emission standards. In tests of dry dust collectors in 3-ton cupola furnaces, they used particle dust collectors and reached 92 percent dust removal efficiency, which is also close to state emission standards. In electric arc furnaces with above or below 10-ton capacity, they conducted tests and research on smoke emission at the furnace hood, smoke emission in the furnace, integrated external and internal smoke emission, smoke and gas cooling and purification by flat baghouse precipitators. All experiments provided very good experiences and satisfactory results in the purification of gas from carbon steel smelting operations with smoke and dust density meeting emission standards.

#### Technological Ways of Control

1. Dust removal in foundry shops. (a) To employ vacuum pickup and induction at seriously polluting casting-sand units, also hot air current drying of casting sand and shooting flow control devices. (b) Wider use of wet-process operations to avoid dust being blown around.
2. Purification of gases from cupola furnaces: (a) For control at cupola furnaces of less than 5-ton capacity, a secondary dust collection installation may be employed. The first stage may use multitubular water-cooled cyclone dust collectors and cooling casings. The second stage may use either particle, electric, baghouse or foam dust collectors. (b) For control at cupola furnaces of more than 5-ton capacity, hot-blast dust collection technology may be used. In the combustion chamber, the carbon monoxide in the gas will be completely burnt off and the air will be heated up to about 500° C before being blown into the furnace. This can save consumption of coke, raise furnace heat and thus improve the quality of the castings. The gases that will be purified by baghouse precipitators will meet the demands of emission standards.
3. Purification of gases from steelmaking electric arc furnaces: (a) For electric arc furnaces of below 10-ton capacity, a furnace hood emission method should be used, employing a system of dust removal composed of baghouse precipitators and air blowers. (b) For electric arc furnaces of above 10-ton capacity, installation of dust collectors inside the furnace or a combination of internal and external dust collectors may be tried out.

4. Dust collectors for smoke elimination at furnaces or kilns of the coal combustion industry : Foundry heaters and high temperature annealing furnaces are to use mechanical furnace fuel dischargers and corresponding cyclone dust collectors. In low temperature annealing furnaces and heat molding furnaces reverberating combustion methods with open flames are to be used.

/No 8, 1983 pp 11-12/

/Text/ II. Technological and Economic Policy

#### A. Strengthening the Management of Environmental Protection Facilities

Poor management of environmental protection facilities is a glaring problem now. Some managers do not keep their systems in good order, others disobey operating rules. Consequently, the efficiency of dust collection equipment and the service life are low. This phenomenon must be reversed, and scientific management must catch up. We should establish relevant rules and regulations and operate and overhaul in strict accordance with the operating rules so that environmental protection facilities can be as effective as they should be. Otherwise, more efficient equipment will be of no avail. In the past few years, some enterprises have included management of environmental protection facilities among their eight economic objectives and linked them directly with bonuses. The results of this have been good.

#### B. Develop the Manufacture of High-Efficient Dust Collectors

Once management work has caught up, industrial enterprises' dust collection efficiency will generally rise. Nevertheless, some industries and work procedures that have high concentrations of particulates (smoke and dust) and require stringent conditions will still be allocated the necessary high-efficiency dust collectors. This requires the organization of every industry's forces, which are to be linked with research and trial-production, based on national conditions, of new types of high-efficiency dust collectors. The Ministry of Metallurgical Industry's Institute of Safety and Technology has now set up an experimental electric precipitator, which has created conditions to further raise the production standards for this machine. It can do thorough research on gas temperature and humidity, wind velocity through an electric field, particle paths, comparative resistance, particulate concentration, dust-clearing effects, specific properties and structural patterns of air currents and power supply patterns. It is hoped that every manufacturing unit will take full advantage of this benefit and do some more solid, helpful work to raise production and application standards for China's electric precipitators. Furthermore, although the current tests and correlation work of the "appraisal of the hot-state operation of cyclone dust collectors for industrial furnaces" is not limited just to industry, it will still play a positive role in the prevention of harm by industrial dust.

## C. Succeed in Comprehensive Utilization and Prevent Secondary Pollution

### 1. The Electric Power Industry

We must make multipurpose use of fine coal ash. Every year, ash and slag left by dust collection devices, amount to nearly 30 million metric tons. Except for use by some units, most of that residue goes into ash dumps or is dumped directly into rivers, lakes and the sea. Given the frequency of this, it is dreadful to contemplate the environmental pollution arising therefrom. We must further strengthen research and production work on making bricks and other building materials out of fine coal ash. For example, Beijing municipality produced 597,000 metric tons of fine coal ash in 1981, 423,000 of which were used to make bricks and other building materials. Most of the floating ash recovered by dust-eliminating machines (i.e., 94.6 percent of what these machines recovered) was utilized, creating an output value of 17.45 million yuan for the state. If China can utilize 80 percent of recovered fine coal ash, it can realize an output value of nearly 1 billion yuan. In this regard, one point that must be emphatically made is that in some areas, the state has put into effect a necessary policy of price subsidies in order to initiate competition between clay bricks and bricks of fine coal ash. We must also encourage peasants to use fine coal ash for fertilizer. Furthermore, we have to strengthen research on the application of fine coal ash's hollow, minute spheres. These spheres, formed in a newly-discovered process, have tremendous prospects in such industries as metallurgy, petroleum, chemicals, building materials and the electric industry. Temporarily unusable fine coal ash must be stored for later use in building dikes and dams lest it pollute rivers, lakes and the sea.

### 2. The Building Materials Industry

There are various measures of utilization of the fine dust recovered from any work procedure. The cement dust recovered by plants using either the dry or wet method of making cement must go through every kind of direct conversion into cement. Cement dust recovered from packing machines and cement mills is high-grade cement and should go directly into the end product warehouse. Because of its high potassium and sodium content, fine dust recovered from waste gas from stationary kilns can be made into potash fertilizer and sold and can also be put in calcine and become clinker for cement. The handling of dust from Liboer /4539 3134 1422/ kilns awaits continued research.

### 3. The Metallurgical Industry

If the iron content in recovered fine dust approaches or exceeds 50 percent, the dust should be carried directly back to sintering plants to be mixed with raw material and be used again as sinter. It can also become spheres through the wet method, enter the sintering machine for stoving, and be melted down for smelting.

### 4. The Engineering Industry

Fine dust recovered from casting should be added to the proper amount of cohesive material, become spheres through the wet method, and be used again, thus preventing

secondary pollution. Cupola and arc furnaces make misty ash that should become spherical, melt down, and burn. We suggest that dust and furnace ash recovered from coal-burning industrial furnaces be used in a unified and concentrated way by urban construction departments.

D. Some enterprises with backward technology, high consumption, serious pollution with no feasible control measures and severe financial losses must be classified according to their circumstances for closure, suspension, merger or retooling. The engineering system is now reorganizing and merging its foundries and casting shops that produce little besides severe pollution. The building materials industry's local stationary kilns should also be closed or suspended.

In sum, besides the above technological and economic policy, we still feel that as far as environmental protection projects and the use of environmental protection technology are concerned, we cannot merely calculate costs, profits, output value and, so forth. We must also begin with the entire national economic picture and with a broad view of social benefits and then comprehensively measure environmental and economic results. We cannot unduly stress the economy and sacrifice the environment. Therefore, we have to launch cost-benefit correlation analysis and should vigorously strengthen investigation and research of the environment and the economy.

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## TASKS OF ENVIRONMENTAL HYDRO-SCIENCE OUTLINED

Beijing SHUILI XUEBAO [JOURNAL OF HYDRAULIC ENGINEERING] in Chinese No 12,  
28 Dec 83 pp 1-6

[Article by Fang Ziyun [2455 1311 0061] of the Chang Jiang Water Resource Protection Bureau: "The Tasks of Environmental Hydro-Science"]

### [Text] I. Introduction

Environmental hydro-science studies the interrelationship between the environment and hydraulic engineering projects in order to make such projects more effective and avoid impairment of (or minimizing detrimental effects on) the environment. The science studies the influence of hydraulic engineering projects on the environment and the new tasks of and requirements for, which are necessitated by changes in the environment, aquatic bodies and developmental projects. The science is a new discipline that closely integrates hydraulic engineering and environmental science.

When we review the design and approaches incorporated in aquatic system programs, we discover that some planners have already used the concept of environmental hydro-science as a guide in their work. For those planners have progressed from single to multi-purpose development, from considering water quantity along to emphasizing both quantity and quality and from considering only human water needs to the simultaneous concern for environmentally safe water usage so as to coordinate the development of ecosystems. The planners have begun to include environmental planning (environmental impact evaluation) as an important part of their programs; and the planners have also simultaneously considered technical, economic and environmental indices in plan selection.

This new discipline was created in the hopes that the workers in hydraulic engineering will open their minds and draw upon the recent accomplishments in environmental science so that new elements can be added to the traditional field of hydraulic engineering. This means that, in addition to engineering and economic perspectives, we must also incorporate ecological approaches so that construction projects will not abuse natural resources, and the environment will not deteriorate.

## II. The Tasks of Environmental Hydro-Science

The major tasks of environmental hydro-science can be divided into three areas.

1. To study the environmental problems that new hydraulic projects may cause and to propose countermeasures beforehand.
2. To study how to enable hydraulic engineering projects fully to play their roles in environmental protection, maintaining ecological balance and improving water quality.
3. To study the protection and utilization of the aquatic environment.

There has already been much treatment of the first and third tasks, and thus this paper is devoted to an exploration of the second.

### A. Studying Environmental Problems Posed by the Construction of Hydraulic Engineering Projects and Proposing Countermeasures Beforehand

From the history of hydraulic engineering projects, it is apparent that the mission of these projects--no matter whether the projects are conceived for flood control, navigation or irrigation--has always been to improve the environment and promote production. However, the scale of modern projects continues to expand. Dams are growing higher, and reservoir capacities are getting larger. Projects are expanding from single reservoirs to cascades thereof, and from single rivers to diversions of water across several river valleys. These bigger projects have a much greater impact on the environment than those of the past and consequently have impaired some aspects of the environment. Therefore, whenever hydraulic engineering plans are selected, environmental indicators must be studied in order to understand the scale, nature, and magnitude of the environmental effects of the projects envisioned. The detrimental effects must be studied in further detail so that abatement measures can be adopted.

Currently, many countries have already incorporated environmental considerations in the design and planning of hydraulic engineering projects. A draft environmental impact evaluation must be presented during preliminary planning, and the final report must be completed by the time blueprints are to be drawn up. Construction cannot begin until the report is fully discussed, reviewed and studied. China has a similar rule.

The ultimate objective of the environmental impact evaluation is to ensure and improve environmental quality. The evaluation provides complete documentation, including current environmental status, the potential effect of construction, control plans or improvement measures, problems to be resolved and plan comparison.

This is the first task of environmental hydro-science.

## B. Studying Ecological Laws in Order To Enable Hydraulic Engineering Projects Fully to Play Their Roles in Improving the Environment: River Development and Pollution Control

The second task of environmental hydro-science is to study how projects can fully play their role in protecting the environment, maintaining ecological balance and improving water quality. For example, for the optimal development and utilization of fishery resources, fishery management plans must be properly prepared for reservoirs. The water temperature and water level suitable for spawning and fish-egg incubation should be taken into account when reservoir capacities are adjusted. For pollution control in rivers, we should adopt optimal plans integrating hydraulic engineering projects with matching wastewater treatment systems. Such plans should be cheap and efficient. Therefore, when studying river development and designing hydraulic engineering projects, we must also study the relevant elements of pollution control. The latter must not be limited to the establishment of wastewater treatment plants, especially since most rivers now suffer varying degrees of pollution. We will not be able to meet new needs if we persist in employing the old methods of river control, which are concerned only with balancing and distributing water volumes.

Therefore, in addition to flood control, power generation, irrigation, navigation and aquatic production, river control work must also incorporate the improvement of water quality, which should be studied in conjunction with the above tasks.

1. Principles of River Pollution Control. Rivers form the receptacles for wastes generated by human activities. As long as rivers' self-purification capabilities are not exceeded, rivers can process these wastes and thus avoid disturbance of the normal ecological balance, retain vitality and continue to provide the water needed for human production and living and for coordinated ecosystem development.

As population grows and human economic activity expands, waste generation also increases. The self-purification capabilities of many rivers in the world have been exceeded, and all types of pollution have occurred. The basic formula to express the occurrence of pollution is:

(impact of human activities) - (regenerative capability of the natural dynamic equilibrium) > 0 (occurrence of pollution)

For rivers, the expression is:

(total pollutant volume) - (self-purification capability of the river by dilution) > 0 (occurrence of pollution)

Therefore, the principles of controlling river pollution should be "reducing the flow of polluted water (reducing the pollution load) and creating new sources of fresh water (increasing the self-purification capability of the river by dilution)." It is most efficient and cost effective to use both

methods simultaneously as a comprehensive control approach. Most control programs in China have employed only the approach of reducing pollution, which efforts are costly, produce results slowly and are of only limited effect. Thus we shall discuss the problem of pollution control in river development in greater detail.

2. Several Methods of Pollution Control That Might Be Considered in Comprehensive River Development. Currently, unified industrial discharge standards are approximately 10 times higher than the pollutant concentrations permitted in surface water (for example, for mercury, the former is 50 times higher than the latter). Thus, when contaminated water is discharged and homogeneously mixed in river water, river flow volume must be at least 10 times higher than effluent volume, and a certain amount of flow distance downstream will be required before surface water standards can be met. Therefore, when studying the pollution control problem of rivers, we must investigate the sources of pollution in each river segment (including pollution load, wastewater volume, wastewater discharge mode and concentration of each type of pollutant) in order to determine (after taking the original diluting self-purification capability of the river into account) the minimum flow rate that hydraulic engineering projects must provide. Next, the pollution characteristics of each river segment must be understood in order to determine the critical period for controlling pollution therein (for example, for the Songhua Jiang in the Harbin area, that period falls during freeze-over, from December to March, and for the Huangpu Jiang, the period extends from May thru September and from January thru April). Based on these critical periods, water-quality standards can be established to guide the scheduling of project operations during water release. Below I shall describe several methods by which this can be done.

(A) The task of improving water quality can be completely or partially combined with those such as power generation and navigation. For example, if the critical period for controlling riverine water quality falls during the dry season, water release for power generation, navigation and water quality improvement can be simultaneously and totally integrated. However, when the release rate required for improving water quality is greater than that for navigation or for guaranteed power generation, we must further study and determine the monthly drive-power distribution for dry years in order to maintain guaranteed levels of power generation, and we must take into account the entire electric power system and provide more generating power during critical periods, when water quality is at its worst, so that the task of improving water quality can be realized at the same time. Economics must be taken into account, but the problem has to be considered from the maximum benefit of the national economy as a whole and not from the perspective of individual sectors.

For example, a certain amount of wastewater is discharged into the Sancha He on the Songhua Jiang. The Fengman reservoir was affected by a prolonged dry spell from 1976-1979, during which time the average flow was less than 60 percent of that for most years. Furthermore, the reservoir did not adhere to the water-release schedule, because it was preoccupied with the power shortage problem. The minimum flow rate required for power generation was only 105 m<sup>3</sup>/sec., and including occasional runoff, the flow rate on the Sancha He at



that time fluctuated between 105 and 130 m<sup>3</sup>/sec. Therefore, the dilution ratio was lowered significantly. Hence, in addition to the reservoir's original tasks of flood control, power generation, industrial water supply, navigations, irrigation, and fishery, it appears that we should include the task of improving quality in this second tributary of the Songhua Jiang. When the reservoir is functioning normally, this task can be achieved according to the water-release schedule and almost completely integrated with power generation. Even in dry years in which the designed power generation assurance rate is 90 to 95 percent, water release rates can still reach approximately 350 m<sup>3</sup>/sec in low-water sections, and the dilution ratio can be greatly increased. In an extremely dry year, even if only half of the flow needed to guarantee power generation is discharged, the flow rate can still reach 180 m<sup>3</sup>/sec, which is much larger than 105 m<sup>3</sup>/sec. The rivers self-purification capability through dilution thus can also be increased.

If the power plant can properly increase its output between December and March, then the improvement of water quality would be greatly facilitated even in the driest of years. It is apparent that the control of pollution in the Songhua Jiang will be costly and ineffective if we focus only on wastewater treatment and ignore the role of the Fengman reservoir. Therefore, we should study and determine the minimum, reasonable water-release volume for the reservoir and make this rate the design requirement for controlling pollution in the Songhua Jiang. In addition, organic pollution in the wastewater discharged from such cities as Laha and Qiqihar in the Nen Jiang basin is also very serious. Sufficient attention should be addressed to the Nen Jiang in order to improve water quality in Harbin. Besides controlling the sources of pollution, we should also study and choose proper sites for building reservoirs in order to increase the flow rate in the dry season. These reservoirs should be operated in conjunction with the Fengman reservoir to jointly improve the self-purification capability of the Songhua Jiang.

(B) Various ways, such as the construction of multipurpose reservoirs primarily aimed at improving the water quality, should be adopted to increase the flow rate in the dry season and to improve rivers' diluting, self-purification and navigational capabilities and capacities. For example, the Li Jiang in Guilin, a famous scenic spot in China, has high water quality requirements. Based on data analyzed at the Guilin hydrological station between 1941 and 1976, the average flow rate of the Li Jiang over the years is 128 m<sup>3</sup>/sec, with the maximum being 4640 m<sup>3</sup>/sec (1976) and the minimum, 3.8 m<sup>3</sup>/sec (1951). Water is abundant in the Li Jiang basin. The problem is the variation between rainy and dry seasons and years. If various ways are used to increase the dry-season flow rate, then it is possible to improve the river's self-purification and navigational capabilities. Such methods include afforestation and conserving water resources in the upper reaches of the river, rational adjustment of water levels in the Qingshitang reservoir, studying how to enlarge and strengthen the reservoir and conducting a study to prepare for the construction of the Hu Jiang Meiziling reservoir. The primary objective of these methods is to improve water quality and navigation conditions in the Li Jiang, to link this effort with power generation and to reduce power shortages.

It must also be emphasized that harnessing the Li Jiang must be considered as a component of city planning. In addition to requiring that treatment of industrial wastewater be properly treated before discharge, cities must also rationally arrange their water intake and underground water systems.

(C) When it is impossible to build a reservoir to regulate the flow in one river basin, the possibility of diverting water from another river should be studied in order to increase dilution flow in the first river. For example, when studying pollution control for the Huangpu Jiang, we should consider diverting water from the Chang Jiang in order to increase the former's source of fresh water. It has been determined that, if the water level of the Tai Hu can be rationally controlled by regulating the lake's inflow, the self-purification capability of the Huangpu Jiang can be increased, pollution in the river's upper reaches, caused by tidal backup, can be reduced, the chances of salt intrusion into the lake can be lessened and thus the supply of water from the upper reaches of the Huangpu Jiang can be guaranteed and the river's water quality improved.

(D) In lakes and lake systems, pollution is caused by untreated wastewater dumped by nearby chemical and fertilizer plants, which reduces aquatic plant life and commercial fish, disturbs ecological balance and affects the health of residents to a certain extent. In such cases, besides improving in-plant treatment, a cascade of oxidation ponds can be built at appropriate low-lying places in order to protect water resources and ecological balance, and biological methods can be used to fully utilize and strengthen the self-purification capability of natural bodies of waters to further process the pollutants in industrial wastewater. Such a treatment system is inexpensive to operate and can save much energy. Such elements as phosphorus and nitrogen can be recovered in the form of fish harvests, and water resources can be further utilized after passing through oxidation pond cascades. The latter provides a method that can be studied and applied to the control of pollution in some lakes, a successful example of which is the harnessing of Yaer Hu.

3. Controlling Pollution Load and Strengthening Control of Wastewater Discharge. In order to control the pollution load of a river, we must first improve treatment of industrial wastewater. The latter objective can be achieved by building large, small, integrated or individual wastewater treatment plants according to specific conditions and by improving treatment of industrial wastewater treatment by strengthening control of discharge volume. Wastes cannot be discharged until certain standards are met. If water quality is poor during dry seasons, then wastewater discharge must be even more rigorously controlled during these periods. This control can be effected by planning less waste discharge so that discharge volume is brought into line with the self-purification capability of the river, by adding equipment to treat seasonal wastewater and by scheduling inspection and repair work or plant shutdowns during these brief periods so as to minimize discharge as much as possible.

4. Utilize Unified Planning Using Systems Engineering To Provide an Overall Arrangement in the Wastewater Treatment and Hydraulic Engineering Systems and To Obtain the Optimum Pollution Control Plan. In the water pollution control system, there are numerous contrasting programs which may be adopted, such as:

(A) Wastewater in a given region is collected and delivered to a central treatment plant and is discharged into the river from this one location. Or many smaller treatment plants can be used to discharge wastewater at many points.

(B) Increasing river flow volumes, holding wastewater in ponds, increasing treatment efficiency and so on during dry seasons.

We cannot simply apply one control measure uniformly. Rather, we must design specific programs for each particular river and adopt a variety of measures (such as many wastewater treatment units, which are also called subsystems) so that maximum results can be obtained at least cost.

Systems engineering provides an effective methodology for studying and resolving these types of problems.

Yet systems engineering for the control of river pollution is still in the stage of development. The integration of research on river development and pollution control provides one approach, the steps of which are as follows.

A. To investigate and compute the sources of pollution and their volumes and to determine pollution load by time period (wastewater volume and discharge concentrations for pollutants).

B. To study the hydrological, meteorological, and pollution characteristics of rivers in order to determine the critical periods of pollution.

C. To plot and analyze, according to monitored data, the interrelationship between pollutant concentrations and such factors as longitudinal distance, transversal distance, water depth and river flow rate.

D. To establish mathematical models for river self-purification by dilution.

E. To determine the design requirements for each time period, such as support programs for hydraulic engineering projects, water-release regulations and hydrological requirements.

F. To establish the relation between control targets and costs for each subsystem.

G. To determine overall water-quality targets for each time period (i.e., the overall target for each system).

H. To calculate environmental capacity according to the design requirements for each time period, the overall target for each system and river self-purification capability.

I. In accordance with the principle of minimizing control costs and taking into account specific constraints, to employ optimization techniques to undertake load redistribution for that portion of pollution exceeding environmental capacity and to seek the best control programs for all types of hydraulic engineering conditions.

J. To determine the investment and operating costs borne by each project support program in improving water quality and to ascertain the magnitude of these programs' contribution to hydraulic engineering and hydroelectric power generation.

K. To compile a comprehensive control cost table (see Table 1) based on the results calculated from steps I and J.

Table 1. Comprehensive Cost Statistics

<u>Type of Plan</u>	<u>Cost Shared by Hydraulic Engineering Project (10,000 yuan)</u>	<u>Cost of Appropriate Optimal Pollution Control Plan (10,000 yuan)</u>	<u>Total Treatment Cost (10,000 yuan)</u>
First plan, exclusively using wastewater treatment plants (no hydraulic engineering support, $\Delta Q=0$ )	--	$E_1$	$S_1 = (E_1)$
Second plan (including hydraulic engineering support, with increase $\Delta Q_1$ )	$C_2$	$E_2$	$S_2 = (C_2 + E_2)$
Third plan (including hydraulic engineering support, with increase $\Delta Q_2$ )	$C_3$	$E_3$	$S_3 = (C_3 + E_3)$
Fourth plan (including hydraulic engineering support, with increase $\Delta Q_3$ )	$C_4$	$E_4$	$S_4 = (C_4 + E_4)$

Note:  $\Delta Q$  denotes an increase in flow rate

Using the above table, we can select the optimum seasonal treatment plan. For example, if river conditions are as depicted in Figure 1, we shall choose the hydraulic engineering-pollution load distribution plan that corresponds to the lowest total treatment cost ( $S = S_{\min}$ ). Figure 2 represents, for a given river, the comprehensive treatment plan designed through systems engineering.

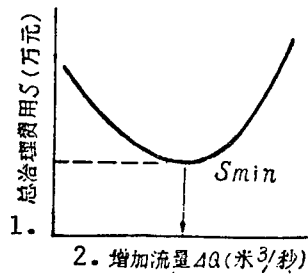


图 1

Figure 1

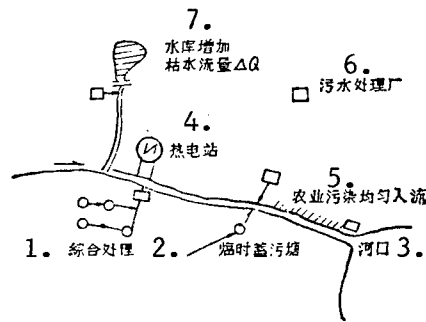


图 2

Figure 2

KEY:

1. Total treatment cost S(10,000 yuan)
2. Increase in flow rate  $\Delta Q(m^3/sec)$

KEY:

1. Comprehensive treatment
2. Temporary waste holding pond
3. River mouth
4. Thermal electric plant
5. Homogeneous agricultural runoff
6. Wastewater treatment plant
7. Reservoir increases dry-season flow rate by  $\Delta Q$

C. Studying the Protection and Utilization of the Aquatic Environment

The third task of environmental hydro-science is to study the protection, evaluation, and utilization of various aquatic environments and water resources. Water is the lifeblood of agriculture, industry and the national economy. China's river flow volume ranks sixth in the world, behind Brazil, the USSR, Canada, the United States and Indonesia; averages approximately 2,720 cubic meters per year per capita, which is only one-fifth of the world average; and is very unevenly distributed temporally and spatially; and faces the threat of growing pollution. Therefore, exploitable water resources are declining, and many cities and areas have already experienced water shortages and pollution of the aquatic environment. The development of agriculture and industry has been affected, and drinking water for human beings and animals has become a problem in a few areas. The water resources we use are derived mainly from rivers, lakes and reservoirs. Hence the study, protection, evaluation, and utilization of water resources and aquatic environments have become urgent issues.

To ensure protection of aquatic environments, we must formulate environmental quality standards and regional pollutant discharge standards for water and study the self-purification capabilities and environmental capacities of rivers. Usually, environmental quality standards are first determined for each river segment based on its primary function. Then the self-purification capability of the segment is calculated according to segment's hydrological and meteorological conditions. Next the segment's permissible lower cross-sectional load

is computed according to the environmental quality standard for the segment. The load standard, together with the segment's self-purification capability, is used to carry out an equilibrium comparison of the concentrations and volumes of the pollutants discharged from each outfall along the segment. If pollutant concentrations and volumes exceed the segment load standard, a load distribution plan will have to be devised according to the cost-benefit analysis described above. On this basis, discharge volumes can be established for each outfall of each plant, and thus regional pollutant discharge standards can be determined.

In short, the study of riverine self-purification by dilution involves investigation of the three-dimensional diffusion of pollutant concentration along rivers. To solve this problem, we usually employ modeling (i.e., mathematical and physical modeling).

The mathematical model for river sections unaffected by tides has been described in detail. But those segments so affected, which are influenced by both fresh-water currents and salt-water tides, await comprehensive analysis.

When performing the hydrodynamic calculations of polluted water in tide-affected river segments, we should consider the following tidal characteristics.

1. The DO content is very high during high tides and must be monitored and accounted for when we study organic pollution.
2. Tidal current may mix river pollutants better, so we must monitor pollutant homogeneity at various segment cross-sections in order to facilitate monitoring and accurate analysis and calculation.
3. Tide-affected river segments do not experience as dramatic an increase in pollution load near outfalls as do unaffected segments. And due to the effect of high and low tides, polluted areas in the former are also expanded upstream of waste outlets.
4. Because of the rise and fall of tides, pollutants travel back and forth in affected river segments and linger for long periods of time, sometimes even over a year. Therefore, when studying the BOD of organic pollutants, we must consider not only the BOD<sub>5</sub> carbonization stage but also even longer periods, such as those for BOD<sub>20</sub> and even the nitrification stage.
5. In a tidal river, salinity is high, electrolyte content increases and pollutants are prone to precipitation and thus contaminate the mud bottom. Such contamination frequently poses a potential pollution threat to the body of water itself. Therefore, in tidal river segments, pollutant precipitation and pollutant absorption, decomposition and dissolution on the mud bottoms during low and high tides should be studied.

### III. Conclusions

The three major tasks of environmental hydro-science were described above. The author believes that this new discipline can be established by integrating survey research and advanced foreign experience. First, we should choose several typical hydraulic engineering projects for detailed survey and analysis in order to determine their characteristics and patterns. We should open our minds; refer to the advanced foreign experience, including such latest scientific and technological accomplishments as systems engineering, mathematical modeling and related basic theory; and gradually establish environmental hydro-science.

Once this discipline is established, hydraulic engineering projects will achieve even greater results, water resources can be protected and exploited more rationally and environmental quality can be ensured and improved.

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## ENVIRONMENTAL MEDICINE IN MAJOR HYDRAULIC ENGINEERING PROJECTS

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[Article by Lu Shengye [7627 3932 2814] and Cai Hungdao [5591 1347 6670] of the Wuhan Medical College: "Environmental Medicine Problems in Large Hydraulic Engineering Projects"]

[Excerpts] Hydraulic engineering construction projects are magnificent undertakings that benefit the people and transform nature; and, unlike the cutting down of forests, the cultivation of wasteland and the discharge of the "three wastes" by industry, such projects do not pollute the environment, cause detrimental effects, disturb ecological balance or create public hazards. However, if such projects suffer from weak viewpoints in environmental ecology, lack of understanding or insufficient research or are handled improperly, unfavorable effects will be engendered, including some ecological imbalance and certain diseases, which effects will detract from the benefits of projects. Since Liberation, health conditions in China's cities and villages have been totally changed, and the people's health continues to improve. However, in some work we have lacked understanding of ecological laws and thus have been unable consciously to employ them in our attempts to conquer and perfect nature.

### I. Threat of Natural Foci of Infection to Human Beings

Natural foci of infection are areas from which specific diseases may spread, and the unit by which such spread occurs is the existing ecosystem, which is comprised of pathogenic factors, the susceptible population and environmental conditions. Under certain environmental conditions, such systems can be created artificially. Strictly speaking, only communicable diseases among wild animals have natural foci of infection, for the pathogens thereof do not depend on humans but rather merely circulate among host animals and vector insects. There are over 200 known infectious diseases of animals, of which half are communicable to human beings. In addition, there are over 100 parasitic diseases that are contagious and communicable between human beings and animals. This relationship among biological species has some natural geographic characteristics and has developed through interdependence and interaction during evolution. Under different natural configurations, there exist specific ecosystems consisting of different biological species, and these ecosystems are characterized by specific ranges of natural foci of infection. As human



productive activities expanded, mankind consciously or unconsciously joined or established ecosystems and thus began to contract diseases that have natural foci of infection. From the perspective of biology, the pathogens, vectors and hosts of natural foci of infection belong to specific biological communities in specific geographic configurations and are functions of hydrology, meteorology and vegetal cover. Hydraulic engineering projects, flooding, cultivation of wasteland and destruction of forests can often ruin or alter biological communities, affecting the hosts and vectors on which pathogens rely to survive and circulate, and thus natural foci of infection are strengthened, weakened or eliminated. For example, when forests are destroyed, jungle encephalitis diminishes or disappears. The construction of hydraulic engineering projects often affects climate, hydrology and vegetal cover; alters the living environment of the hosts and insect vectors of pathogens to favor such creatures' breeding and expansion in number and species; enlarges the infected area; accelerates the spread of disease; and endangers the health of human beings.

The task of environmental medicine is to employ epidemiological survey and observation to collect data on the state of diseases in order to guide human activity, prevent or eliminate these types of diseases and increase the benefits from efforts to transform nature.

## II. Examples of Environmental Diseases Caused by Hydraulic Engineering Projects

Hydraulic engineering projects can create benefits (increasing water supplies, irrigation, power generation, navigation, aquatic products, tourism, etc.), eliminate disasters (floods, drought, salinity, pollution, silting, etc.) and are needed to accelerate economic development. In the 30-plus years since Liberation, China has undertaken widespread hydraulic engineering construction, the accomplishments of which are recognized throughout the world. The construction of large dams affects natural ecological conditions across large areas, alters regional climate and has a great impact on residents' living conditions, health and production. Residents of submerged areas have to be relocated. Villages and towns around the reservoir experience changes in water quality due to rises in water tables, and thus new sources of water have to be found or rebuilt in order to prevent the spread of thyroid enlargement, cretinism, fluorine poisoning, Kaschin-Beck disease and Keshan disease. Reservoirs used for irrigation and drinking water affect human health most directly, being capable of causing the aforementioned diseases and of becoming new foci of infection.

The key project at Danjiangkou began storing water in 1967 and has a total capacity of 17.45 billion cubic meters. The river segment above the dam is approximately 890 kilometers long, and the local climate is humid and warm, with an average annual temperature of approximately 15-17 °C and an average annual rainfall of approximately 700-1,000 mm. All the counties in the area previously had malaria, and after the dam was built, incidence thereof increased. Environmental epidemiological surveys have proven that the living habits of malarial mosquitoes are directly related to water storage in the

reservoir. For example, most cases of malaria in Yun County's 25 communes occur in the 8 communes surrounding the reservoir. In Yunyang Prefecture, the incidence of malaria was 1.3 percent before water was stored and rose slightly thereafter. The protozoon detection rate was less than one percent before the dam was built (1955) but also increased thereafter (1970). The dominant mosquito species surrounding the reservoir is the Chinese anopheles, whose breeding season falls just as flood-control levels are reached and coincides with the malaria season. The reservoir area is large and stable, which provides favorable conditions for the propagation and spread of malarial mosquitoes.

### III. Health Problems of Reservoirs Supplying Drinking Water

Due to the uneven spatial and temporal distribution of fresh water, drinking water is in short supply in many areas. Especially serious is the fact that unsanitary water and untreated contaminated surface and groundwater are used for drinking in villages, which causes water-borne diseases to spread. For example, the water of many villages in India is contaminated by pathogenic bacteria, contains organic material and flourides and thus is undrinkable. Not only is water quality poor, but supply also falls far short of the needs of human beings and animals. China's per capita supply of water resources is less than one-fourth of that in the United States, water consumption in many Chinese cities and industrial areas is steadily rising, many areas are short of water and reservoirs and canals thus must serve as sources of centralized water supplies. Under these conditions, how to select and protect multipurpose reservoirs as large-capacity, high-quality and easily manageable sources of water supply become important issues. It is very difficult for conventional reservoirs to meet the state's standards and requirements for centralized water supply. Therefore, we must conduct comprehensive surveys of natural geological health and engineering conditions in the areas for which dam construction is planned so that environmental impact evaluations can be prepared. And we must propose specific methods by which to provide safe water for residents in reservoir areas and downstream and to prevent the occurrence of endemic disease and the spread of contagious disease after reservoirs are constructed.

The sanitary condition of reservoir water generally is not very good. Because of slow flow and insufficient or complete absence of exchange, reservoirs experience large build-ups of organic material. Anaerobic decomposition, which affects human sensory-functions, may take place, and mineral contents and bacteria counts increase, causing water quality to deteriorate. Artificial exchange of reservoir water may be conducted as needed. Usually, it is better to regulate sanitary conditions in reservoirs annually or seasonally. If several exchanges can be made each year, significant changes in water volume will occur, and these will facilitate purification and reduction of discoloration. Water volume increases during rainy seasons or when mountain freshets occur, causing salt concentrations to decline correspondingly, sometimes to one-third or one-fifth of their original levels, and concentrations of trace elements, such as iodine and flourine, similarly to vary. In addition to the aforementioned conditions, geological and sanitary situations in reservoirs

also have a great effect on the water quality of surface runoff; and wind speeds and the temperature differences and flow speeds of reservoir water also promote water exchange and thus enhance the dilution, diffusion and decomposition of pollutants entering the reservoir. If the terrain of a catchment area is steep, water flow will be swift, soil erosion will occur, sedimentation in the reservoir will increase and thus water quality will naturally be poor. If the catchment area is covered by forests and herbage, surface runoff will be slow, suspended substances (including bacteria) will be detained and thus the sensory properties of reservoir water will improve. If the catchment area consists of cultivated farmland, then the water quality of surface runoff will vary seasonally and usually will contain many suspended substances and much organic material. Moreover, agricultural chemicals such as fertilizers and pesticides will enter the reservoir. Population density, the quantity and quality of industries and enterprises and the quality of the sanitary equipment operated by the towns and villages in the catchment region all have a great impact on the amount and nature of polluted water entering the reservoir. This impact not only is epidemiologically significant but also has an environmental toxicological effect according to the degree of wastewater purification. Practice has proven that, in order to maintain good water quality in reservoirs supplying drinking water, population density in catchment regions should not exceed 50-75 persons per square km.

Distances from catchment areas to reservoirs vary, as do the contents and compositions of suspended substances in surface runoff. Usually, in areas within 2 to 3 km from reservoir banks, sanitary measures should be taken to prevent the anaerobic process from occurring. For example, buildings should be torn down, pollutants that impair surface water quality should be cleaned up, newly planted trees and grasses should be protected, and cultivation should be prohibited. Hence, a 2-3 km-wide protection belt should be established. The geological and sanitary conditions of submerged areas have a great effect on water quality in future reservoirs and thus should be taken into account in dam-site selection. The most epidemiologically dangerous of such conditions include mud bogs, marshes and ponds with large amounts of organic deposits.

Among all the factors affecting water quality, the cleanup of reservoir bottoms in submerged areas poses a major problem. Pollutants left on bottoms will intensify contamination of reservoir water by pathogenic microorganisms; industrial wastes and organic material will affect human sensory functions; and such conditions favor the breeding of algae and mosquitoes. Thus the causes of water contamination should be eliminated as much as possible. The extent to which cleanup can be carried out is related to the future functions of reservoirs. Usually, all buildings should be torn down, and all organic pollutants, garbage and human wastes should be removed from areas to be submerged or ploughed under or deeply buried. Ideally, such work should be accomplished within 1 year prior to submerison. The spread of contagious waste should be strictly prevented, and such waste should be disinfected and purified in situ in order to reduce contamination to a minimum. To prevent eutrophication and ensure good sensory properties, all forests, shubbery and stands of trees should be removed. The latter produce organic material and chromoplasts, thus increasing coloring and organic contents and altering the

taste and smell of water. When prospective reservoir bottoms are cleared, special attention should be addressed to the cleanup of graves and animal burial grounds which will be submerged or can be easily washed away. Highly contagious wastes, especially the extremely dangerous *Bacillus anthracis*, should be strictly prevented from entering reservoirs. Reservoirs that are to provide drinking water supply must be cleaned up much more carefully.

Reservoir water color is related both to water flow speed and to the characteristics of submerged soil and vegetal pigmentation. Water discoloration increases in the summer, when planktonic (such as green algae) propagation has a great effect, and is hard to reduce through the purification procedures employed at water treatment plants. Reservoir water is undesirable due to its fishy smell and muddy taste. There have also been reports of toxicity caused by aquatic plants. Due to photosynthesis, reservoir water is often saturated with dissolved oxygen, which therefore usually cannot be used as an index to evaluate the water quality.

Reservoirs can also affect the level of water tables and well water and spring-water flow, which changes are usually detrimental. Water quality changes, sometimes very distinctly, due to the mixing of ground- and reservoir water, which increases moldiness, stench and pigmentation and alters the contents of such chemicals as salts and alkalis. For example, water in the Gubixuefu reservoir seeps through cracks in the reservoir's peat-covered limestone and dolomite substructures. Shortly after the creation of the reservoir, water in neighboring wells 45-70 meters in depth was found to contain several tens of milligrams of chlorides per liter, and these concentrations greatly increased thereafter.

#### IV. Environmental Medicine Problems in the Gezhou Dam and Reservoir Area

On 4 January 1981, the Gezhou Dam began to interrupt water flow for storage. In order to compare the effect on the health of residents of the changes in environmental medical conditions caused by water storage, we formulated an observation plan according to the survey and observation principles of environmental epidemiology and including the active radius and possible range of influence of vector animals. An epidemiological reporting system was established, and personnel were assigned to collect from each commune historical information on natural foci of infection and endemic and epidemic diseases and to record the volume and distribution of each pollution source. Points were set up to observe the changes in vector-animal species population at specific intervals, patients were examined, pollution conditions in the sources of drinking water were monitored, and dynamic changes were analyzed to provide a medical basis for the environmental impact evaluation of the Gezhou Dam and reservoir and for the overall plan and engineering design of the Sanxia High Dam. The following preliminary conclusions were obtained.

1. Surveys of Natural Foci of Infection. Before and right after Liberation, there were many causes of disease. The climate in the reservoir area was temperate and humid, rice fields were filled with water, hills and ditches crisscrossed the area, alluvium grew into shoals, and weeds grew everywhere.

Such an ecosystem favored the breeding and habitation of vector animals and facilitated the rapid spread of disease among humans and animals.

2. Malaria Prevention in the Gezhou Dam Area. Surveys indicate that Yichang Prefecture in Hubei has a low incidence of malaria and that the protozoon type of the disease is the Plasmodium vivax. It is estimated that the life span of adult mosquitoes will be lengthened now that the Gezhou Dam has begun to retain water, because backwater from the reservoir will create shallow water areas in tributaries, and low-lying weedy areas experience increases in humidity. This phenomenon is common in medium and large reservoirs in China and the rest of the world.

3. Schistosomiasis. The natural landscape changed totally after the Gezhou Dam was built. No live oncomelania was found in the 1981 survey.

4. We Must Carry Out Surveys of Other Endemic Diseases and Be Attentive to Monitoring Work. Preliminary environmental medical investigation of the Gezhou Dam area, especially the monitoring work conducted before and after water retention, indicates that there were no distinct differences between the area and neighboring counties regarding the nature and distribution of and the patterns of change for pathogenic factors. It is projected that, after the dam is completed, no major change will take place in the short run as long as sanitary and epidemic control measures are taken seriously. When formulating overall engineering projects, we should adopt malaria prevention measures, beginning with the eradication of environmental conditions favorable to mosquitoes. Before storing water, the bushes and weeds around reservoirs should be thoroughly cleared to provide a clean environment, and in areas where water levels fluctuate and water tends to accumulate, drainage systems should be built and connected to the main reservoir. Water levels fluctuate seasonally, thus eliminating all breeding conditions for mosquitoes. Malaria incidence should be monitored constantly, observation of infection among children should be emphasized, forecasting work should be initiated for malaria prevention, protection of the susceptible population should be strengthened and the occurrence and spread of malaria should be controlled in order to avoid or minimize health hazards.

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12553

CSO: 4008/153

## WEIGHTING IN ASSESSMENT OF ENVIRONMENTAL QUALITY

Changchun DILI KEXUE [SCIENTIA GEOGRAPHICA SINICA] in Chinese No 1, Mar 84  
pp 38-42

[Article by Ying Longgen [2019 7893 2704] and Zhang Changping [1728 7022 1627], both of the Department of Geography, East China Normal University: "The Weighting Method of  $P_j$  Factor Analysis in the Assessment of Environmental Quality"]

[Summary] In spite of rapid progress achieved in research work on the assessment of environmental quality, the problem of weighting of various factors has never been really solved so far. Strictly speaking, weighting should be based upon the objective sub-contribution of specific assessment parameters to the total environment and their biological effects. But according to recently studied cases in China and abroad, due to quite a few reasons the conventional practice of weighting still follows the way of subjective judgment with strong artificial influence. This paper presents a new approach to weighting, i.e.,  $P_j$  factor analysis, based upon an attempt to comprehensively assess the environmental quality in the Baoshan-Wusong District of Shanghai. Our approach revises the conventional weighting practices in two directions. First, the measuring environmental value  $P_j$  is used as original information of weighting in the same way that a standard would be used, instead of relying on subjective judgment. Second, it introduces the approach of factor analysis to estimate the objective sub-contribution of specific assessment parameters and their interrelationship. This makes it possible to trace and interpret pollutant distribution, migration and reorganization in a regional system. Especially today, since the means of environmental monitoring has been electronized, the  $P_j$  factor weighting method may be used as a prerequisite for overall modernization of environmental quality assessment.

9717

CSO: 4009/108

## HUBEI CONFERENCE VIEWS LAND CONTROL PROBLEMS

### Rapid Loss of Farmland

HK031152 Wuhan Hubei Provincial Service in Mandarin 1100 GMT 2 Aug 84

[Text] At the first Hubei provincial conference on land control which closed yesterday, our reporter learned that the province's land control work was in chaos, the practice of arbitrarily occupying and using farmland was quite common, and consequently, there was a considerable decrease in farmland. According to a statistical survey, the province's farmland area decreased by 415,000 mu annually during the 20 years from 1961 to 1982, while the province's population increased by 760,000 every year. The annual farmland decrease is equivalent to the area of Shien City; in other words, the shrinkage in the province's farmland over the past 20 years totaled more than 8.3 million mu, equivalent to the total area of Xiangfan City.

The major reasons for the rapid shrinkage in the province's farmland area are that some units and a small number of individuals, have arbitrarily occupied and used farmland, ignoring the relevant state rules and regulations, the instructions of the central authorities, and the guidelines laid down in the documents concerned issued by the provincial CPC Committee and the provincial government. Some people have bought, sold, and rented out farmland according to private agreements, some units have made use of their good relations with the departments concerned to commandeer excess farmland but then let the farmland lie idle. Some people have wantonly occupied farmland while the others have built houses on farmland without approval.

The provincial conference on land control appealed to the governments at all levels to strengthen leadership over land control, conscientiously implement the relevant policies laid down by the central authorities and the provincial government, and handle cases of arbitrary occupation of farmland in violation of the law, in order to curb the illegal practice of buying and selling farmland and building houses on farmland. Meanwhile, the conference also called for promptly setting up a sound land control organization to efficiently administer and use all farmland of the province in a unified, comprehensive, and scientific way according to law.



## Better Management Urged

HK031210 Wuhan Hubei Provincial Service in Mandarin 1100 GMT 2 Aug 84

[Station commentary]

[Text] The area of our province's farmland is decreasing at a rate of more than 400,000 mu a year. This is a really shocking fact showing that the strengthening of land control is a task which cannot afford delay. As the saying goes, all things come from the earth, and the earth produces grain. Our country has a large population but limited farmland. This has long been a conspicuous contradiction. In the wake of the development of the national economy and the constant improvement of the people's livelihood, more farmland will surely be allocated for other uses and thereby further aggravate this contradiction. However, we need a sufficient supply of farmland in order to fulfill our aims in agricultural development. Therefore, the efficient control and use of farmland have an important bearing on the realization of the magnificent goal of socialist modernization. How well we complete this task will determine the quality of the environment we will leave to our descendants.

Therefore, this task is a key matter of fundamental and overall importance. If we continue to shut our eyes to the phenomenon of arbitrary occupation and use of farmland, we will certainly be punished by history and be scolded by our descendants.

The efficiency of land control depends on the policy adopted and is related to work in many fields. Strengthening leadership is the key to efficient land control. Local governments at all levels must regard the policy on land control as a state policy and place land control at the top of the agenda. The vast number of cadres and the masses should for their part treasure farmland, thinking about the interests of their descendants. Everyone must abide by the laws and decrees promulgated by the state concerning land control, resolutely safeguard the socialist public ownership of land, and conscientiously protect land resources. All departments concerned at all levels must efficiently administer all land under their jurisdiction, make reasonable and full use of all land, raise the productivity and utilization ratio of land, and devote great efforts to the improvement of environment so as to contribute further to socialist modernization.

CSO: 4008/395

## WUHAN MOVES TO CONTROL INDUSTRIAL POLLUTION

OW291522 Beijing XINHUA in English 1435 GMT 29 May 84

[Text] Wuhan, May 29 (XINHUA)--About one-third of the nearly 600 heavy pollutant-discharging factories and workshops in Wuhan, a major industrial center in central China, have either closed down, stopped operation or shifted production to non-polluting processes.

This is a result of steps taken by the city government to improve the environment of Wuhan which has more than 3,800 factories and enterprises.

Since 1980, the city government has taken economic sanctions against factories which fall short of pollution control standards. More than 800 factories have been fined and 160 anti-pollution projects built with the revenue thus obtained.

Waste gas, sewage and industrial residue are being processed and applied to economically beneficial ends. The Wuhan petrochemical works makes between 30,000 and 40,000 yuan a month from recovered sulphur and various oil by-products.

Environmental monitoring is done by vehicles patrolling the city and a network of 20 data-collecting stations.

CSO: 4010/117

TIANJIN STILL SINKING, BUT RATE SLOWS

OW101728 Beijing XINHUA in English 1431 GMT 10 Jul 84

[Text] Tianjin, July 10 (XINHUA)--Tianjin, a major industrial and port city in north China, sank 14.4 centimeters in 1983, two centimeters less than in 1982, according to city geologists.

The maximum subsidence in some areas of the city was 18.8 centimeters a year due to the overuse of the underground water, according to records.

To check subsidence, measures were taken to save underground water while recycling more surface water. More than three million cubic meters of used surface water were pumped into the ground last winter for use in this summer, and fifty-eight percent of the used water was recycled last year.

A large project diverting water from the Luanhe River to Tianjin was put into use last September, and it has since supplied more than 600 million cubic meters of water to the city. New waterworks have been added and existing ones expanded.

The Tianjin Municipal People's Government is organizing scientists and technicians of the local geological and water supply departments to work out plans to basically control subsidence by the year 1990.

CSO: 4010/117

## ELECTROPLATING POLLUTION REDUCED IN TIANJIN

Tianjin TIANJIN RIBAO in Chinese 8 Feb 84 p 2

[Article: "Treating Electroplating Wastewater Reduces Pollution"]

[Text] Our municipality has consolidated city construction regulations and carried out a professional readjustment of electroplating, thereby reducing pollution in the urban district. From 1979 to the present, we have moved 8 seriously polluting electroplating plants from residential areas to the suburbs and relocated 13 electroplating sites that were within 300 meters of drink-water sources on the Hai He. We have eliminated 306 sources of electroplating pollution, reduced pollution of air and drinking water and carried out pollution treatment at electroplating production sites.

In the last few years, the Tianjin Environmental Protection Bureau has used the receipts from fines levied for exceeding pollution standards, local renovation and reconstruction funds and capital raised by enterprises--a total of 2.5 million yuan--to treat water polluted by electroplating. Through such treatment, 1.47 million tons of wastewater meet national discharge standards each year. More than 50 units can absorb, purify and treat chromium acid mist, nitrogen oxides and waste acid vapors, while in more than 60 electroplating sites, nearly 20,000 square meters of electroplating ground surface have been covered with anti-seepage floors of acid-resistant ceramic tiles, granite and diabase cast stone, whose cracks have been sealed with epoxy. Thus pollution of the urban area has been reduced.

12380  
CSO: 4008/193

## HENAN STIPULATES 50 ENVIRONMENTAL PROTECTION PROJECTS

HK070757 Zhengzhou Henan Provincial Service in Mandarin 1230 GMT 5 Jul 84

[Excerpts] In order to carry out the spirit of the first provincial conference on environmental protection held in March this year, the provincial Planning Committee, the provincial Economic Committee, and the provincial Urban and Rural Construction and Environmental Protection Department recently jointly issued a circular to make known the second group of 50 projects which must be handled within a definite period. Most projects must be handled within 2 years, and some overall treatment projects should be completed between 1985 to 1988.

The projects which must be handled within a definite period include the Zhengzhou Aluminum Plant, the Anyang Iron and Steel Plant, the Pingdingshan Coking Plant, the Zhongyuan Oilfield, the Zhengzhou Pesticides Plant, the Xinyang Phosphate Fertilizer Plant, the Henang Chemical Industrial Plant, the Kaifeng Chemical Fertilizer Plant, the Luoyang Tractor Plant, the Luoyang Glass Factory, the Xinxiang Cement Plant, the Zhengzhou Meat Processing Plant, the Kaifeng Paper Mill, the Zhoukou Leathermaking Factory, and 28 other units, in which the single item of treating waste water, waste gas, waste residue, and industrial wastes should be carried out. The eight other projects are [words indistinct], the treatment of (Jingshui) River in Zhengzhou City, the protection of the headwaters of (Xiliu) Lake in Zhengzhou City, the overall treatment of a stream in (Zhuhua) Street of Zhengzhou City, the treatment of (Chanhe) River in Luoyang, the treatment of (Panyang) Lake in Kaifeng City, the overall treatment of the (Chuya) Lake Reservoir, and the treatment of (Lihue) section of (Dihe) River.

CSO: 4008/385

## HENAN CITY INVESTS IN ANTIPOLLUTION MEASURES

OW201332 Beijing XINHUA in English 1246 GMT 20 Jun 84

[Text] Luoyang, Jun 20 (XINHUA)--Fish have come back to a river in the rising industrial center of Luoyang in Henan Province and soot has been reduced in the municipality, thanks to anti-pollution measures.

According to the city environmental protection bureau, more than 28 million yuan have been invested in the last five years on 263 projects to improve the city environment. They include the establishment of a citywide atmosphere monitoring system, and dust removers installed on 140 of the city's 680 furnaces and kilns. The newly installed facilities are able to filter out 80 percent of dust discharged from chimneys.

The Luoyang heat and power plant used to dump coal ash into the nearby river, blackening its water and killing the fish. In 1981, the factory spent 8.1 million yuan on a recycling plant, and the river is gradually coming back to life.

In addition, non-cyanic electroplating has been introduced to 22 major plants which used to be heavy polluters.

With a population of 990,000, the ancient city of Luoyang has become an industrial center with the construction of China's first tractor plant, a large ball-bearing plant and many other factories. Today, it has 470 enterprises in machine-building, metallurgical, chemical, building materials and power industries.

Along with the anti-pollution efforts, Luoyang has launched a program to beautify the ancient city. Today, streets are shaded by trees and lined with lawns and flowerbeds. Peonies and Chinese roses have become popular in factories, schools and people's homes.

CSO: 4010/117

## SURVEY OF ENVIRONMENTAL PROTECTION WORK IN GUANGDONG

Guangzhou HUANJING [ENVIRONMENT] in Chinese No 5, 1 May 84 pp 2, 4

[Article by Jin Yang [6855 7122], committee member of the Guangdong Advisory Commission: "Environmental Protection Work in Guangdong Must Progress a Step Further."]

[Text] If environmental protection work in Guangdong is to make a breakthrough it must first advance a step. The central authorities have demanded that the economic construction in Guangdong advance before the nation as a whole, and environmental protection, which is an important constituent of the national economy, must be suited to that economic construction. At present, economic construction in Guangdong has progressed especially quickly in construction of the Special Economic Zones and in the economy of the Zhu Jiang Delta, of which everyone is aware. However, the development of environmental protection and of economic construction cannot yet be of a similar pace, and there is still a distance between them. Environmental protection work cannot be out of step and must progress, only in this way can we ensure that Guangdong economic construction will press forward, and only in this way can we create a new situation; without this we will affect the pace of the entire construction. We must face facts, be resolute in our confidence that we can progress, and enable environmental protection work to even better serve economic construction.

What constitutes progress? It is none other than when the work that has already placed environmental protection in an advanced position is to strengthen and continue its development; when work in middle or backward stages or work that is called a weak link will move forward to catch up in a planned fashion and at a quicker pace. What kind of work in this province has reached advanced levels? Selecting just the main points, there are:

1. The Shunde experience. Primarily, resolved the problem of rural environmental pollution brought on by development of rural and township enterprises. This experience should be popularized, and each prefecture should foster and establish models like that of Shunde county, which will enable the rapid development of environmental protection work in the rural areas of Guangdong.

2. The experience of Chaozhou. For the most part, environmental science has been popularized in middle and elementary schools, which has allowed environmental protection to become firmly established in the thinking of youth, and has a far reaching significance.
3. Strengthening of the environmental protection organizations in Guangzhou city. With a readjustment of structure, all levels of environmental protection organizations were strengthened, forming a sound system in a fundamental way. This has been an effective guarantee to protect the environment successfully.
4. Accomplishing publicity and education. This magazine, ENVIRONMENT, has been welcomed by readers; provincial environmental protection schools have fostered a body of talent; various types of classes have been organized. All three must be managed even better. All areas should elevate the work of propaganda and education to a primary position.
5. Develop the role of environmental conferences. Provincial environmental conferences were managed by specialists and were rather lively; the Chaozhou environmental conference on middle and elementary school education was also run well. All areas should rely on conferences, these "front armies," to encourage the constant advancement of environmental protection work.
6. Work such as the nature survey of Hainan Island; background investigations into special environments; and the pre-evaluation of the environmental impact of thermal power plants all have special characteristics. Having done this fundamental work, we have been able to bring about the conditions for managing environmental protection within a certain scope.
7. There have been results in the work of smoke prevention and dust control. Cities like Guangzhou and Foshan are outstanding examples; air pollution in various medium and small cities has in general been brought to varying degrees of control. Smoke prevention and dust control ought to continue to undergo technical transformation in order to manage it even better.
8. Accomplish the tasks of scientific research and monitoring. The Provincial Office of Environmental Protection has cooperated with relevant areas to obtain a certain measure of results in scientific research; environmental monitoring stations in the various prefectures have gradually attained their rightful function. In particular, with the set up of the atmospheric pollution automatic monitoring groundstation there will be a scientific basis for improving environmental conditions in the cities.
9. There have been obvious results in the control of the "three wastes" by large polluters. Pollution from the Maoming Oil Refinery, the Shaoquan Smeltery, and large factories within Guangzhou with the name "Guang" in their titles has been basically controlled; pollution from other plant and mining enterprises has improved to varying degrees.
10. County level environmental protection organizations have been set up everywhere. Of the 95 counties throughout the province, by the end of 1982



85 had established environmental protection organizations, which is about 90 percent, and there were more in 1983.

There are also some more advanced aspects that we are not listing one by one, but even within that which is advanced there are still insufficiencies, as in lack of attention to solidification and continuing advancement, where there is danger of falling behind.

There are even more aspects of the task of environmental protection in this province that lie somewhere in the middle or even to the point of backwardness. Chief among weak links are: the work of publicity has been carried out too narrowly, especially in stimulating the various publicity departments. This includes the use of various tools of publicity, which have been used insufficiently to display environmental protection publicity before all levels of leadership and the broad masses. The two vast tasks of publicizing to villages and schools have also been weak. Environmental protection organizations are still insufficiently formed, some of the organizations included do not complement each other, do not constitute a set, and do not make up a network. The work of monitoring has not kept up with the demands of developing circumstances. The task of monitoring is the eyes and ears of environmental protection, as well as its basis, although at present technological capabilities are inadequate, instruments and equipment are lacking, and are insufficiently advanced. Agroecology and the job of marine environmental protection have not developed everywhere and have not gotten into line yet with the system of environmental protection itself. Investigative research and the formulation of environmental strategies and plans have not been conscientiously emphasized.

Can the work of environmental protection in Guangdong progress? Since some tasks have made progress, as long as we constantly move forward, are daring in innovation, with one eye on advancement and one eye paying attention to weak links, we will bring along the middle, and when this has been thoroughly grasped, it will be completely possible for us to go forward. In the meantime, we need to concentrate on a few points:

We want to increase consciousness of the task of environmental protection, be full of confidence, and be resolute in determination. We want to establish lofty aspirations and great ideals to overcome difficulties in the path ahead and to constantly encourage the progressive development of the task of environmental protection.

We want to give full rein to strong points, use advantageous conditions, and by including the basis that already exists, the aspects that are already advanced, and the experience we already possess, to determine strategic goals and planning for environmental protection. We want to arrange concrete campaign positions that will allow our goals and plans to become realized and to conscientiously produce success.

We want to attentively implement the spirit of the Second National Conference on Environmental Protection, to deeply publicize that environmental protection is one of China's basic policies, and to proclaim that

environmental protection should not follow the old path of population problems. We want to encourage all levels of government and environmental protection committees that were set up long ago as well as set up perfect environmental protection organizations to carry on the task of environmental management.

Every year we want to solve some of the environmental problems that the masses urgently demand we solve, to create a beautiful working and living environment, to guarantee the health and prosperity of the masses, and to obtain the support of the masses and the respect of the leadership.

12586

CSO: 4008/356

## 'THREE WASTES' TREATMENT IN LIAONING REPORTED

Guangzhou HUANJING [ENVIRONMENT] in Chinese No 5, 1 May 84 pp 6-7

[Article by Wang Changyuan [3076 1603 3293] and Rong Weilin [2837 4850 3829] of Liaoning Province: "Important Ways to Control Pollution"]

[Text] Fushun is a comprehensive industrial city that concentrates on fuel, power, and raw and semifinished materials industries. Pollution from the "three wastes" is serious, affecting not only economic development but harming as well the physical well being of the people.

In recent years, Fushun has obtained an excellent record by energetically developing comprehensive utilization of the "three wastes" as an important way to control pollution. From 1980 through 1983 the city as a whole put into effect 103 projects for the comprehensive utilization of the "three wastes" that have yielded very good environmental, economic, and social results. According to statistics, during the 4 years more than 600,000 tons of oil, 350,000 tons of coal, 113.8 million kwh of electricity, and 35 million tons of water were saved, and there resulted as well the recovery of a great quantity of resources like platinum, lead, powdered sulphur concentrate, iron ore powder, the raw materials of concrete, cracking crude oil, coal sludge, hydrocarbons in liquid state, and acrylonitrile, the economic value was 84.13 million yuan, which was more than 22.67 million more than the original amount of investment. At the same time, 2,408 people were employed, which unified the environmental, economic, and social results, and quickened the pace of pollution control.

The Hun He is the lifeline of water resources for the Shenyang-Fushun sector. Fushun is at the headwaters of the Hun He. The water quality in the Shenyang-Fushun sector of the Hun He not only directly affects the production and everyday use of water in Fushun and surrounding villages, but affects as well the production and everyday water use of the Shenyang and Yingkou areas at the lower reaches of the river and extends to the millions living along the coast. Before 1979, the city annually released into the Hun He more than 200,000 tons of powdered coal ash, more than 100,000 tons of coal sludge, 12,000 tons of oil, 830 tons of volatile phenol, and 137 tons of cyanide. The seriously polluted rivers and blocked river channels caused the water to become black and odoriferous, and fish and shrimp disappeared. During the 70s there were even major pollution incidents of fire from burning oil on the river and poison in the sources of drinking water. In confronting

pollution conditions of this magnitude, Fushun has taken management of the Hun He as its focus and energetically developed comprehensive utilization of resources from the "three wastes." Since 1979, they have used pollution discharge fees, a comprehensive utilization profits withholding special fund, and self-prepared fund to an extent of over 30 million yuan to create 22 programs for comprehensive utilization of effluent, which has reduced pollution in the Hun He from sewage. In the past the Fushun power plants discharged 200,000 tons of powdered coal ash into the Hun He annually, not only silting up the river but paddy rice production in the cities and suburbs of Fushun and Shenyang was affected. Each year they have had to pay tens of thousands yuan in indemnities. In 1982 they set up a vacuum dehydration installation that annually recovers 150,000 tons of powdered coal ash, provided to brickyards for the production of red brick, and solves the problem of powdered coal ash pollution of the Hun He that has not been solvable for many years. In the past, Fushun had 3 coal mines that annually released more than 100,000 tons of coal into the Hun He, that not only caused a loss of resources, but turned the river water black. After adopting measures in recent years for the precipitation of coal sludge, it is no longer released into the Hun He. From 1982 through 1983, the Xiloutian mine and the Longfeng mine each set up large-scale precipitating basins that can recover nearly 100,000 tons of coal sludge annually. This not only recovers resources for the country but has allowed water quality in the Hun He to improve, bringing to an end a more than 50 year history of coal sludge pollution of the Hun He. After adopting sewage treatment measures like oil separation, flotation, and aeration, three petroleum refineries also successively set up secondary dehydration and oil recovery packages in oil storage areas causing a great decrease in the amount of sewage that contains oil. Crude oil released annually into the Hun He decreased from 1979's 12,000 tons to 1214 tons by the end of 1983, a reduction of 89.8 percent. Based on monitoring, when comparing 1979 with 1983, suspended matter content in water in the final reaches of the Hun He at urban districts decreased 63.8 percent, oil dropped 34.5 percent, phenol decreased 95.3 percent, and ammonia and nitrogen decreased 71.3 percent. The pH value, suspended matter, dissolved oxygen, and amount of biochemically consumed oxygen reached the standard for surface water.

Comprehensive utilization is also a major way to control air pollution. Before 1979, 80,000 tons of cement dust and 1300 tons of carbon black were released into the atmosphere annually throughout the city, as well as great quantities of gas fumes and surplus heat. Not only was this a large waste of resources and energy, but it also added to air pollution causing the air in the urban district to reach a "serious pollution level." Since 1979, and with an investment of over 20 million yuan, 55 waste gas, dust, and surplus heat comprehensive utilization projects have been built, with an obvious improvement in air quality. For example, cement dust has been one of the chief reasons for settlement being excessively over acceptable levels. During the past three years, after three cement companies each set up electronic dust collecting and bag filter packages, cement dust decreased 80 percent with an annual cement recovery of 64000 tons at a value of 1.28 million yuna. Three carbon black enterprises each set up carbon black recovery and purification installations and measures for post purification tail gas fuel

substitution, and annually recover more than 1000 tons of carbon black. The post purification tail gas may be used as a substitute fuel, which saves annually 3500 tons of fuel oil and 2800 tons of coal. Thus, both economic and environmental results have been good. The Fushun Chemical Plant also uses carbon black tail gas for fuel to generate electricity, each day generating 50,000 kwh which accounts for two-thirds of the plant's electricity usage. Recovering the gas expelled into the air by the Fushun Petroleum Plants No 1, No 2, and No 3 and burning it in place of fuel oil purifies the air and each year saves 50,000 tons of fuel oil with a value of 2.6 million yuan. Units at the Fushun power plant, the Fushun steel factory, and the two petroleum plants use the surplus collective heating from the factories to heat an area of 2.86 million square meters, discontinuing the use of more than 400 boilers at an annual saving of 170,000 tons of coal. Currently, the quality of air throughout the city has been improved. According to monitoring, and comparing 1983 with 1980, the amount of coal burned increased 14.9 percent although gross output value for industry increased 9.6 percent. However, not only did air pollution decrease, carbon dioxide, carbon monoxide, and nitrous oxide in the urban area air has met effluent standards. Particulates were reduced from 0.88 mg per cubic meter to 0.848 mg per cubic meter; settlement fell from 36.19 tons per square km per month to 34.83 tons per square km per month, and air pollution in the urban area dropped from a "serious pollution level" to a "pollution level."

In addition, comprehensive utilization has been carried out in adopting the measures of pit back filling, paving, brick manufacturing, and manufacture of raw materials for concrete in relation to industrial dross, and the utilization rate has already reached about 54 percent.

The reason work on comprehensive utilization of the "three wastes" in Fushun could be developed, adhered to, and successful has been inseparable from the high regard by and support from the leadership. The city CPC committee, the city People's Congress, and the city government have all been extremely concerned with recovery and use of the resources of the "three wastes," with carrying out the comprehensive utilization, and with eliminating pollution and improving the environment. In order to concentrate on pollution prevention and control of the Hun He, for routine business the mayor is in charge and the committee, office, and bureau leadership all participate. They have set up a Hun He prevention and control campaign headquarters, and the efforts of organizations, various mobilization departments and units are actively supporting the campaign program. The city leadership regularly goes down to the grassroots levels, understands the conditions, is fulfilling the task, and is solving problems with the comprehensive utilization work. Implementing the policy of profits withholding for comprehensive utilization directly affects the problems of local revenues, but the city CPC committee leadership has clearly proposed: "All products that have as a chief component the resources of the 'three wastes', that which should not be taxed will not be, and where profits should be withheld they will be withheld," to support factories, mines, and enterprises in comprehensive utilization. The city People's Congress has twice organized delegations to investigate major polluting units, and these have been of great encouragement to enterprises.

Second, with publicity, and with implementation of the "Environmental Protection Law" and of Premier Zhao Ziyang's written instructions concerning environmental protection work at the Anshan Iron and Steel Company, this has mobilized enthusiasm for enterprises to manage pollution from the "three wastes" and to develop comprehensive utilization. It has enabled enterprises to recognize that engaging in comprehensive utilization of the "three wastes" can make profit from harm, can change waste to something treasured, can eliminate pollution, can protect the environment, and that withholding of funds can act as a special fund for use in environmental protection. Therefore, large and small factories and mines have flocked to set aside funds for comprehensive utilization programs. In just the 2 years 1979 and 1980 funds set aside by enterprises reached more than 10 million yuan, in more than 50 comprehensive utilization projects. In accordance with methods of profits withholding, environmental protection departments have joined with financial departments to jointly examine and approve 33 comprehensive utilization projects to be provided with profits withholding, with a yearly withholding rate of about 7 million yuan. With one examination and approval, withholding for 5 years or for 3, by the end of 1983 4 years of accumulation actually withheld profits of 28.81 million yuan. Under implementation of the profits withholding policy for comprehensive utilization enterprises have grown self reliant, environmental pollution is being solved, financial channels have been opened, and as a consequence there has been further stimulus of enthusiasm for enterprise. During the years 1980 through 1983, individual enterprises have used withholding funds to arrange another 141 environmental protection projects, enabling city-wide pollution prevention and control work to develop unceasingly.

Third, there has been cooperation between financial and taxation departments. Implementing the economic policy of rewarding "three wastes" comprehensive utilization has been the key to developing that comprehensive utilization. Profits withholding had to be jointly examined and approved by financial and taxation departments and environmental protection departments. To properly carry out the task of joint examination and approval of profits withholding we must secure the cooperation of the financial and taxation departments. We took the initiative to publicize to financial and taxation departments the important significance of undertaking comprehensive utilization of the "three wastes" and implementing the policy of profits withholding. This enabled financial and taxation departments to realize that although financially this bit of income would be temporarily unavailable, after 3 or 5 years this amount of money would always enter into the financial budget. If comprehensive utilization of the "three wastes" were not developed, the resources that were wasted would never be obtainable for use, and the public finance would never get that amount of money. What is more, environmental pollution would never be controlled. Weighing the pros and cons it was felt that it would be best to implement the policy of profits withholding and encourage the development of comprehensive utilization of the "three wastes" resources. When all were agreed both sides advocated making the effort to affect industry, mining, and enterprise, to jointly investigate and study, and to cooperatively examine for approval "three wastes" resources comprehensive utilization and the amounts for profits withholding. Under implementation of the comprehensive utilization withholding policy

there will be constant improvement in the enthusiasm for enterprises developing comprehensive utilization.

Although we have achieved some success during the work of developing comprehensive utilization of the "three wastes" these last few years, it has not been enough. At present, the potential for city wide "three wastes" comprehensive utilization is still very great, and the task of controlling pollution is still an onerous one. Hereafter, the spirit of the 12th Party Congress should serve as a guide for the diligent implementation of the spirit of the Second National Conference on Environmental Protection, for the summation of experiences and precepts, for continued striving and working, and when development of "three wastes" comprehensive utilization is finally at hand, for the constant opening of new doors on the task of environmental protection.

12586

CSO: 4008/356

## SICHUAN, HUNAN IMPROVE ENVIRONMENTAL MONITORING

Beijing ZHONGGUO HUANJING BAO in Chinese 24 Apr 84 pp 1, 2

[Article by Zhou Guiling [0719 2710 3781]: "Sichuan and Hunan Greatly Strengthen Construction of Environmental Monitoring Stations"]

[Text] Editor's note: Environmental monitoring is a fundamental task of environmental protection work. It is a means of scientifically managing the environment, and must be implemented and strengthened.

Sichuan and Hunan Provinces implemented practical measures following the Second National Environmental Protection Conference to strengthen the construction of environmental protection monitoring stations, and the organization and construction of environmental protection monitoring stations were implemented at appropriate places. This will undoubtedly serve a great role to promote the early establishment of a monitoring network, the formation of an environmental monitoring system that is forceful in command, versatile in operation, that has close coordination and that can reflect the situation in time.

Sichuan and Hunan Provinces implemented concrete steps following the Second National Environmental Protection Conference and made important decisions to strengthen the construction of environmental monitoring stations.

With the consent of the Sichuan Provincial People's Government, the provincial Labor Commission, the provincial Financial Department and the Urban and Rural Construction and Environmental Protection Department issued a communique and decided to beef up the existing 21 environmental monitoring stations throughout the province and to build 100 new environmental monitoring stations at the prefecture and county levels. An additional 2,660 people were recruited. The document stipulated that the temporary status of the 21 environmental monitoring stations will be changed to permanent status. The staff in the two cities of Chongqing and Chengdu is set at 130 to 150 people. The staff in the two cities of Zigong and Dukou is set at 50 to 60 people. The staff of environmental monitoring stations in other regions and prefectures is set at 35 to 45 people. The staff of the newly built prefecture level monitoring stations is set at 35 to 45 people. County level stations are classified into large, medium and small stations according to the actual conditions. The large stations will have a staff of 25 people, the medium stations will be staffed by 20 people and the small stations will have a staff of 15. In such cities as Chengdu, a second monitoring station and the Qingbaijiang Ward monitoring station were established with a staff of about 35 to 45 people.



The document also stipulated the needed operating funds for the environmental monitoring stations at each level. The funds were included in the budget for contract work at each administrative level.

Hunan Province placed the construction of county level environmental monitoring stations in an important position. Recently, the provincial Finance Department, the Urban and Rural Construction and Environmental Protection Department and the bank of construction issued a communique and clearly stated that environmental monitoring stations will be established in all counties, county level cities and areas with a population over 500,000. It also determined the scale of the stations and the sources of capital, and made it clear that the authority for approval of the stations will be in the hands of the provincial Urban and Rural Construction and Environmental Protection Department. The document asked the urban and rural construction and environmental protection departments at each level to concentrate on the construction of monitoring stations, strive to obtain approval and to start construction during the same year and to complete construction and begin operation during the same year.

9296

CSO: 4008/385

## ENVIRONMENTAL PROTECTION EFFORTS IN DUKOU

Chengdu SICHUAN RIBAO in Chinese 16 Mar 84 p 2

[Article by Liu Nansheng [0491 0589 3932]: "The Key to Managing Environmental Protection Is Serious Attention By the Leaders--Investigation Into Controlling Environmental Pollution in Dukou City"]

[Text] For a time environmental pollution in Dukou was rather serious. Later, after strengthening environmental management and control of 145 sources of pollution, environmental pollution has decreased annually since 1980. Following a great reduction in the amount of sewage discharged exceeding standards, the quantities of phenol, cyanogen, and mercury contained in waters of the Dukou segment of the Jinsha Jiang reached the standards for surface water quality. Particulates and carbon monoxide emitted into the atmosphere were also greatly reduced, and the average quantities of sulphur dioxide and nitrogen oxide in the atmosphere were lower than standards for national environmental quality.

In the 8 years that Dukou has been controlling the environment it has made great advances, and the most important reason has been serious attention by the leaders. Before 1975, there was billowing thick smoke and polluted water throughout the city because of the development of industrial production and the sharp increase in the city's population, which seriously affected the work of laborers. With the encouragement of the first national and provincial conference on environmental protection city leaders recognized the importance of environmental protection, and beginning with organization and ideological improvements they vigorously strengthened environmental management. They set up a city-wide leading group and office for environmental protection, provided it with specialized cadres, and called the first city-wide conference on environmental protection. They also set up environmental protection organs in large and medium scale enterprises like the Panzhi Iron and Steel Co. and the Dukou cement plant. At the same time, they broadly developed environmental protection publicity for the people, and workers of the city, printed relevant materials, and enabled everyone to realize that: there must be a determination to control environmental pollution. The city environmental office and relevant departments wrote a 5-year plan for environmental protection. At the second city-wide environmental protection conference, leading cadres of the city CPC committee issued the slogan, "fight against pollution, fight hard for 3 years, and control pollution." Leaders from various levels divided

up the labor for this task and included it in their daily agendas. It was also provided that every year environmental protection departments at all levels would report on their work to party and governmental leading organizations, to the standing committee of the people's congress, and to a general meeting of workers and staff. Every year leaders of the city people's congress and the city government personally go to plants, mines, enterprises and service units two or three times to check on environmental protection work to form regulations.

In controlling pollution Dukou City has adopted model methods for leading the way. They first concentrated on the serious pollution by the Dukou cement plant, the Hemenkou power plant, the Panzhi coking plant, and a refractory materials plant, and using their results did away with some people's "pollution is hard to avoid theory" and "pollution cannot be controlled theory," and strengthened everyone's confidence in controlling pollution. The broad mass of workers, science and technology personnel, and cadre all vied with one another to submit plans and policies, to tackle key technical problems, and to set up facilities for the control of pollution. On this basis, they organized great cooperation for city-wide control of pollution. By 1980, environmental pollution throughout the city had begun to be controlled.

However, merely relying on controlling the sources of pollution will not fundamentally solve the problem of environmental pollution. Implementing the policy of "integrating management and control" brought forward by the national conference on environmental protection, they are on the road to overall management and overall prevention. Organization of environmental protection and scientific research departments by Dukou City depended upon the cooperation of the nation's higher institutions and scientific research units, they began research on overall assessment of environmental quality and overall prevention of environmental pollution. They finished the overall assessment of environmental quality in Dukou in 1982. This achievement was awarded a provincial major science and technology prize. The results of implementation have been that work on city-wide environmental protection has proceeded to a new stage of overall management and overall prevention.

In practice Dukou realized that many environmental problems are created because of a lack of environmental management or because of poor management. Only by focusing on prevention, by combining prevention and control, and by strengthening environmental management can the problems be resolved rather quickly. The city has combined environmental management and regulation in the overall planning for the city and enterprises, making it known to all levels while investigating and summing up; they similarly assess the rate of operation for production equipment and environmental protection equipment. Economically, they resolutely implement environmental protection regulations, maintaining that "whoever pollutes is responsible for control" and levy fees when the discharge of pollutants exceed standards. The index for pollution standards and index for excess pollutants fees are applied to factories and mines, workshops, and teams and groups, and the system of personal responsibility is one standard for economic assessment and for consolidating enterprises. Profits gained from use of the three wastes go to whoever manages it. This has aroused everyone's enthusiasm for environmental protection.

To protect the environment the city integrated regions and departments, unified planning, and division and assignment of the work to individuals or groups. For new plants and mines they strictly carry out the provisions of the "three simultaneous efforts," and as much as possible make use of advanced equipment that is either non-polluting or less polluting. In areas where pollution is serious, they will not build residential zones. In areas where factories and residential areas are intermingled they have moved or demolished some temporary structures. They have planned a protective zone and undertook tree planting. At present, the rate of green cover in the city has risen from the 4 percent of 1979 to more than 20 percent.

12586

CSO: 4008/241

LAWS AGAINST DESTROYING NATURAL RESOURCES OF MIN JIANG VALLEY

'Notice' on Min Jiang Area

Fuzhou FUJIAN RIBAO in Chinese 23 Feb 84 p 1

[Article by Liu Jinzhi [0491 6855 2655] and He Shaolin [0149 1421 2651] of the General Office of the Provincial Government: "Guarantee the Safety of the People's Life and Property, Protect and Utilize the Natural Resources of the Min Jiang--A Specially Issued Notice by the Provincial Government Demanding That Each Area Strictly Implement it, Violators To Be Severely Dealt With"]

[Text] On 15 February the provincial people's government called the sixth Standing Committee meeting this year to successfully manage and protect, develop and use the natural resources of the Min Jiang Valley. They passed resolutions, and issued the "Fujian Provincial People's Government Notice on Strengthening Management of the Min Jiang and Protecting the Natural Resources of the Min Jiang Valley," which went into effect from the day of promulgation.

The "notice" prohibits the unauthorized reclamation of land from river channels or on river banks, occupying shores and filling in river areas, construction of factories or housing such that they obstruct the water, and random construction of spur dikes or erection of fences for swimming. Dumping of waste soil, waste rock, industrial residue, tailings, or rubbish into rivers or brooks is prohibited, as is the direct discharge of untreated toxic industrial effluent and sewage containing pathogens from hospitals into rivers and brooks. Electric shock fishing, fishing with poison, and blast fishing are not permitted. Obtaining soil, planting, blasting, excavation, opening ditches, burying pipes, erecting frameworks, drilling wells, and piling up sundry objects are not permitted within five meters on both sides of dikes and revetments in river channels. Ships and boats are not allowed to dump waste in unassigned areas, nor to expel contaminated oil or contaminated bilge water. Random cutting and denudation of forest trees is not permitted, nor is the clearing and planting of crops on slopes of 25 degrees or more, nor the random removal of rocks nor the random excavation of mines thereon. Buildings are not permitted to be constructed in violation of rules and regulations. All existing projects that violate the above provisions ought to follow the principle that whoever set up the barriers will clear them away, and whoever is in violation will make corrections. This will be handled within a definite time limit according to the degree of danger, and that which should be reconstructed will be reconstructed, while that which ought to be torn

down should be torn down. Projects constructed on the banks of the Min Jiang must be done so that they do not affect flood safety in the river course, so that they do not give rise to harmful changes in the physical features of the river, and so that they do not affect the safety of the upper and lower reaches and of the dikes on both banks. These projects must suit the requirements of water and soil conservation and of environmental protection, protection of aquatic product resources, as well as be beneficial to boat and ship navigation. If among the mainstream and tributaries there are dams built where there is a requirement to pass boats, logs, and fish, facilities must be set up according to the program grading for passing boats, rafts, and fish. Design, construction, and operation should be made simultaneously with the principal part of new building and related projects.

The people's government of Fujian Province has empowered the committee for the planned development of the Min Jiang Valley to supervise implementation of the provisions of this notice. All units and individuals who have outstanding achievements in the work of protecting the water and soil resources of the Min Jiang should be presented with meritorious rewards, and those units and individuals who violate the provisions of this notice and wantonly cause trouble shall be severely dealt with according to the seriousness of their cases, even to the degree of seeking responsibility for the crimes.

#### Commentary on Environmental Protection

Fuzhou FUJIAN RIBAO in Chinese 23 Feb 84 p 1

[Commentary: "Mountains Cannot Be Damaged, Rivers Cannot Be Polluted"]

[Text] In October of last year, when inspecting this province, Comrade Li Xiannian pointed out that mountains cannot be damaged nor can rivers be polluted. Recently, when Comrade Deng Xiaoping inspected the Xiamen Special Economic Zone, he made an important remark: "Get the special economic zones moving even faster, make them even better." This demands that economic construction both have a definite pace and that we must also talk about economic results.

As for the Min Jiang Valley, it has vast amounts of land directly adjacent to the coast, it has abundant natural resources, its surface area is half that of the province, the quantity of its commodities and the output value of its industries are more than half that of the entire province, and the timber that it ships out is 80 percent that of the whole province. From this we can see that the Min Jiang Valley occupies a decisive position in the economic construction of this province. However, at present, there are some extremely serious problems: arbitrary occupation of the riverbeds, discarded soil and coal cinders are dumped into the river in large quantities causing the river to be silted up and some sections have been reduced as well as causing increases in flood levels. The "three wastes" are dumped into the river in great quantities causing the pollution of the Min Jiang to be more and more serious, the forests are overcut, land is cleared along steep slopes, soil erosion is very serious.... These problems are getting worse every day, and if effective measures are not taken immediately nor management improved, the consequences will be unthinkable.

In 1982, the provincial CPC committee and the provincial government set up a committee for the planned development of the Min Jiang Valley which put forward the "Document on the Plans and Tasks of the Min Jiang Valley." In December 1983, the State Planning Commission officially approved the document, and made the management of the Min Jiang an experimental area for national land management. All we have to do is to resolutely follow the instructions of the Central Committee, the provincial CPC committee, and the provincial government, with unified thinking from top to bottom, with concerted effort, to be completely qualified to establish a modern economy in the Min Jiang Valley with stress on industry and with modern agriculture and forestry fully developed.

To attain this grand objective is naturally not one day's effort, but will require the effort of a generation of people, perhaps even two, and will need a great investment of manpower, material resources, and funding. However, a thousand li journey is started by taking the first step. With an eye on the future, we must put forth effort in the present. The most important task at present is to urgently mobilize, to curb and correct all violations of objective law, stop stupid actions that destroy natural resources, rivers and mountains, and that threaten society. The "8 prohibitions" and the "one sanction" put forward in the "Notice on Strengthening the Min Jiang Management and Protecting the Natural Resources of the Min Jiang Valley" issued by the provincial people's government are based on the various laws and regulations such as the national environmental protection laws, the forestry laws, aquatic products protection laws, and the regulations for water and soil protection. These are the summation of experiences and lessons from decades of management of the Min Jiang, and are provisions that must be adhered to as we get hold of our fate, operate within the laws of nature, and bring benefit to society. No one may violate them. Therefore, the "Notice" also clearly stipulates: violators will be severely dealt with in accordance with the seriousness of their cases, even to the degree of seeking responsibility for a crime.

We hope that under the leadership of all levels of party committees, and through the combined effort of the various departments and the cadres and masses from the various regions of the river area, around the Min Jiang the green hills will always be there, the blue water will ever flow, that it will become a river even more beautiful and richly endowed, that it will aid the modernist construction, and that it will enrich the people.

12586

CSO: 4008/241

## ENVIRONMENTAL PROTECTION IN NANJING

Guangzhou HUANJING [ENVIRONMENT] in Chinese No 2, 1984 pp 20-21

[Article: "Ten Accomplishments in Ten Years of Protecting Nanjing's Environment:"]

[Text] For the last 10 years, especially since the 3d Plenary Session of the 11th Party Central Committee, environmental protection in Nanjing has grown out of nothing and developed from a little to a lot, thereby opening up an era of new accomplishments and achieving good results.

### I. Improvement of environmental quality in some areas.

A. Strict precautions against the spread of new pollution. From 1975 to 1982, the city environmental protection department has examined and approved 430 cases of the "three simultaneous efforts." The rates of examination for new construction and excavated, improved and modified projects have been elevated every year, from 32 percent and 28 percent respectively to 90 percent and 64.8 percent.

B. Some sources of pollution have been controlled. For 10 years, the city's investment in environmental protection has been 150 million yuan, more than 70 percent was invested after the 3d Plenary Session. Nearly 2,000 units (sets) of various pollution prevention installations have been constructed so that the capacity for treating industrial effluent has reached 140 million tons per year, for waste gas, 23.2 billion standard cubic meters per year and for industrial residue, 210.8 tons per year.

C. We have basically controlled pollution of the water body of Xuanwu Hu by industrial effluent. Before 1977, 22 major plants along the lake discharged an average of 1,900 tons of industrial effluent into the lake every day. By 1982, this had been reduced to 1,200 tons and the average value of the concentration of five toxins in the waste water was lower than the discharge standards.

D. Marked improvements in the water quality along the Nanjing section of the Chang Jiang. According to data from 10 years of monitoring the toxicological levels along the Nanjing section of the Chang Jiang, there has been a great decline in the contents of toxins such as phenol, cyanogen, mercury, chromium and arsenic, and the oil-polluted areas have also been eliminated.



## II. Prevent industrial pollution through technical transformation.

From 1979 to 1982, the combination of technical transformation and comprehensive utilization has led to the completion of 297 pollution prevention projects, with a total investment of 60 million yuan. After the completion of these projects, the energy saved every year is equal to 260,000 tons of coal, and about 5 million tons of various metals and chemical raw materials have been recovered. The discharge of industrial effluent has been reduced by 80 million tons, sulphur dioxide by 10,000 tons and industrial residue by 1.2 million tons. In 4 years, 110 million yuan of economic benefits have been obtained.

## III. Environmental management has been improved.

Ever since 1976, we have formulated and promulgated three temporary management regulations on the protection of water sources, noise control and the discharge of smoke and dust by boilers and kilns and a series of management methods. In 1982, courts at the city and district levels accepted, heard and took care of 24 pollution cases, and levied pollution charges against more than 700 units that exceeded pollutant discharge standards. By adopting such measures as closing, suspending, merging and retooling factories, the sites of thermal treatment pollution were reduced from 140 to 106, and those of electroplating from 242 to 181. In 1982, we have handled 998 letters from people and resolved 49 disputes between plants and the people.

## IV. Rapid development of environmental monitoring forces.

We have set up 32 environmental monitoring stations in the city, prefectures, counties and at plants and mines. The total capital construction investment for the city, district and county environmental monitoring stations was 2.4416 million yuan, the construction area covers 13,000M<sup>2</sup>; the investment for equipment was 1.6 million yuan. There are 242 major pieces of equipment and 11 monitoring vehicles.

## V. We have obtained results from environmental research.

According to incomplete statistics, 71 major environmental research projects have been completed. Thirteen have received awards and 18 are still in the research stage. There are 102 theses on file, 12 of which are excellent.

## VI. Environmental education and the popularization and propaganda of environmental studies have been developed and enhanced.

For the past 10 years, 190 students have graduated or are now attending environmental protection specialized institutions of higher education. We have sponsored 55 sessions of various short-term training classes, 13 environmental protection exhibits, 195 popular science lectures on environmental protection and have shown 202 science films; we have completed and printed 212 issues of propaganda material and organized 18 international scholarly exchanges.

VII. Planting trees and afforestation to protect the environment.

Nanjing is becoming a green-land system where sites, lines and areas of tree planting meet. By the end of 1982, the total area of greenland in the city was 5,085.48 hectares, with 140,000 trees lining the roads. There are 24 parks, accounting for 27.6 percent of the city's total area.

VIII. A system of environmental management organizations and a contingent of environmental protection forces have begun to be set up.

Nanjing environmental protection organizations have developed from the "management of the three wastes" in 1973, to the management of environmental protection in 1974, to the establishment of the Department of Environmental Protection in 1979. After 1980, 15 prefectures and counties throughout the city and 15 bureaus (companies) responsible for industries as well as most of the large and medium-size plants, mines and enterprises have specifically established environmental protection department (sections). The personnel has grown gradually from the original 6 to 992, with 1,500 part-time workers.

IX. The production and industry of environmental protection equipment and service enterprises have been newly developed.

In the city, there are now 27 plants specializing in the production of environmental protection instruments and equipment, and one professional environmental protection service company responsible for various pollution control projects and the sale of environmental protection instruments and equipment.

X. The emergence of a number of advanced groups and individuals in environmental protection.

In 1981, the Nanjing government awarded the honorary title of advanced unit to 35 plants, workshops, technical offices, construction projects and teams such as the Nanjing Chemical Plant and the Nanjing Electro-chemical Plant. In 1982, it also awarded the honorary titles of environmental protection advanced units and groups to 8 plants, 46 workshops and teams such as Meishan Project Command and the Jiangnan Optical Instrument Plant and designated Sun Licheng [1327 4539 2052] and 161 other comrades as environmental protection advanced workers.

12380

CSO: 4008/191

## SHANGHAI IMPLEMENTS MEASURES TO IMPROVE ENVIRONMENT

Shanghai JIEFANG RIBAO in Chinese 24 Apr 84 p 1

[Article: City Government Holds Meeting to Propagate the Spirit of the Environmental Protection Conference of the State Council, Shanghai's Environmental Protection Emphasizes Seven Key Measures]

[Text] Deputy Mayor Ni Tianzeng [0242 1131 1073] of Shanghai made a report to the meeting held yesterday by the city government to propagate and implement the resolutions of the State Council's second working conference on environmental protection. He said in the report that following the requests made by Mayor Wang Daohan [3076 6670 3211] in his "government work report" to the second meeting of the Eighth People's Congress of Shanghai, this city has decided to emphasize the following seven key measures in environmental protection work this year and next year:

Continue to concentrate on the completion of treatment projects for the three wastes. Of the 306 pollution control projects approved by the city government, 214 projects had been completed as of 1983; 92 are not yet completed. Efforts should be exerted to complete them this year or next.

Improve the quality of tap water. Regarding the plan already approved by the city government to move the water diversion stations for tap water upstream, efforts should be exerted to produce construction blueprints by the end of the year and preliminary preparations to start construction in 1985 should be actively completed so that the project can begin operation in 1986. The upper reaches of the Huangpu Jiang have been designated a water source protection zone. Plants that create pollution will no longer be allowed to be built within that zone.

Gradually establish and perfect the city's sewage treatment system. Within this year and next, the city must draw up general plans and implementation schedules for the city's sewage treatment system.

Reduce contamination of vegetables. At present, the quality of irrigated water for 80,000 mu of the area of vegetable fields in the Shanghai suburbs does not meet state standards. During this year and next, the city will first divert clean water for irrigating the Jiading and Baoshan vegetable fields west of the Taopu He, south of Wenzaobin and north of the Suzhou He, and the Shanghai

County vegetable fields north of Dian He and south of Suzhou He, totaling 70,000 mu, and prevent sewage outside of the vegetable fields from entering. It will also draw up waste treatment plans for the more than 270 large and small factories inside the vegetable protection zones. Those factories that truly cannot be treated must be firmly ordered to stop production, to close down, to be merged with others or transferred. In the future, the city must strictly prohibit the establishment of polluting enterprises inside the vegetable protection zones.

Within 2 years, strive to create 12 administrative districts within the city as areas free from black smoke.

Continue to control urban noise. The areas where honking at night is prohibited will be expanded from the original area inside Zhongshan North Road to the entire city (including Wusong and Minxing Wards). The percentage of low pitch horns must be increased from the present 40 percent to about 80 percent within the year. All high volume broadcasting loudspeakers within the city except those needed for special reasons, will be dismantled. About 90 percent of the 300 factories that have created disturbances because of noise should be controlled this year or the next.

Increase the construction of environmental sanitation projects to maintain the city's appearance and environmental sanitation.

Since the Third Plenum of the 11th Party Congress, environmental protection work in Shanghai has realized some progress. From 1980 to 1982, the city built 6,821 projects to treat the three wastes. At the end of 1982, the daily capacity of effluent treatment was increased to 418,000 tons. The ratio of industrial waste treatment throughout the city increased from 14 percent prior to 1980 to 23 percent. The hourly capacity to treat waste gases reached 10.1 million standard cubic meters. The amount of dust in 1982 showed a drop of 20 percent from 1979. The amount of settling dust dropped 24 percent. In the area of Nanshi ward, Jingan ward and Huangpu ward, together called the "two streets and one square" (Nanjing East Road, Zhongshan East First Street, the People's Square) basically became an area free from black smoke. Of the 17 "yellow dragons," 15 have been treated and this greatly improved the surrounding environment. In 1982, 6.48 million tons of solid industrial waste were basically cleaned up, and the percentage of comprehensive utilization of solid waste at present has reached 58.6 percent. The average value of environmental noise within the city is still controlled at around 62 decibels (A), and the noise in some areas with busy traffic also dropped an average of 3 decibels (A) from 1979.

Although Shanghai's environmental protection work has realized some progress in recent years, pollution is still very serious. It is still a long way from meeting actual requirements, therefore, improvement of the environment needs to be stepped up. To quickly improve the situation, Deputy Mayor Ni Tianzeng asked all industries throughout the city to concentrate on environmental protection and he asked that simultaneous development of the city's economic construction and environmental protection be quickly realized.

Mayor Wang Daohan presided over yesterday's meeting and proposed suggestions on how to further carry out environmental protection work in Shanghai well. More than 1,800 leading cadres from all sectors of the city attended yesterday's meeting.

ENCLOSURE OF SHANGHAI SEWER COMPLETED

Shanghai JIEFANG RIBAO in Chinese 23 Dec 83 p 1

[Article by He Wannan [6320 1354 3948] and Chen Fachun [7115 4099 2504]: "The Project to Cover the Open Sewer in Southern Shanghai Is Complete"]

[Text] The project to cover the open sewer in southern Shanghai has been completed. The entire system will be opened for water-flow tests beginning December 30.

The sewer-line construction project in southern Shanghai began in 1969. From its western terminus at the pumping station at Luban Road in Puxi, the line extends eastward, 2 meters in diameter, across the Huangpu Jiang, through 10 communes in Chuansha County and finally to the East China Sea at Quchiwan of Heqing Commune. The total length of the lines is 32 km, but the section from the Number 3 Pumping Station at Huamu Commune in Chuansha County to the Number 7 Pumping Station at Heqing Commune, where the line enters the sea--a total length of 18.3 km--was originally left uncovered. When construction began, the danger of sewage pollution was not understood, and this section was left open so that sewage could be used as a fertilizer in irrigation. However, in the last decade or so, long-term wastewater discharge in the open sewer made pollution on both sides thereof increasingly serious, caused unbearable stench and seriously affected people's health. Consequently, in 1981 the Municipal People's Government decided to cover the sewer completely.

Construction began last September. With direct help from the municipal government, the Chuansha County Construction Company, which contracted to undertake the project, selected 3,000 workers from the 17 best construction teams, struggled day and night, overcame all difficulties and completed the project 1 year ahead of schedule.

Yesterday (22 December), these reporters visited the completed sewer. It is 3.2 meters wide, 2.1 meters high, constructed entirely of steel-reinforced poured concrete and resembles a sturdy underground tunnel. The ground surface of the sewer is wide and level and can accommodate automobile traffic. A responsible comrade at the project's headquarters informed us that the entire project may save 4 million yuan and has won commendation from the municipal government leadership and departments concerned.

After the completion of the reconstruction work on this sewer line, sewage discharge from the districts of Huwan, Xuhui, Huangpu and Nanshi can be expanded; domestic sewage and some industrial sewage from the Pudong development area can also be accommodated and daily discharge volume can be increased from the present 230,000 tons to 550,000 tons.

12380

CSO: 4008/193

## POLLUTION BY SHANGHAI'S POWER PLANTS REDUCED

Shanghai JIEFANG RIBAO in Chinese 21 Dec 83 p 1

[Article: "A Large Ash Fill Will Be Constructed Along Hangzhou Bay; Shanghai's Electric Power Plants Will Have a Place to Dispose of Their Powdered Coal Ash; 1,700 Mu of Land Will Be Reclaimed in 7 Years"]

[Text] The powdered coal ash discharged by Shanghai's power plants will no longer pollute the Chang Jiang and the Huangpu Jiang. The other day, 40 units, including the Ministry of Water Conservancy and Power and the Municipal Planning, Capital Construction, Agricultural and Economic Commissions unanimously voted to approve the plan to construct dikes to enclose shoals along Hangzhou Bay in Fengxian County to create a place to deposit ash. This project will not only solve the problem of disposing of the ash discharged by Shanghai's power plants but will also reclaim land from the sea for agricultural use and in 7 years will add more than 1,700 mu of land.

Power plants in Shanghai produce 1 million tons of powdered coal ash. This ash is widely used in building projects, city construction and building materials, but about 400,000 tons of it are dumped into the estuary of the Chang Jiang every year, affecting environmental conditions therein and in the Huangpu Jiang. In order to provide for proper disposal of this ash, the State Planning and Economic Commissions approved in 1980 the Plan and Tasks of the Shanghai Ash Project and agreed to set aside a 7 square kilometer area of shoals on Hangzhou Bay as a place to dispose of the ash. First, dikes would be built to enclose the shoals, and the ashes would be used to fill these areas in; then these areas would be converted into good agricultural land. The Huadong Electric Power Administrative Bureau signed a contract with the Fengxian County government to lease the land. First, the 1,700-plus mu of uncultivated land in the Number 4 Polder of Xinhai Commune will be used as an ash fill. This polder can hold 5 million tons of wet ash, and it will take all of Shanghai's power plants 7 years to fill the area in. Then earth will be spread over the ash to create agricultural land. Meanwhile, dikes will be built to reclaim more land for ash deposit. At the beginning, a shoal area 1.1 square kilometers in size will be enclosed for ash filling. Later, the area can be expanded gradually. Thus the problem of Shanghai's excess powdered coal ash can be basically resolved through comprehensive utilization.

12380

CSO: 4008/193

ENVIRONMENTAL RADIATION LEVEL, DOSES IN LIAONING REPORTED

Beijing ZHONGHUA FANGSHE YIXUE YU FANGHU ZAZHI [CHINESE JOURNAL OF RADIOLOGICAL MEDICINE AND PROTECTION] in Chinese No 3, 25 Jun 84 pp 15-18, 78

[Article by Lu Zhanhui [7120 0594 1920], Zhang Wenzhi [1728 2429 1807] and Zhan Qingchang [2069 1987 7022], et al., all of the Liaoning Institute of Labor Health, Shenyang: "Level of Environmental Radiation and Doses to Population in Liaoning Province"]

[Summary] In this paper the results of measurements of environmental gamma radiation in Liaoning Province and calculation of human dose are reported. The exposure rate was measured by RSS-111 high pressure ionization chamber and FD-71 portable scintillation counters. The results showed that the average values of outdoor and indoor exposure rates were determined to be 7.9  $\mu\text{R}/\text{h}$  and 11.7  $\mu\text{R}/\text{h}$ , respectively, i.e., the indoor exposure was higher than that of the outdoor by a factor of 1.5. The annual average gonad dose of the environmental gamma radiation to the inhabitants in Liaoning was about 58 mrad/y and the annual effective dose equivalent was 57 mrem (0.57 Sv).

9717

CSO: 4009/117



NATURAL GAMMA RADIATION LEVELS IN SUZHOU INVESTIGATED

Beijing ZHONGHUA FANGSHE YIXUE YU FANGHU ZAZHI [CHINESE JOURNAL OF RADIOLOGICAL MEDICINE AND PROTECTION] in Chinese No 2, Apr 84 pp 39-41, 71

[Article by Sun Chengzhi [1327 0701 1807], Yan Zhongmin [2518 0112 3046] and Yao Ying [1202 5391], all of the Suzhou Heat Engineering Research Institute, Ministry of Water Conservancy and Electric Power; Yu Rongsheng [0205 2837 3932] and Chai Jinrong [2693 6855 2837], both of the Suzhou Sanitary Epidemiological Station; and Yang Zifen [2799 1311 1164], Suzhou Architecture Research Institute: "Natural Gamma Radiation Levels in Suzhou and Evaluation of Doses Received by Inhabitants"]

[Summary] This paper describes the results of the natural gamma-radiation level investigation in Suzhou, Jiangsu Province. From the indoor and outdoor gamma exposure data measured by the FD-71 scintillation radiometer, it was deduced that the indoor natural gamma exposure rates of the various buildings in Suzhou ranged from 12.4 to 28.0  $\mu\text{R}/\text{h}$  with an average of 18.6  $\mu\text{R}/\text{h}$ ; the range of outdoor values was between 8.6~25.7  $\mu\text{R}/\text{h}$  with an average of 14.3  $\mu\text{R}/\text{h}$ . From the above values, the annual dose equivalent resulting from external exposure upon the inhabitants of Suzhou was estimated to be 1.080 mSv/y. In this paper some related problems are also analyzed and discussed.

9717

CSO: 4009/96

## MANAGEMENT OF GROUNDWATER RESOURCES IN SHANGHAI

Beijing GONGCHENG KANCHA [GEOTECHNICAL INVESTIGATION AND SURVEYING] in Chinese  
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[Text] I. Groundwater Use in Shanghai and the Problem of Subsidence

Shanghai has two water sources; one is the Huangpu Jiang and the other is groundwater. Because groundwater remains at a constant temperature and is of good quality, safe, inexpensive, and easy to use, many industries draw upon groundwater for their needs. As a result, groundwater use in Shanghai is characterized by two distinctive features.

The first is the large quantity of water which is consumed. In 1949 usage amounted to 87.5 million cubic meters; this rose to 159.63 million cubic meters in 1958, and by 1963 had increased drastically to 201.5 million cubic meters.

The second aspect of Shanghai's groundwater utilization is its highly concentrated nature, with respect to location, depth, and time:

1) Water is extracted intensively in limited areas. Although Shanghai covers an area of 6,100 km<sup>2</sup>, the wells are concentrated within an area of 140 km<sup>2</sup>. This is particularly true of the Hudong and Huxi industrial sections of the city, where the average density of deep wells is from 16 to 27 wells per square kilometer, with a maximum density of 52 wells/km<sup>2</sup>. The daily rate of water extraction reaches 5,000-7,000 m<sup>3</sup>/km<sup>2</sup>. Hudong and Huxi together account for more than 80 percent of Shanghai's water use.

2) The water is drawn from a limited range of depths, mostly from two strata which contain water under pressure and lie at a depth of 75-150 meters below the surface. According to the figures for 1958, these two aquifers provided 74.5 percent of the total water used in Shanghai.

3) Water use is also highly seasonal, more water being drawn during the summer months to provide cooling. Summer usage may amount to more than 70 percent of the total.

Because of these characteristics the groundwater level has dropped extensively, with the result that a local funnel-shaped depression has formed over an area of 600-800 km<sup>2</sup>. In addition to causing the depletion and abandonment of numerous wells, this has also produced large-scale settling (subsidence) of the land.

Subsidence was first noticed in Shanghai in 1921 and has been increasing gradually since the 1960s. In 1948 the rate of subsidence in the Shanghai area was 21 mm/year; from 1949-1956 and from 1957-1962, the corresponding figures were 40 and 98 mm/year. Between 1921 and 1965 the total average drop in land levels in the Shanghai region has been 2 meters (as much as 2.63 meters in places), resulting in the formation of a sunken disk-shaped depression.

This settling has many pernicious effects, particularly near the banks of the Huangpu Jiang, where settling has permitted the river to overflow its banks during periods of high water and damaging floods have occurred. In addition, the underground drainage system has become ineffective, so that surface water remains after a heavy rain; bridge pilings have sunk together with the land and now obstruct river traffic. The sinking of the land supporting warehouses and dock piers has adversely affected the loading of commercial boats and caused tall buildings to lean over and crack. Vast sums of money have been spent to find ways to remedy these problems.

Groundwater conservation, subsidence control, and improved management have thus become an urgent problem which must be given top priority.

## II. Laws and Regulations for Managing Shanghai's Groundwater

Between 1957 and 1982 legislation has been proposed on four occasions to manage groundwater throughout the city by legal, economic, and technological means.

In 1957 the Municipal People's Committee promulgated the first such piece of legislation, entitled "Method for Managing Deep Wells in Shanghai Municipality." In 1963 standard procedures were set up for examining proposed well sites. In 1964, 220 deep wells used by 88 chemical and metalworking plants and light industry were shut down, mainly because of subsidence problems; these plants were supplied with surface water, and groundwater recharging experiments were undertaken.

The next piece of legislation, introduced in 1965, called for artificial supplementation of groundwater during the winter for use in summer. In 1968 an alternative system of summer recharging for winter use was popularized, and the regulation of water usage was systematically examined and measures were drawn up for the rational utilization and recharging of groundwater.

The "Methods for Managing Deep Wells in Shanghai Municipality" was reissued by the Shanghai city government in 1979.

Finally, in 1982 the management methods described above were supplemented by additional provisions. Standard fees were established for water usage, the range of rates was widened, and stiff penalties were added for violating the well-drilling statutes.

The "Methods for Managing Deep Wells in Shanghai" contains a total of 6 sections and 28 articles, which we summarize briefly as follows.

Section 1 (6 articles) the Shanghai Municipal People's Government empowers the Shanghai Public Works and the Management Division of the Water Utility Corp to strictly monitor and ration groundwater for all of Shanghai in order to bring subsidence under control.

Section 2 (five articles) deals with well drilling. It is stated that drill sites must be inspected and that licenses are required. Precise guidelines are given for the location, depth, diameter, and distance between wells. On-site examination of newly constructed wells is required and relevant documents must be kept on file.

Section 3 (eight articles) is concerned with the operation, repair, and recharging of wells. Deep wells must be maintained by specialists and drawn from and replenished according to a fixed plan, and reports on the amount of water pumped in or out must be filed promptly. No payment is required for recharging, but fees are levied for water taken from the wells and fines (at 10 times the normal rate) are imposed for excessive use.

Section 4 (three articles) deals with the closing and abandonment of wells. No well can be abandoned without examination and approval. Closed and abandoned wells must not be repaired without authorization. The penalty for violation is a fine of 10 times the normal usage rate plus a self-criticism submitted in writing.

Section 5 (five articles) primarily emphasizes the need to conserve the quality of groundwater. The quality of waste and recharging water must meet established government standards.

Section 6 is an appendix (one article).

### III. Organization and Functions of the Shanghai Municipal Resource Management System.

#### A. Organization

There are two entities, which look to the Shanghai Municipal People's Government Construction Council for unified leadership and which are administered by the Shanghai Department of Public Utilities and the Shanghai Construction Planning Board. The first entity is the Shanghai Waterworks Company, which is the agency concerned with administration and law enforcement. The second entity is the Shanghai Municipal Geological Office, which is responsible for analyzing groundwater resources and drawing up plans--that is, for technical research. Groundwater users (plants, companies, factory systems) are to be closely managed on a local basis. Well users are to appoint groups specifically responsible for water facility management and the names of these people must be reported to the administrative department, which will provide guidance. Users are also responsible for supplying necessary materials and information (Fig 1).

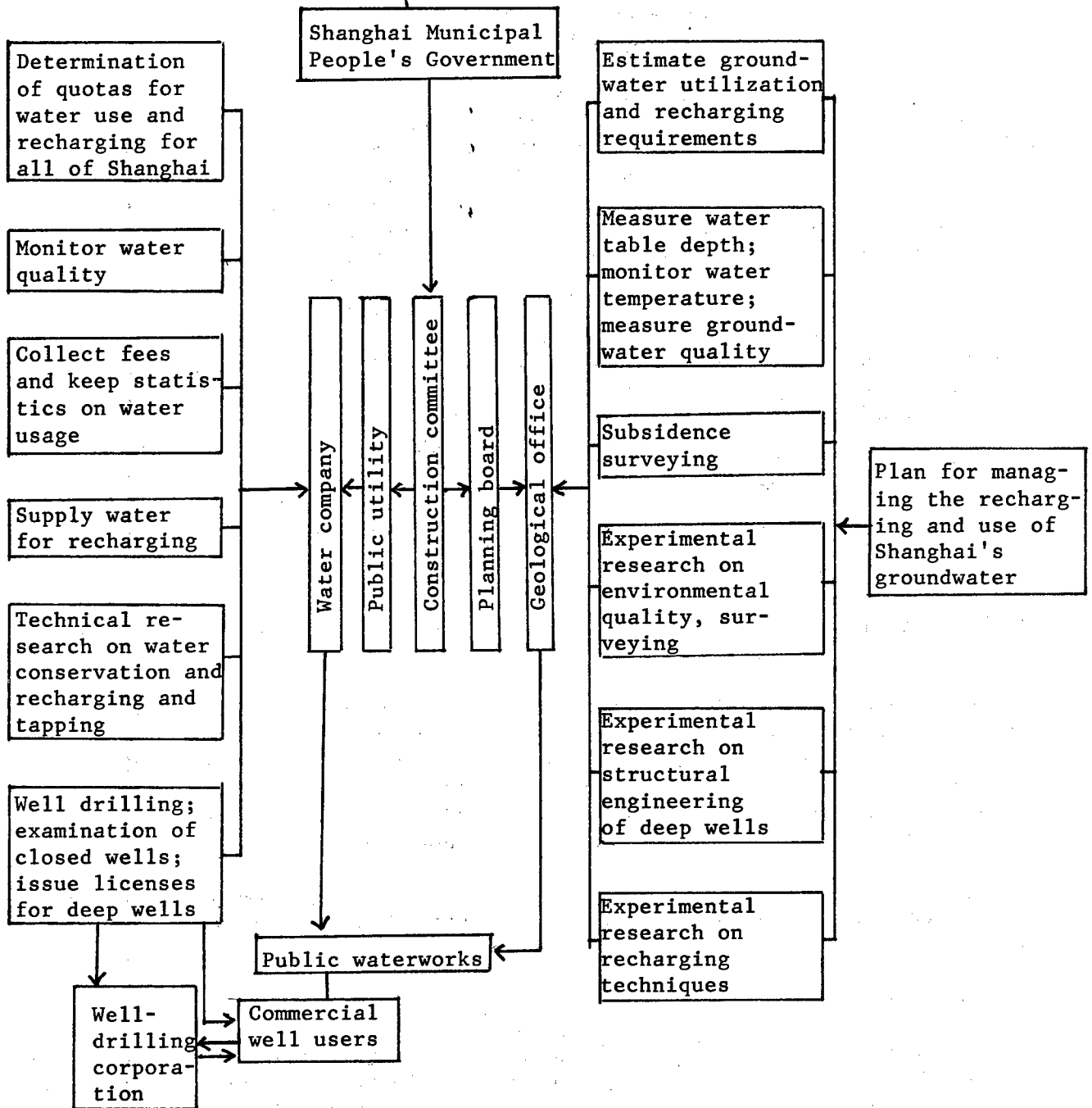


Fig. 1

## B. Functions of Groundwater Resource Management

### 1. Management Activities

- a) Examine applications for drill sites on the basis of hydrological information supplied by the Technical Management Department and in accordance with plans for drawing and recharging groundwater. This requires a determination of why the water is needed, how much will be used, where the well is situated, its diameter, depth, and distance from other wells, etc. Licences are to be issued after a thorough examination. Newly completed wells require on-site inspection, after which appropriate documents must be kept on file.
- b) The relevant authorities must be informed annually about the estimated recharging and withdrawal requirements based on the Shanghai groundwater program drawn up by the Technical Management Department. These authorities must report this information within a specified time to the users in their jurisdiction and to the enforcement authorities. In addition, they must promptly compile statistics on groundwater use, collect fees, and levy fines for excessive use.
- c) Water for scheduled recharging is to be supplied free of charge to all users abiding by the usage guidelines; technical assistance will also be provided.
- d) Water table levels and the quality of recharging water and effluent are to be rigorously monitored at regular intervals.
- e) Well users will carefully observe the recharging and withdrawal guidelines and appoint specialist groups responsible for water planning and conservation. Three tiers of water use will be set up (at the factory, workshop, and worker team levels); water conservation management networks must be established and methods for anticipating water needs perfected; each well will be equipped with two water level marks to be used for recharging.

In summary, the administrative work consists in managing groundwater resources in accordance with the "Method for Managing Deep Wells in Shanghai Municipality."

### 2. Technical Work

- a) Detailed geological surveys to monitor local environmental quality are required. Reports of local hydrological and structural conditions must be filed, along with plans for local groundwater usage (tapping and recharging).
- b) Statistics on groundwater usage must be compiled at regular intervals for all of Shanghai, district by district and level by level, and yearly usage must be reported.
- c) A network for dynamically monitoring the Shanghai groundwater table will be set up. Roughly 400 wells will be involved in the measurements, which are to be carried out at specified intervals from various depths below the ground. Yearly reports will be filed.

d) Well water will be sampled from various depths in order to measure the temperature and that of the effluent water. Also, the energy storage and recharging efficiencies should be estimated.

e) A system will be established to monitor dynamic changes in groundwater quality by periodically sampling water taken from various depths.

f) An all-Shanghai network will be set up for precisely monitoring ground heights using roughly 500 benchmark levels. The measurements will be made at regular intervals and will be used to plot topographic maps of subsidence in the Shanghai area.

g) The data on the balance between groundwater tapping and recharging, water levels, and subsidence will be fed to a computer in order to formulate an optimum program for managing the annual use and replenishing of Shanghai's groundwater.

h) Develop recharging techniques, carry out experimental research on stopped-up wells, and develop special recharging equipment.

We thus see from the foregoing that the water management program has a well-defined tripartite structure in which local management is combined with legal and technical controls. This has been reflected in a significant improvement in water resource management and subsidence control in recent years.

#### IV. Results

##### A. Less Groundwater Is Being Used

A groundwater conservation program has been in effect in Shanghai since 1963 according to which surface water has replaced groundwater as circumstances and water usage permit. A decisive step in ameliorating groundwater depletion was taken in 1966 with the implementation of artificial recharging, rationing, and other measures, which have dramatically cut back water usage. Indeed, in 1963 Shanghai proper consumed 114 million cubic meters of water (202 million cubic meters for the entire Shanghai Municipality). Since 1965, however, this figure has fallen to 13-15 million cubic meters per year, amounting to an annual reduction of nearly 100 million cubic meters. On the other hand, use has been increasing in the suburbs, so that the entire Shanghai Municipality now consumes roughly 120 million cubic meters of water yearly (See Table 1).

##### B. The Water Table Has Been Raised and Subsidence Controlled

Measures such as artificial recharging of water supplies have greatly curtailed depletion of groundwater resources, and the water table has been rising gradually each year. In 1963 the lowest water level at the center of the tapped area lay at -37.3 m and settling was occurring at a rate of 80 mm per year; by 1965 the water level had risen to -18.7 m and the annual rate of subsidence had dropped by 22 mm. After 1965 the water table rose even further to a level of between -6.7 and -8.6 m, and subsidence varied from -11 to +6 mm per year. Thus, Shanghai's subsidence problem was essentially under control (see Table 1).

Year	Water use (10,000 m <sup>3</sup> )		Metro Area	Recharging (10,000 m <sup>3</sup> )	Water level (m)	Subsidence (mm)
	City	Suburbs				
1949	7811	939	8750		-10.0	-35
1953	9271	1130	10401			-35
1956	11023	1367	12390		-19.6	-49
1957	12377	1533	13910			-87
1958	13493	2470	15963		-34.0	-105
1960	13072	7269	20341			-98
1961	11525	8515	20040			-98
1962	11101	8421	19522			-74
1963	11362	8788	20150		-37.3	-80
1964	9210	8850	18060		-37.4	-62
1965	4763	8198	12961		-36.8	-22
1966	1361.62	6082.38	7444	337.5	-18.7	+6
1970	1167.16	6332.84	7500	1214.12	-6.9	+2
1975	1304.90	8112.1	9417	1705.93	-6.7	-11
1978	1498.87	9167.58	10666.45	1758.87	-7.8	-7
1979	1508.72	10645.98	12154.70	1836.38	-8.5	-1
1980	1340.54	10192.97	11533.51	2177.26	-8.6	-5
1981	1496.57	9913.54	11410.11	1910.99	-8.1	+4
1982	1324.90	9353.79	10678.69	1951.63	-8.0	-4

TABLE 1

- Notes: 1) The figures in the table refer to groundwater below 70 m (tapping of water above -70 m is neglected owing to the small amounts involved).
- 2) Figures before 1965 were calculated from the number of deep wells by using data on the amount of water usage per well in 1965; data after 1965 were determined from water level measurements.
- 3) Subsidence data before 1965 are for the natural calendar year (January-December); data after 1965 are for the period October-September.
- 4) The subsidence figures are average values; the + and - signs indicate rising and settling, respectively.
- 5) The values given are the lowest water levels recorded during the summer months.



### C. Energy Is Being Supplied to Industry and Agriculture

After the initial success of the experimental work on groundwater recharging, year-round recharging techniques were gradually put into effect in 1965 at relevant industries throughout the Shanghai area. The annual amount of added water increased from 3.38 million cubic meters in 1966 to 19.52 million cubic meters in 1982 (this amount peaked in 1980 at 21.77 million cubic meters). Thus subsidence has been effectively controlled without interfering with industrial water use (for cooling and air conditioning, washing, heat exchangers, boilers).

Through strict scientific management of groundwater resources, Shanghai has thus succeeded in controlling subsidence while also providing waterpower by means of a policy which combines rationing and recharging.

### V. New Problems and Further Developments

Shanghai has been using groundwater for more than a century, but water use legislation has appeared only since liberation. Recent groundwater management has been quite successful, and laws are being improved. However, rapid industrial development has produced a dramatic rise in groundwater consumption in Shanghai's suburbs and in rural Anhui Province. The resulting steady drop in water levels in these regions has made the water levels there lower than in the city during the winter and spring months (an "inverted funnel" has been formed). Thus the direction of water replenishment is now from the city to the outlying areas rather than the other way around. Excessive groundwater tapping in nearby coastal communities and in the Tai Hu basin has resulted in subsidence and varying degrees of groundwater pollution in small and medium-size cities. Groundwater resource management on a regional rather than city-wide basis is thus an urgent problem. Local, small-scale management must be coordinated with regional policy--that is, research and management facilities should be established to plan water usage for the developing Sanjiao Zhou economic zone in accordance with natural conditions. These facilities will coordinate the development and use of groundwater resources by each locality and maximize effective groundwater control by legal and technical means.

We expect that by the year 2000 the management facilities will have a main-frame computer for formulating optimum strategies for water conservation and use and for controlling subsidence and coping with a host of related environmental problems.

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## FORECASTING, PROSPECTING GROUNDWATER RESOURCES IN QAIDAM BASIN

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[Article by Cai Shiquan [5591 4258 3123] and Zhang Yong [7022 0516], No 1 Hydrological Brigade, Qinghai Department of Geology and Mines]

[Text] The famous Qaidam basin in China, a vast, arid, landlocked basin rich in minerals (it has been called a "treasure trove"), will play a key role in the future development of farming and livestock raising in Qinghai Province. However, because of Qaidam's extreme aridity (less than 50 mm of precipitation falls annually), the scale and nature of development in the basin will be determined largely by the availability of water resources, particularly groundwater.

After more than 10 years of field work, the No 1 Hydrology Team of the Department of Mines in Qinghai Province has reached preliminary findings concerning the distribution of nonsaline groundwater in the Qaidam basin. According to calculations, the basin may contain more than 340 billion cubic meters of groundwater, or four times as much water as Qinghai Lake. This abundant groundwater is highly favorable for the development of the Qaidam basin. However, one must bear in mind that the distribution of groundwater in Qaidam is uneven and the hydrological conditions are complex, and research remains at an inadequate level and many theoretical and practical problems await investigation and solution.

In this paper we carry out a preliminary analysis of present and future hydrological constraints relevant to groundwater resource development in Qaidam basin. We also offer a few simple suggestions for future hydrological work and provide some reference material.

### 1. Prospects for Groundwater Resource Development

Although the Qaidam basin is extremely arid, it has an abundant supply of groundwater because it is surrounded on all sides by tall mountains. Because of climatic variations with altitude the mountains receive generous rainfall, in some cases more than 400 mm annually. In addition, a large surface area for water collection is available--if the 1° watershed is demarcated by a circle, this circle will contain 254,923 square kilometers as opposed to only 120,000 square kilometers within the plateau of the basin itself. This mountain rainfall converges and accumulates as groundwater, greatly augmenting the

the water resources of the basin. Moreover, tectonic movement has formed a large depression in the Qaidam basin and produced a stratum of loose Quaternary material more than a kilometer thick which can transport and store groundwater on a large scale and acts as a natural groundwater reservoir. Exploration has revealed that the Gobi plain on the south side of the basin contains phreatic water-bearing strata which are more than 600 meters thick and have good porosity. Single aquifer strata of this thickness are rare.

Qaidam's abundant groundwater resources are very irregularly distributed in a way that depends partly on the rainfall and mountain runoff patterns and partly on the geological conditions. The hydrology of the Qaidam basin is complex because of differences in the underlying geological structures and variations in the overlap of the tectonic plates. Thus the amount and nature of the water resources differ in the southern, northern, and western parts of the basin (see Fig 1, which shows a hydrological map of the Qaidam basin sketched by Jiang Weijian [5592 4850 0256]).

The Kunlun Shan piedmont in the southern part of the basin has a typical hydrological profile. Water flows naturally downgrade, and the variations in the groundwater distribution with depth tend to follow the contours of the land and the lithofacies. The lithological grains in the water-bearing stratum become finer from south to north, and the stratum splits into several layers; the water pressure increases gradually, and there is a corresponding decrease in the amount and quality of the water. In short, variations in water supply and quality in different regions of the basin are quite evident.

The northern part of the basin contains a "piedmont" made up of Palaeozoic and Miocenic groups. This piedmont, which lies between the northern face of the mountains and the plateau, dissects the basin into numerous secondary intermontane basins of small to medium size and is responsible for the distinctive features of groundwater formation and distribution. In general, each intermontane basin or valley has its own central location at which groundwater is collected, and the amount and quality of the water differ from one location to the next.

Barren hills make up the terrain of the western basin. Tertiary and old Quaternary rock formations are widely distributed, but phreatic water is found only in thin, shallow Quaternary accumulations which are invariably highly mineralized. Some of the deep depressions contain bittern springs. The shallow part of the large Tertiary group region does not permit subterranean transport, while the deeper portion contains highly mineralized water mixed with petroleum (the aqueous component was presumably trapped there when the oil was formed).

The central basin bounded by the north and south basins is a "salt world" containing highly saline groundwater and bittern or brackish lakes (such as the famous Chaerhan salt lake) rich in potassium, magnesium, lithium, boron, and other mineral salts.

In summary, we see that the prospects for groundwater resource development in the south basin are excellent, particularly in the central portions of some of the large diluvial fans (such as the Alaer, Nalenguole, Geermu, Nuomuhong,

and Xiangride alluvial and diluvial fans). Each well in these areas could produce up to several thousand cubic meters per day of high-quality water capable of meeting the needs of medium-size towns, the mining industry, and agriculture. However, it should be pointed out that the groundwater is irregularly distributed both vertically and horizontally. Studies have shown that water seepage into the Gobi through river caverns carved through the mountains has played a decisive role in the formation of underground water in the piedmont plain; lateral addition of water from the mountain bedrock has been of secondary importance. The discharges of the mountain rivers supplying the basin vary widely, and this is reflected in the wide disparities of groundwater supply from one alluvial fan to another in the piedmont plain. In view of the irregular distribution, a comprehensive plan for rational groundwater utilization is therefore required.

As for the ease of exploitation, we note that the great depth of the phreatic water in the Gobi piedmont makes development difficult. On the other hand, exploitation is easier at the edge of the piedmont and in the middle and upper portions of the fine-grained soil region, where well-drilling is relatively easy and conditions are ideal for water exploitation at some locations (water flows spontaneously under pressure).

The northern basin contains several small-to-mid-size intermontane basins (such as the Huahaizi, Dachaidan, Xiaochaidan, Delingha, and Wulan basins) which are rich in free-flowing pressurized phreatic water and in which the topographical and logistic conditions favor development. However, the wide variations in groundwater distribution from one intermontane basin to another make it necessary to select wellsites in accordance with specific local conditions. As for the western basin, its groundwater resources are so meager that its requirements will have to be met by transporting water from neighboring sources such as the Alaer and Leng Hu regions.

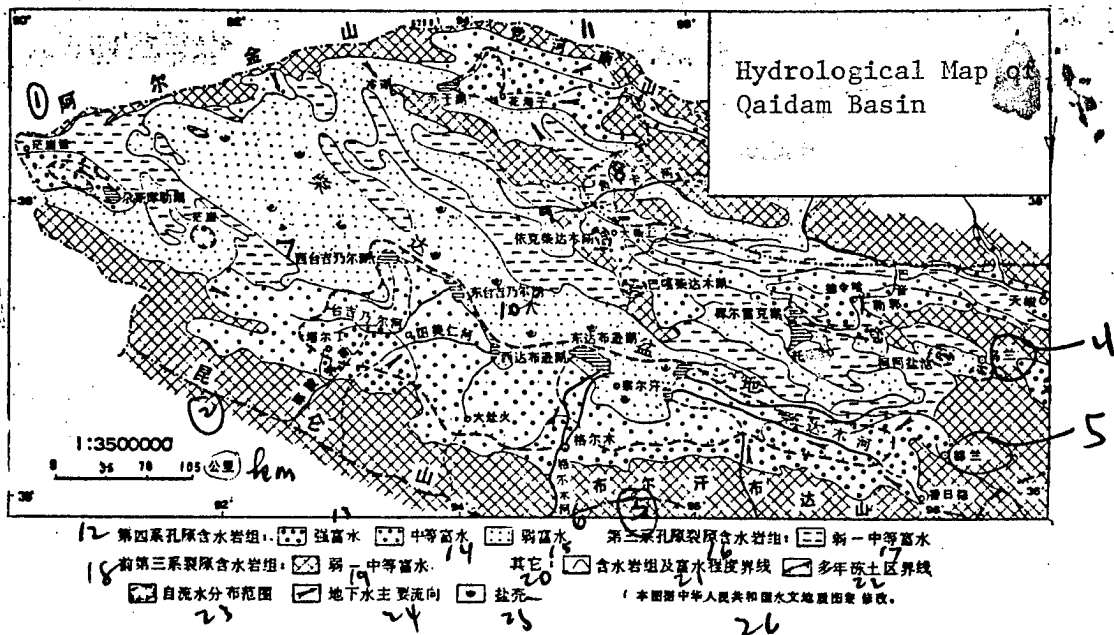


Figure 1 [key on following page]

Key:

- |  |   |
|--|---|
| 1. Aerjin Shan                             | 15. Low water content   |
| 2. Kunlun Shan                             | 16. Tertiary water-bearing porous rock  |
| 3. Buerhanbuda Shan                        | 17. Low-moderate water content  |
| 4. Wulan                                   | 18. Pretertiary water-containing crevasses  |
| 5. Dulan                                   | 19. Low-moderate water content  |
| 6. Geermu He                               | 20. Other symbols   |
| 7. Xitaijinai Hu                           | 21. Boundary of water-rich rock   |
| 8. Yuka He                                 | 22. Permafrost boundary   |
| 9. Yikechaidamu He                         | 23. Limits of free-flowing water  |
| 10. Dongtaijiernai Hu                      | 24. Principal directions of groundwater flow.   |
| 11. Danhenan Shan                          | 25. Salt incrustations  |
| 12. Quarternary Pourous Water bearing rock | 26. This map is taken from the Revised Hydrological Atlas of the People's Republic of China |
| 13. High                                   |   |
| 14. Moderate                               |   |

## II. Analytical Forecasting

### 1. Accurate Assessment and Rational Use of Groundwater Resources

Surveys of Qaidam's groundwater resources are still in their earliest and most general stage, and some parts of the basin have been studied much more fully than others. Studies of the Qaidam basin lag considerably behind those of other arid areas of China's North and Northwest, particularly with regard to the number and quality of the surveying expeditions, calculations of water balance, and other fundamental areas, and further work is needed. Industrial and agricultural development in the basin will dramatically increase groundwater consumption, so that more accurate projections and more efficient utilization of groundwater resources will become steadily more important in the future.

Although present usage is still very low, many undesirable problems have already developed. For example, exploitation of ground and surface water is not being regulated and wells are being drilled wherever water is needed. This frequently disrupts the upper and lower water strata and thereby destroys the natural structure of the aquifers. Moreover, some artesian wells are allowed to gush out of control and waste large amounts of water; irrigation aqueducts have sprung serious leaks; unrationed irrigation water is used copiously over long periods, leading to salinization and abandonment of farmland. All of this must be prevented in order to conserve water quality and avoid depletion.

Long-term hydrological work is now underway in various provinces and regions under the unified direction of the Department of Mines. For example, our province has been carrying out hydrological work in several districts of the Qaidam basin, and the results have been carefully examined and reviewed. These findings provide basic hydrological data for guiding economic development on a district-by-district basis together with research findings of significance for water usage. Henceforth a wide variety of technical charts detailing the natural conditions relevant to groundwater exploitation will be available.

These charts will include maps appropriate for planning groundwater use by industry and agriculture in addition to charts of known and predicted groundwater reserves. Hydrological work along these lines should be carried forward and upgraded.

## 2. Problems of Water Quality

Groundwater pollution may be aggravated as mining and agricultural develop in the basin. Although groundwater pollution is generally less serious than surface water pollution, groundwater is harder to clean up once polluted. Moreover, since ground and surface water are recycled in the basin, it is particularly important to maintain the quality of the inflowing water (this includes both surface and groundwater). Industrial pollutants such as petroleum and chemical wastes are particularly harmful and strict measures are needed to keep accidents (such as oil leaks) from contaminating sourcewater.

The related problem of groundwater depletion has attracted serious attention both in China and abroad. Urgent action is required to avoid damage caused by excessive water use in the Qaidam basin.

## 3. Antisalination Measures

Arid regions are susceptible to soil salinization. Slow irrigation using copious quantities of water without adequate drainage has raised the water table in some areas of the basin where the soil is fine; this has caused secondary salinization and subsequent abandonment of farmland. Comprehensive protective measures are thus urgently needed as agriculture is developed further. The use of wells for irrigation and drainage is of particular importance for rational water exploitation and maintaining local water balance; the necessary hydrological groundwork should be arranged for as quickly as possible.

## 4. Supplying the Water-poor West Basin

Except for the Alaer region, which is rich in groundwater, the western part of the Qaidam basin consists of extensive Tertiary hills with very little non-saline water. Supplying water to this region will become an increasingly urgent problem as mineral salt mining is developed. Since water is not available locally, it will have to be piped in from the outside. Substantial hydrological work is required to resurvey and accurately assess the feasibility of using various outside sources for this purpose. Research must also be started on hydrological problems associated with desalinization and the use of salty water. In general, a distinction should be made between water for industrial use and water for cooking and bathing. Surveys and assessments should be made to maximize economic benefits in each case.

## 5. Examination of Mineral Salt Deposits and Water Requirements

The Qaidam basin is rich in mineral salts, mostly in the form of halogen-rich water. This water constitutes a portion of the groundwater resources, and in fact one of the chief hydrological problems is to identify and analyze these

mineral waters. Much work is needed to employ hydrological theory and methods to investigate how the halogen-rich water was formed and distributed and to determine the amount. Analytical work on the local groundwater distribution should be combined with general long-range research on mineralization processes in order to quickly further our understanding of the mechanisms responsible for mineralization and the nature of existing reserves.

In summary, although the Qaidam basin contains much groundwater, the complex hydrological conditions are a composite of features specific to the area and features common to arid regions in general. Substantial hydrological investigation will be needed to resolve difficult practical and theoretical problems in the Qaidam basin in order to permit the large-scale development of Qinghai Province.

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ENVIRONMENT MINISTER COMMENTS ON NEW WATER POLLUTION LAW

Beijing ZHONGGUO HUANJING BAO in Chinese 15 May 84 p 1

[Interview with Li Ximing [2621 6932 6900], Minister of Urban and Rural Construction and Environmental Protection, on the passage of "Water Pollution Prevention and Treatment Law": "A Matter of Vital Concern to People's Health, Well-being and Modernization"]

[Text] The Standing Committee of the National People's Congress passed the "Water Pollution Prevention and Treatment Law of the People's Republic of China" on 11 May after careful deliberations. Li Ximing [2621 6932 6900], Minister of Urban and Rural Construction and Environmental Protection, answered our reporter's questions concerning this law.

Question: People from all walks of life are very interested in the "Water Pollution Prevention and Treatment Law of the People's Republic of China" passed by the Standing Committee of the National People's Congress. Why do we need such a law?

Answer: In considering this law, many members of the Standing Committee emphasized the importance of protecting water resources and preventing water pollution, and the urgency of strengthening the law in these areas. It was also pointed out that it was a vital issue which affects people's health and well-being and the development of the national economy. Water is the source of life, the most basic environmental condition for human existence, and a precious resource indispensable to the economic and cultural development of human society. There might be an abundance of water on earth, but the amount that is used relatively easily--in lakes and rivers, and surface and ground water--is rather limited. Water consumption rises rapidly in the wake of modern industrialization, agricultural mechanization and urbanization. Some people believe that water will replace energy as the world's most important natural resource in the near future. With an annual per capita runoff of only 2,600 cubic meters, which is one quarter that of the world average, China is not rich in water resources. Water, therefore, is even more of an asset to us, which must be cherished and preserved. A major task is to prevent water pollution. The hazards of water pollution are immense. In discussing the law, several committee members pointed out that if we let water pollution continue unchecked, we would in effect be committing suicide by degrees, and harming future generations as well. They were not exaggerating at all. Water



pollution nowadays indeed poses enormous hazards to human health. Polluted water carries many toxic substances, such as mercury, cadmium, chromium, lead and arsenic, etc, and other toxic chemicals, which enter the human body through drinking water and food and cause diseases. Many countries have learned this painful lesson. Water pollution is also a danger to fishery and agriculture; in areas where pollution is serious, some fish species have even become extinct. Furthermore, by raising the costs of water treatment and reducing economic results, water pollution leads to industrial losses. In view of China's relatively serious water pollution problems, it's imperative that we draw up this law and take effective measures to control the problems without delay. The passage of the law by the Standing Committee of the National People's Congress is a major event in the development of China's environmental protection work.

Question: You just mentioned that water pollution in China is relatively serious. Could you elaborate?

Answer: Environmental pollution in China is relatively serious. The most glaring problems are water pollution, air pollution and noise pollution, among which water pollution affects the largest area and has the greatest impact. Certainly, air and noise pollution should also be brought under control and laws are being formulated for this purpose. The main sources of our water pollution are industrial and urban sewage. Because of the backward technologies and equipment used by our industries, both the effective utilization ratio and water recycling rate are relatively low, and effluents, high. Each year, the nation as a whole discharges 31 billion tons of effluent, of which industrial effluent accounts for 77 percent, and domestic effluent, 23 percent. The effluent carries in it 130,000 tons of hazardous wastes and toxic substances, which explains why pollution is so serious. At present, about 12.7 percent of the trunk stream of China's major rivers are polluted, and 55 percent of their tributaries, particularly those in urban areas, are seriously polluted. Pollution is widespread in medium- and small-sized lakes in urban areas. Groundwater pollution is concentrated in large- and medium-sized urban areas and sewage-irrigated areas. In some places pollution has gotten so bad that the rivers have changed color and give forth an offensive smell. Water from these rivers is not safe to drink. These places also register a high incidence of disease.

Another condition merits our attention. In recent years, small-town industrialization has been developing rapidly. In developing their industries, some localities have ignored environmental protection and set up many polluting industries without any preventive safeguards. Often, one very small factory is enough to pollute an entire river. The fact that many villages in China still depend on rivers for their drinking water only makes the situation more hazardous. We must stop water pollution from getting worse as soon as possible.

Question: Which issues should we address in carrying out the "Water Pollution Prevention and Treatment Law"?

Answer: In drawing up this law, the Standing Committee insisted on pragmatism, taking the existing conditions in China as its starting point. We must do the same when we enforce the law. We are modernizing in order to quadruple the output value of agriculture and industry and achieve a fairly comfortable standard of living for the nation by the end of the century. Environmental protection work must ensure the realization of that objective as well as preserving the environment. The purposes of the law are to safeguard the physical health of the people and promote economic development. In carrying it out, we must harmonize the two, and try our best to integrate economic results with social and environmental results ones.

Concerning the relationship between prevention and treatment, while we must stress both, we should integrate the two and make prevention our priority. Prevention is essential both to ensure a particular locality would not be polluted and to prevent a polluted environment from getting worse. Large- and medium-sized industrial and mining enterprises must do a good prevention job. Small-scale and small-town enterprises must also conform to the standards imposed by the law without any exception. If prevention is important, so is treatment. Since pollution has become so bad, we should emphasize treatment, without which there could be no protection and no improvements. The law has made adequate provisions for both prevention and treatment. We must stress both in our implementation.

Another point is that standards must be appropriate, and management, strict. Standards play an important role in law enforcement. The law authorizes the environmental protection agency of the State Council to set national standards. In doing so, the agency must proceed from the nation's existing conditions and try to satisfy the basic requirements of protecting human health and preserving the ecological balance without losing sight of China's economic and technological realities. Management must be strict. Whatever is enforceable must be enforced. There should be no excessive leniency, no indulgence.

Question: The law comes into effect on 1 November. What can we do now to prepare for it?

Answer: There is almost a half-year preparatory period between promulgation and implementation. It is essential that all parties concerned have the time to modify their operations to meet the requirements of the law. The "Water Pollution Prevention and Treatment Law" stipulates numerous rules and regulations affecting the people's government at all levels, environmental protection agencies and other related departments, enterprises, individuals involved in water pollution work, and judicial departments. Once a law is made, we must make sure it works. As the law has been promulgated, we must examine our operations to find out what must be done to meet its requirements. The Ministry of Urban and Rural Construction and Environmental Protection has an important role to play in carrying out this law. It must work out the implementation details and lay down standards as soon as possible. It must strengthen its supervisory and managerial capability to make sure that the law is carried out smoothly.

A crucial task right now is publicity. We must go all out to publicize the law, and help people learn and understand it and use the legal instrument. We must also disseminate knowledge on how to prevent water pollution, and introduce prevention technologies; some people break the law not wilfully, but out of ignorance. This is particularly true of small enterprises and enterprises in rural areas. Apart from regulations, we must resort to propaganda education and the popularization of science and technology. Propaganda education should involve everybody; newspapers, radio and television stations should highlight it by covering it extensively. The ZHONGGUO HUANJING BAO, especially, is duty-bound to do a fine propaganda job and contribute towards the implementation of the "Water Pollution Prevention and Treatment Law."

12581

CSO: 4008/345

## NEW IDEAS TO DIVERT WATER TO NORTH

Beijing GUANGMING RIBAO in Chinese 21 Jun 84 p 2

[Article by Li Wei [2621 5588]: "Experts Propose Water Diversion Project"]

[Text] A new idea to divert water to the north has been put forward by a group of meteorologists and water conservancy experts from Beijing, Nanjing and Qinghai after they inspected the sources of the Chang Jiang and Huang He. Through human intervention, atmospheric vapor in the upper reaches of the Chang Jiang is to be moved to the source of the Huang He where it will come down as rain, thus raising the water level of the river. By the end of the century, the gradual implementation of this idea, coupled with useable water from the Huang He and appropriate water conservancy works, could increase irrigated farmland in Qinghai by 2.5 million mu; irrigated timberland, pastureland and land used to grow fodder, by 2.35 million mu; irrigated desert, by 10 million mu; and hydro-electric power, by 4 million kilowatt. Definite changes will also occur in the climatic system over the Qinghai Plateau, stimulating husbandry and agricultural production. Furthermore, there will be an immense and far-reaching impact on the effort to afforest the barren mountains along the upper and middle reaches of the Huang He.

Titled the "Project to Increase the Water of the Source of the Huang He," the study was organized by the Qinghai Provincial People's Government and the Chinese Federation of Economic Societies. Participating in the project, which took place last April, were Rao Xing [7457 5281], former director of the State Meteorological Bureau; Yao Zhensheng [1633 2650 3932], a professor at Nanjing University; Zhu Mingdao [2612 2494 6670], a meteorological expert with the Chinese Federation of Economic Societies; Wang Fuxiang [3076 4395 4382], senior engineer of the Water Conservancy Department of Qinghai Province; and Zou Wenming [6760 2429 2494], deputy chief engineer of the same department. The study tour lasted 23 days and covered 3,500 km. They focused on the watersheds of the Chang Jiang and the Huang He--the passes of the Bayanka shan, Jiuzhishan, Manzhangshan and agricultural areas around Xining.

12581

CSO: 4008/345

## COMPREHENSIVE UTILIZATION OF WATER RESOURCES URGED

Chengdu SICHUAN RIBAO in Chinese 29 May 84 p 2

[Article by Wang Yi Ming [3769 0001 6900]: "Water Resources Must be Utilized Comprehensively"]

[Text] Crisscrossing Sichuan Province is a network of rivers, creating excellent conditions for transportation, irrigation, hydro-electric power generation, water supply, and the development of an aquatic products industry. The basins of such rivers as the Chang Jiang, Jialing Jiang, Tuo Jiang, Min Jiang, Dadu He, Jinsha Jiang, Qu Jiang, Pei Jiang, Wu Jiang, Qing Jiang and Yalong Jiang account for 80 percent of the area of the entire province. With more than 8,000 km of navigable rivers, Sichuan is one of those provinces which have the largest number of rivers open to shipping. The abundance of water resources is an extremely important material basis for the province's four modernizations.

After the founding of the people's republic, the various waterrelated departments in Sichuan Province have achieved definite results in tapping the rivers' water resources. But many problems still remain in comprehensive utilization, the major ones being: 1) There has been a lack of unified planning which takes into consideration every aspect of water utilization. An improvement someplace is often offset by a deterioration elsewhere. For example, an electric station may be repaired at the expense of shipping. Studies have shown that shipping on 32 percent of all navigable rivers in the province were disrupted or cut off due to such repairs. 2) Some residents and industrial and mining enterprises along the rivers have been dumping wastes and residues wantonly, silting up shipping lanes and harbors, and polluting the water. Not only do such practices affect shipping, irrigation, aquatic products and the urban environment, but they also constitute a grave threat to the health of the general public. 3) Some units along the rivers have been constructing projects on them improperly, e.g., building dykes to reclaim land from a river, and narrowing river beds. As a result, river beds become badly silted, which, in turn, affects shipping and causes waterlogging.

Below are some proposals on the rational development and utilization of rivers and water in order that water resources are comprehensively utilized in Sichuan Province:

1. We must insist on the principle of comprehensive utilization. A unit should not be left alone to do its own thing in isolation from others. Even more impermissible is the kind of project which requires sacrifices by other parties. First, departments responsible for water-borne transportation must seriously carry out the principle of comprehensive utilization and other relevant regulations issued by the State Council and the Ministry of Communications; actively coordinate their work with fraternal units that also utilize river water resources; strengthen the management and preservation of rivers, and ensure that shipping lines and harbors remain navigable. All communications and shipping departments must assist the construction departments and other units to tackle existing shipping obstructions, in strict accordance with relevant directives issued by the central government and provincial authorities.

2. An agency for the comprehensive utilization of water resources should be established at each of the provincial, local and county levels. Its duties are to supervise the implementation by the departments of the general and specific policies issued by the central and provincial authorities that concern water-resource comprehensive utilization; organize the systematic development and utilization of rivers by all water-related departments; and coordinate and arbitrate inter-agency differences. The directorship of this agency should be held concurrently by the responsible comrade at the relevant level. Its personnel should be drawn from the major water-related departments. Its office can be set up inside the economic planning commission at the appropriate level.

12581  
CSO: 4008/345

VIRUS CONTAMINATION IN TAP WATER STUDIED

Beijing HUANJING KEXUE [JOURNAL OF ENVIRONMENTAL SCIENCE] in Chinese No 2,  
30 Apr 84, pp 29-30

[Article by Zhang Chuyu [1728 2806 3342], Li Pifen [2621 0012 5358], and  
Wang Zuqing [3769 4371 0615] of Virology Department, Wuhan University:  
"Preliminary Study of Virus Contamination in Tap Water"]

[Summary] In recent decades, virus was found in treated tap water supplies abroad which raised considerable concern. An experimental study was carried out in order to determine whether tap water in China contained any virus. Seven water samples were taken from a water treatment plant during the period April-December 1982. Viruses were collected by filtering the water sample through a microporous filter coated with an absorption layer. They were cultured, separated and examined. HeLa, Vero and A549 cells were used in these tests. Specific procedures were formulated to study adenovirus as well as enterovirus. All seven water samples showed signs of virus contamination. Five out of the seven specimens were identified. Adenovirus was found in all five samples and Coxsackie virus B existed in four samples, which indicated that these two types of viruses are highly resistant to chlorination. The major cause was believed to be contamination of the water source. The current water purifying technology cannot completely remove and eliminate viruses, and needs to be improved. A virological standard should also be established.

12553  
CSO: 4009/95

## EFFECT OF RIVER POLLUTION ON GROUNDWATER QUALITY

Dalian HUANJING KEXUE XUEBAO [ACTA SCIENTIAE CIRCUMSTANTIAE] in  
Chinese No 1, Mar 84, pp 65-68

[Article by Zhang Qide [1728 0796 1795], Yu Shuqing [0060 3219 3237]  
and Song Liming [1345 4539 2494]: "Study of Effects of Polluted River  
Water on Groundwater Quality"]

[Summary] Based on common major contaminants in river water and groundwater, synchronized observation of water level and hydrogeological survey, the extent, range and mechanism of secondary pollution in the Hun He basin were investigated. The region studied was the Mantan area approximately 30 Km long and 4 Km wide. The groundwater is replenished directly by river water and regional groundwater. Four sampling cross-sections perpendicular to the river bed were used. Each was about 3 Km long (1.5 Km on either side of the river) and had 12-16 sampling wells. Common contaminants such as oil (aromatic hydrocarbon), phenol, ammonia, nitrite, COD and BOD were used as indicators. Groundwater flow and hydraulic gradient were determined by synchronized water level observation. The water containing layer thickness and permeation coefficient were measured through surveys. The amount of river water replenishing the groundwater was calculated by the Darcy formula.

Secondary pollution of groundwater by river water was found on both sides of the river. The extent of pollution followed a pattern that latitudinally it was more serious closer to the river. Longitudinally, it was worse upstream because of the relatively better purifying capacity downstream. The pollution was limited to a region 800 meters wide on either sides of the river in continuous extraction area and 100 meters in non-extraction area. It was estimated that 36.7 tons of oil, 4578.1 tons of COD, 892.3 tons of ammonia, 7.5 tons of phenol, 660.2 tons of BOD and 8.6 tons of nitrites enter the groundwater annually.

CSO: 4009/81  
12553



CHLORINITY, SALINITY, ELECTRICAL CONDUCTIVITY, ALKALINITY AT  
MOUTH OF THE ZHU JIANG

Beijing HAIYANG XUEBAO [ACTA OCEANOLOGICA SINICA] in Chinese No. 6,  
25 Nov 83, pp 728-733

[Article by Liang Zhi [2733 1807] and Wang Zhaoding [3769 5128 7844]  
both of the Nanhai Ocean Institute of the Chinese Academy of Sciences,  
submitted on 14 Aug 82: ["Chlorinity, Salinity, Electrical Conductivity  
and Alkalinity and Their Interrelation at the Mouth of the Zhu Jiang"]

[Summary] Water samples were collected in April 1980 from seven stations  
at the mouth of the Zhu Jiang and analyzed in order to determine the  
chlorinity, salinity, electrical conductivity and alkalinity as well  
as their interrelation. They were filtered through a 0.45 micron acetate  
fiber and transferred into glass bottles in the laboratory. The chlorinity  
was measured by potentiometric titration using  $\text{AgNO}_3$  solutions. The  
salinity was determined by the Morris gravimetric method. The electrical  
conductivity was measured using a DDS - 11 conductivity meter. The  
alkalinity was determined by a pH method.

The chlorinity and salinity of the Zhu Jiang were found to gradually  
increase from north to south due to the dilution of seawater by fresh  
water. The relations between chlorinity  $S$  and salinity  $Cl$  was found to  
be  $S\% = 0.030 + 1.8109Cl\%$ . The relation between salinity and  
electrical conductivity  $R_{15}$  was found to be:  $S\% = 0.03314 + 26.7625R_{15}$   
 $+ 10.6465R_{15}^2$ . The alkalinity of the water sample also increased with  
increasing salinity. The specific alkalinity  $A_c$ , which is the ratio  
of alkalinity to chlorinity, was found to decrease drastically with  
increasing alkalinity and then gradually levelled off to approach a  
constant. This relation was expressed by the following empirical  
formula:  $A_c = (0.5099 + \frac{11.971}{Cl} * 10^3)$ .

Results indicate that error usually exist when the Knudsen equation  
is used to calculate the salinity in coastal waters because it assumed  
that seawater of the same salinity has the same ionic ratio. Alkalinity  
is a good indicator of the mixing process at the river mouth. It not  
only affects salinity but also reflects the carbonate equilibrium. This  
information will serve as a basis for further studies on the water  
chemistry at the mouth of the Zhu Jiang.

12553  
CSO: 4009/62

## CHANGSHA HOUSEHOLDS POISONED BY PESTICIDE

### Accidental Chloropicrin Spraying

HK170744 Changsha Hunan Provincial Service in Mandarin 2300 GMT 15 Jul 84

[Text] Yesterday [15 July] and the day before, this station continually reported that 16 residents' households at No 70 (Fusheng) street in Changsha were harmed by a chemical. People must show great concern regarding how the accident came about.

At 0600 the day before yesterday, (Long Guoxiang), a retired worker of the Changsha warehouse of the traditional Chinese medicine station of the provincial drug company, sprayed a pesticide, chloropicrin, over medicines in the warehouse, resulting in a gas leak that poisoned 16 adjacent residents' households to differing degrees.

After the accident had occurred, (Chen Lushe), and (Wei Yuejie), reporters of this station, rushed to the spot to cover the accident.

They discovered that the supper which the residents had not eaten was full of flies killed by poison and that some chickens and cats had been killed by poison. Fifty-two residents could not return home.

Yesterday at noon, responsible persons of the provincial drug company went to the place where the accident occurred. They expressed sympathy and solicitude for the victims and made proper arrangements for them. (Zhou Linan), secretary of the provincial drug company CPC Committee, told the reporters that the reason for this accident was that on the one hand, drugs were not properly handled and, on the other, the provincial drug department had insufficient funds and was unable to repair suitable warehouses to keep traditional Chinese medicines, resulting in this accidental poisoning.

Dear listeners, after continually reporting to you that 16 residents' households in (Fusheng) Street in Changsha City had been harmed by a chemical, we have very heavy hearts, as you all have. According to relevant data, chloropicrin is a very poisonous chemical. If air contains over 0.12 grams per liter, it will suffocate people. Departments concerned had already prohibited the use of this chemical long ago. What was lamentable was that not a single person of some 20 staff members and workers in this unit, including the station head, knew the function and use of chloropicrin. What was even more distressing was that the provincial drug company did not have a system of strict management of this chemical, so that its subordinate unit sprayed some 10 kg over the drugs in a small warehouse in order to kill a few moths. Thus, this unnecessary accident occurred.

## Drug Company Responds

HK170743 Changsha Hunan Provincial Service in Mandarin 1100 GMT 15 Jul 84

[Text] In the news-in-brief program at 2230 yesterday and in the news program at 1200 today, this station continually reported that 16 residents' households in (Fusheng) Street in Changsha City were harmed by a chemical. At 0330 today, reporters rushed to the spot again. Residents here told the reporters in happy astonishment that relatively proper arrangements had been made for them. They also told the reporters that after the reports by press units, at about 1100, five responsible persons of the provincial drug company, including (Guo Zhiyu), assistant manager of the provincial drug company, and (Zhou Linan), secretary of the company CPC Committee, went to the spot, expressing sympathy and solicitude for the victims. They also compensated them for their economic losses. They told the residents: Tomorrow, in coordination with the provincial Environmental Protection Department, we shall come to conduct an investigation and examine the contaminated food and utensils.

At the same time, the reporters gathered news over the telephone from (Zhou Linan), secretary of the provincial drug company CPC Committee. He first apologized for the accident. He also examined the chaotic situation in drug management. Moreover, he told reporters that due to insufficient funds, the provincial drug department was unable to repair warehouses storing traditional Chinese medicines. He said: The great majority of the existing warehouses for traditional Chinese medicines are temples and run-down warehouses left over from the 1950's. Every year, the losses caused to traditional Chinese medicines which deteriorate and are damaged by insect pests in spring and summer amount to over 2 million yuan. They have reported this situation to the provincial authorities on many occasions but no importance has been attached this situation. They have had no alternative but to adopt a passive method of using drastic poisons to prevent insect pests. He hoped that press units would appeal to the provincial authorities to pay attention to this situation.

CSO: 4008/395

## NITROGEN, PHOSPHORUS IN LAKE DONGHU DESCRIBED

Beijing HAIYANG YU HUZHAO [OCEANOLOGIA ET LIMNOLOGIA SINICA] in Chinese  
No 3, May 84 p 213

[Article by Zhang Shuiyuan [1728 3055 0337], Liu Quxia [0491 5900 7209] and Huang Yaotong [7806 5069 2717], all of the Institute of Hydrobiology, Chinese Academy of Sciences, Wuchang: "The Main Sources of Nitrogen and Phosphorus in Lake Donghu, Wuhan"]

[Summary] The annual input of the total dissolved nitrogen (N) was 536.3 t, corresponding to an average loading per unit area of 19.22 g/m<sup>2</sup>·a. The annual input of total dissolved phosphate (PO<sub>4</sub><sup>3-</sup>) was 87.8 t, corresponding to an average loading per unit area of 3.15 g/m<sup>2</sup>·a. Of the nitrogen loading, 59.2 percent was derived from domestic sewage and industrial wastewater, 34.0 percent from terrestrial run-off and 6.8 percent from precipitation. Of the phosphorus loading, 74.7 percent came from domestic sewage and industrial wastewater, 24.2 percent from terrestrial run-off and only 1.1 percent from precipitation.

The total outputs of nitrogen and phosphorus were 213.1 and 20.1 t/a respectively; 90.8 percent of the nitrogen and 51.7 percent of the phosphorus were removed through the water supply, while 9.2 percent of the nitrogen and 48.3 percent of the phosphorus were removed through fish yielding and macrophyte harvesting.

The differences between the influx and efflux of the nutrients were 323.2 t N/a and 67.7 t P/a, so that 60.3 percent N and 77.1 percent P of the total annual inputs were presumed to have been accumulated in the lake.

Based on the results, important factors causing eutrophication in Lake Donghu are given. Suggestions of measures to control lake eutrophication are presented as well.

9717

CSO: 4009/112

## NITROGEN POLLUTION OF GROUNDWATER IN XI'AN

Beijing HUANJING KEXUE [JOURNAL OF ENVIRONMENTAL SCIENCES] in Chinese No 2,  
30 Apr 84, pp 35-38

[Article by Dong Faki [5516 4099 7030] of Shaanxi First Hydrogeology Team:  
"Environmental Hydrogeological Study on Nitrogen Pollution of Groundwater  
in Xi'an"]

[Summary] The environmental hydrogeological conditions of Xi'an were analyzed in order to study the characteristics of nitrogen pollution of groundwater. The nitrogen content was measured to exceed 60 ppm in the vicinity of downtown and ancient city site north of the city. It continued to decrease with distance to below 2 ppm in the countryside. Nitrogen is present in groundwater in the form of nitrates and the maximum nitrogen pollution depth is approximately 60 meters. The distribution pattern of nitrogen pollution was found to be closely related to the living environment. The major source of nitrogen came from the decomposition of discarded organic nitrogens and proteins in an oxidizing environment. The surface soil in Xi'an favors such reactions, leading to an enrichment of nitrogen. With increasing depth, the oxidizing environment gradually changes to a reducing one, which effectively limits nitrogen pollution to the groundwater level about 60 meters deep. The groundwater in the downtown area contains a relatively high level of nitrogen and is not suitable for drinking. However, irrigation at 50 cubic meters per mou was found to be equivalent to applying 2.5-13.5 kg of urea in the field; which should be exploited. Finally, a water permeation experiment was designed and performed to investigate nitrogen pollution in groundwater and a block diagram of such mechanism was presented.

12553

CSO: 4009/95

## HEAVY METALS AT THE MOUTH OF BEITANG RIVER

Beijing HUANJING KEXUE [JOURNAL OF ENVIRONMENTAL SCIENCE] in Chinese No 2,  
30 Apr 84, pp 31-35

[Article by Li Bingming [7812 4426 6900] of the Institute of Geochemistry,  
Chinese Academy of Sciences: "Distribution, Transport and Self-purification  
of Some Heavy Metals at the Mouth of the Beitang River"]

[Summary] On 23 September 1981, 12 water samples and surface deposits were collected along a 10 kilometer stretch at the mouth of the Beitang River to analyze heavy metals such as cadmium, lead, copper and zinc in order to study their distribution, transport, and the self-purification effect of the river. The heavy metal contents were found to be higher than those in normal seawater. Although the cadmium, lead and zinc levels were below the pollution standards, the average value of copper was so high that further investigation to prevent any secondary pollution to the water quality was warranted. The enrichment of heavy metals in the surface deposits was found to be on the same level as that in the Rhine in the 15th and 16th centuries, showing no apparent signs of pollution. A considerable amount of heavy metals were found to have absorbed on suspended particles in the water which demonstrated the self-purification mechanism of the river. The humus and inorganic minerals present in the water as well as in the deposit controlled the absorption, organic chelating, or ion exchange process at the solid-liquid interface. The interrelation of the heavy metals in the deposit not only reflected the geochemical characteristic of intergrowth composition but also served to remind people to pay more attention to the danger of pollution by the further growth in industry and mining in the upper reaches of the river.

The author wished to thank comrades Chen Yecai [7115 2814 2088] and Chen Yuanzheng [7115 6678 1767] for collecting the specimens, and comrades Zhou Zhongyi [6650 0022 3015], Li Chengshu [2621 2110 2579] and Li Sunrong [2621 5549 5554] for their assistance in microscopic identification, organic carbon analysis and complete water sample analysis.

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CSO: 4009/95

NITROGEN, PHOSPHORUS POLLUTION OF GUANTING RESERVOIR .

Dalian HUANJING KEXUE XUEBAO [ACTA SCIENTIAE CIRCUMSTANTIAE] in  
Chinese No 1, Mar 84, pp 1-15

[Article by Gao Zhengmin [7559 2163 3046], Zhang Fuzhu [1728 4395 3796],  
Dai Tongshun [2071 0681 7311] et al: "Nitrogen and Phosphorous Pollution  
and Its Control of the Guanting Reservoir"]

[Summary] The Guanting Reservoir is an important water supply in the Beijing area. Since the 1970's, it has been seriously polluted by industrial waste. A water resource protection office was established in 1972 to restore the water quality to meet the national standards. After a three year study of nitrogen and phosphorous pollution, three major problems were identified: 1.  $\text{NH}_3$  pollution and its biological effect, 2. Rogor content, and 3. eutrophication. A comprehensive evaluation of N and P was made which revealed that  $\text{NH}_3$ -N pollution was a problem. Because the water pH was around 8.5, the  $\text{NH}_3$  content might lead to some biological effects. The Rogor content in the Guanting Reservoir was high from 1970-1980. It was related to the use of agricultural chemicals. Since phosphorous had been identified as the limiting factor in eutrophication, both  $\text{PO}_4^{3-}$  - P and total P in water and silt were measured in 1981. A mathematical model was used to calculate the values of E and B. The Guanting Reservoir was in a preliminary state of eutrophication. The radioisotope  $^{32}\text{P}$  was used to study the eutrophication of the Guanting Reservoir which confirmed that  $\text{PO}_4^{3-}$  - P was the primary limiting factor. A comprehensive evaluation of N and P pollution and eutrophication was conducted based on the ambiguity group theory. Finally, ecological prevention methods to control N and P pollution were discussed.

CSO: 4009/81  
12553

MERCURY, DDT, BHC IN ECOSYSTEM IN JIYUN HE

Dalian HUANJING KEXUE XUEBAO [ACTA SCIENTIAE CIRCUMSTANTIAE] in Chinese No 1, Mar 84, pp 57-63

[Article by Huang Yuyao [7806 3768 3852], Zhao Zhongxian [6392 1813 2009], Yi Chuigui [0308 0987 6311] and Pang Sujuan [1690 5685 1227]: "Transport, Accumulation and Circulation of Mercury, DDT and BHC in Ecosystem in Estuary of the Jiyun He"

[Summary] The Jiyun He is one of the major rivers in Tianjin polluted by mercury, DDT and BHC by wastewater from chemical plants. Surveys were conducted in 1978 and 1979 to investigate the transport, accumulation and circulation of these three toxic substances. It was found that all three species could easily accumulate in aquatic organisms and the accumulation generally increased with the trophic level. Mercury was the most significant and its average concentrations in water, waterweeds, planktons, benthos, herbivorous fish, monivorous fish, carnivorous fish and water fowl in vivo in the estuary of the Jiyun He were 0.0005, 0.19, 0.34, 0.48, 0.90, 1.28, 1.70 and 3.29 ppm, respectively. The water quality in 1979 was significantly improved. The BHC content was within the drinking water standard. However, mercury and DDT were still high. The concentrations of these three toxic species in the sediment at the river mouth were very high, which might have a great effect on accumulation in vivo. The concentration factor of BHC in fish was found to be low ( $10^2$ ) and easy to remove. The accumulation of DDT was the strongest. However, it could be converted into DDE and DDD in vivo, which are less toxic. Mercury could accumulate strongly and is recycled repeatedly in the ecosystem. Wastewater containing mercury must be strictly processed to cut off the source of pollution and then the sediment on the river bottom must be removed.

All authors are associated with the Institute of Zoology, Chinese Academy of Sciences. The manuscript was received on 2 Apr 83.

CSO: 4009/81  
12553



CONTENT, DISTRIBUTION OF ARSENIC IN SOIL STUDIED

Beijing ZHONGGUO HUANJING KEXUE [ENVIRONMENTAL SCIENCES IN CHINA] in Chinese No 1, 21 Feb 84 pp 73-76 and inside back cover

[Article by Liu Quanyou [0491 0356 0645] and Huang Yanchu [7806 5888 0443] of Environmental Chemistry Institute, Chinese Academy of Sciences: "Study on Contents and Distribution of Arsenic in Soils of Some Areas in China"]

[Summary] Arsenic is a toxic element, harmful to human health and to plant and animal growth. Differences in arsenic content in soils are mainly determined by the types of mother rock. This report is a preliminary study of arsenic content and distribution for soils in Guangzhou, Nanjing, Beijing, Guangdong and Turfan. Tables 1 through 4, 6 and 7 generally show the scope of the study. To determine arsenic content in soil types of some areas in China, and to gradually find the relation between natural background values of arsenic and various soil types, statistical data of the arsenic content in major soil types and topsoil data in 419 profiles are listed in Tables 1 and 2.

To determine arsenic content of various types of soil in China, and to seek the relation among the factors underlying arsenic content and soil types as well as characteristics of mother substance, arsenic content by soil types from different mother substances is listed in Table 3.

Table 1. Basic Data (ppm) of Arsenic Concentrations in Soils of Various Areas

Area	Number of samples	Original Value			Natural Logarithm				
		Range	Arithmetic mean	Median	Standard Deviation	Range	Median	Standard Deviation	
Guangzhou	19	1.53-49.2	13.13	6.65	13.62	0.43-3.90	2.06	1.03	7.85
Nanjing	50	2.10-25.9	10.0	9.39	5.82	0.742-3.25	2.13	0.61	8.43
Beijing	20	5.61-13.1	8.65	8.38	2.41	1.72-2.57	2.13	0.24	8.39
Tianjin	101	3.6-22.1	9.84		3.16	1.28-3.10	2.24	0.32	9.36
Guangdong	72	1.05-95.0	13.5	13.80	15.30	0.05-4.55	2.13	0.99	8.42
Turfan	44	3.75-18.3	10.50	2.82	0.269	1.32-2.91	2.31	0.305	10.09

Remark: Data are quoted from the Soil Background Value Cooperation Section, the Chinese Academy of Sciences.

Table 2. Arsenic Content (ppm) in Soil Types of Various Areas

Area	Soil type	Number of samples	Range	Arithmetic Mean		Natural Logarithm		Geometric Mean
				Mean	Standard Deviation	Mean	Standard Deviation	
Tianjin	Humid soil	67	3.6-22.1	10.76	4.72	2.24	0.31	9.44
	Bog humid soil	5	8.7-13.8	11.38	1.92			
	Salinized humid soil	19	6.3-17.0	10.03	2.78	2.27	0.26	9.70
	Black Earth	10	4.30-15.0	8.43	3.90			
Turfan	Oasis Loess	11	9.5-14.0	11.11	1.44	2.40	0.128	11.02
	Oasis humid soil	3	8 -12.0	9.83				
	Mountain Brown Soil	2	8.75-8.88	8.81				
	Grassy Turf Soil	3	9.37-12.4	10.62				
	Saline soil	6	7.0-13.8	10.49	3.07	2.313	0.302	10.11
	Gypsum Brown Desert Soil	8	4.0-18.3	10.80	4.36	2.295	0.462	9.92
	Brown Desert Soil	7	8.75-13.1	10.78	1.54	2.369	0.145	10.69
Guangdong	Lime soil	4	12.0-39.9	23.1	11.9	3.04	0.494	21.0
	Paddy soil	14	2.43-79.9	12.60	16.6	2.36	0.954	10.6
	Latosol	6	2.45-11.0	6.75	3.41	1.77	0.606	5.89
	Purple soil	9	2.72-95.0	24.4	27.8	2.77	0.983	15.9
	Red loam	21	1.25-62.8	14.6	17.7	1.97	1.23	7.20
	Lateritic soil	4	1.90-18.0	10.4	6.70	2.07	0.989	7.94
	Mountain Loess	8	1.05-12.4	6.37	4.40	1.50	0.884	4.76
	Coastal saline soil	3	8.9-13.8	10.3	3.04	2.30	0.280	9.99
	Parched lateritic soil	3	4.0-6.60	5.12	1.34	1.61	0.254	5.00

[Table 2 continued]

Beijing	Mountain leaching black earth	9	5.61-12.8	8.73	2.53	0.289	2.13	0.291	8.41
	Carbonate black earth	6	6.4-13.1	9.04	2.23	0.247	2.17	0.236	8.76
	Subalpine grassy turf soil	2	7.6-8.10	7.85	0.35	0.045	2.06	0.035	7.77
	Grassy turf black earth	2	6.0-9.4	7.10	1.70	0.091	2.02	0.225	7.53
Nanjing	Yellowish brown earth	10	2.34-24.2	10.02	6.69	0.667	2.09	0.676	8.08
	Yellow hardpan	6	7.45-10.2	9.29	0.87	0.094	2.22	0.104	9.21
	Humid soil	7	9.31-12.4	10.60	1.16	0.109	2.36	0.111	10.59
Guangzhou	Red loam	10	1.53-4.92	12.20	14.28	1.171	1.91	1.08	6.82
	Paddy soil	4	3.93-22.0	12.73	8.04	0.632	2.28	0.76	9.78
	Purple soil	2	2.72-17.2	9.96	7.24	0.727	1.92	0.92	6.82

Table 3. Arsenic Content (ppm) in Mother Rock of Main Soil Types Grown From Different Mother Rock in Some Areas of China

Area	Site	Pedogenic mother substance	Soil types	Arsenic content
Beijing	Tiekuangyu (elevation: 1,200 m) of Huairou County in the upper reaches of the Sha River	Granite	Mountain leaching black earth	5.61
	Gongjiafen (elevation: 800 m) of Huairou County in the upper reaches of the Sha River	Limestone	Mountain leaching black earth	11.60
	A peak (elevation: 1,200 m) in Shangkou Mountains, 13 Ming Imperial Tombs, Changping County	Marble	Mountain leaching black earth	12.80
	A peak (elevation: 1,000 m) in the Bada Ridge, 10 li south of seat of Changping County	Granite	Mountain leaching black earth	9.00
	A peak (elevation: 1,930 m) in Baicaopan Mountains, Mentougou	Andesite	Subalpine grassy turf soil	8.10
	A peak (elevation: 1,700 m) in Baicaopan Mountains, Mentougou	Andesite	Mountain brown forest soil	9.00
Nanjing	3 li (elevation): 200 m) south of Hengling Zhen, Fangshan	Basalt	Yellowish brown soil	6.25
	Luanshi Ridge at 4 li northeast of Qilin Gate	Granite-porphry	Yellowish brown soil	4.30
Tianjin	Lujuzi Shanmen, Haomen Production Brigade, Chuanfangyu Commune, Jixian County	Sandstone	Red clay	14.3
	400 m northeast of Tayuan, Guanzhuang Commune, Jixian County	Granite	Black earth	6.2
	Fouqingling, east of Panshan, Jixian County	Granite	Leaching black earth	5.3
	South of Zhuanwajiao, Panshan, Jixian County	Granite	Leaching black earth	5.7
Guangdong	Dashaping, Dapuling Commune, Huaxian County	Granite	Red loam	10.0
	Shijing Commune, Guangzhou suburb	Sandstone	Red loam	49.2
	Nangang Commune, Guangzhou suburb	Granite	Red loam	2.75
	Luogang Commune, Guangzhou suburb	Granite	Red loam	1.75
	Motianling, Baiyun Mountains, Guangzhou Municipality	Quartz-sandstone	Red loam	26.9
	Northeast of seat of Shixing County, Shaoshan	Granite	Purple soil	13.6
	Dongqiao Commune, Lufeng County, Shantou	Granite	Red loam	28.0
	Bingying Timber Tract, Beidou Commune, Fengshun County	Granite	Red loam	3.08
Weidi Commune, Luoding County, Zhaoqing	Purple sandstone	Purple soil	6.90	

[Continuation of Table 3]

Area	Site	Pedogenic mother substance	Soil types	Arsenic content
Guang-dong	A peak (elevation: 1,876 m) in Wuzhi Mountains, Qiongzong County, Hainan Island	Rhyolite	Mountain loess	1.05
	Northwest of Luhuitou, Yaixian County, Hainan Island	Calp	Black calcareous soil	19.50
Xin-jiang	A hilltop in Meijiao Ditch, Turfan	Diluvial de- position of andesite	Mountain brown soil	8.88
	A vehicle depot in Meijiao Ditch, Turfan	Andesite	Mountain brown soil	8.75

The most recent recorded extreme low value of arsenic content in soil is only 1.05 ppm (as shown in Table 4) at an elevation of 1,876 m in the Wuzhi Mountains.

Table 4. Arsenic Content in Mountain Yellow Earth Grown From Rhyolite in Wuzhi Mountains of Hainan Island

Depth of soil layer (cm)	0-16	16-25	25-40	Rock
Arsenic content (ppm)	1.05	2.25	3.30	2.38

To study the horizontal distribution of arsenic content in soils of some areas in China, a graphic method and  $\chi^2$  examination method are used to examine the distribution types; Table 6 shows the result of  $\chi^2$  examination.

Table 6. Examination on Arsenic Concentration Distribution Types in Soils of Various Areas

Area	Number of Samples	Normal Assumption		Logarithmic Normal Assumption			Distribution Pattern	
		$\chi^2$	Degree of Freedom	Confidence Coefficient	$\chi^2$	Degree of Freedom		Confidence Coefficient
Guangzhou	19	7.09	1	$0.001 < P < 0.01$	4.41	1	$0.02 < P < 0.05$	Logarithmic normal
Nanjing	50	21.56	2	$0.5 < P < 0.1$	1.503	3	$0.5 < P < 0.7$	" "
Beijing	20	0.5	2	$0.5 < P < 0.7$	9.62	2	$0.001 < P < 0.01$	Normal
Tianjin	103	11.84	5	$0.05 < P < 0.02$	3.04	5	$0.5 < P < 0.7$	Logarithmic normal
Guangdong	60	82.79	4	$P < 0.01$	2.019	4	$0.05 < P < 0.8$	" "
Turfan	44	4.24	2	$0.1 < P < 0.2$	6.29	3	$0.05 < P < 0.1$	Normal

From examinations of arsenic distribution types in soils, the arsenic average concentration and the 95 percent confidence level belt of seven areas, as well as a comparison made with world data, are listed in Table 7.

Table 7. Average Arsenic Content and 95 Percent Confidence Belt in Soils of Various Areas

Area	Average Content	95 Percent Confidence Belt
Guangzhou	7.85	7.36-8.34
Nanjing	8.43	7.13-9.97
Beijing	8.65	7.53-9.78
Tianjin	9.36	9.30-9.42
Turfan	10.5	10.42-10.58
Guangdong	7.85	5.77-9.30
World [1]	6.00	0.1 -40.0

Remark: [1] Bowen, H. J. M. Environmental Chemistry of the Elements, pp 60-61, Academic Press (1966).

10424

CSO: 4009/65



DISTRIBUTION OF MERCURY IN SOIL

Beijing HUANJING KEXUE [JOURNAL OF ENVIRONMENTAL SCIENCE] in Chinese No 6,  
30 Dec 83, pp 32-35

[Article by Dai Zhaohua [2071 2507 5478] and Huang Yanchu [7806 5888 0443] of  
the Institute of Environmental Chemistry, Chinese Academy of Sciences:  
"Distribution of Mercury in Soil"]

[Summary] Mercury exists in the earth's crust in various forms. It may be evaporated to enter the atmosphere, or be washed by rain into the water, to be reabsorbed later by the soil. The amount of mercury entering and leaving the soil in uncultivated and unpolluted land was believed to be in equilibrium. The mercury content in soil may vary significantly. Its vertical distribution is not homogeneous. The surface soil normally contains 5-10 times more mercury than the bottom layer (2-10ng/g). In this work, the mercury contents in soil samples from five regions in China were determined. Their vertical distribution patterns were also obtained. The distribution frequency of the mercury content was also examined. It was found to follow a normal or near normal logarithmic pattern as suggested by Ahrens. The geometric average should be more appropriate as the background level of mercury in soil.

12553

CSO: 4009/42

ACCUMULATION OF NATURAL RADIONUCLIDE IN PLANTS

Beijing HUANGJING KEXUE [JOURNAL OF ENVIRONMENTAL SCIENCE] in Chinese No 6,  
30 Dec 83, pp 10-17

[Article by Yang Gang [2799 0474] and Liao Chiwu [1675 6375 2976] of Sanitation and Antiepidemic Station of Guangxi Zhuang Autonomous Region: "Accumulation of Natural Radionuclide in Plants Applied with Phosphate Fertilizer Containing Uranium"]

[Summary] Uranium and its decay series have considerable biological significance. In order to investigate the accumulation of radionuclides in agricultural crops applied with uranium containing phosphate fertilizers, an experimental study was begun in 1975. It involved both field and pot planting tests with rice, wheat and sugarcane. Samples from different parts of each plant were analyzed for uranium and radium. Results indicated that the long term use of uranium containing phosphate fertilizer not only could lead to the accumulation of radionuclides in the field but also would gradually pollute the environment because most of the soluble uranium was lost. The distribution of radionuclides in the plant usually followed a concentration pattern that the root > stem > grain. When the ground was contaminated with 4-13 mg of uranium and  $2.54-6.95 \times 10^{-9}$  curie of  $^{226}\text{U}$  per kilogram of earth, the U and  $^{226}\text{Ra}$  concentrations in the edible portion of the plant were found to be 0.2-6.8  $\mu\text{g}/\text{kg}(\text{liter})$  and  $8 \times 10^{-13} - 5.4 \times 10^{-11}$  curie/kg(liter), respectively. The probability of  $^{226}\text{Ra}$  transfer into the plant was found to be higher than that of uranium. The presence of phosphate favored the absorption of uranium. A preliminary assessment on the radiohygiene of a phosphate fertilizer containing 0.03 percent uranium was performed. It was believed that no human being would be exposed to any significant danger in a period of 100 years.

12553

CSO: 4009/42

TREATING NITROGEN OXIDES WITH DRY ACTIVATED CARBON PURIFIER

Shanghai HUAXUE SHIJIE /CHEMICAL WORLD/ in Chinese No 1, 20 Jan 84 pp 4-6

/Article by Tu Mingcai /1458 2494 2088/ and Li Meiyong /7812 5019 5391/ of the Shanghai Hongkou Electroplating Plant: "Using Dry Activated Carbon Purifier to Treat Nitrogen Oxides Waste Gas"/

/Summary/ Electroplating plants use nitric acid-sulfuric acid mixtures to pretreat parts or to remove undesirable copper-nickel-chromium coatings, leading to the generation of large amounts of nitrogen oxides ( $\text{NO}_x$ ) such as  $\text{NO}_2$  and  $\text{NO}$  and directly pollute the atmosphere. Methods commonly used to treat  $\text{NO}_x$  waste gas in China were analyzed and found to be unsuitable for the operation of the plant. A dry activated carbon purifier was developed jointly by the plant and the Second Institute of Design of the Ministry of Machine Building Industry. The waste gas treatment process and the carbon activation step were introduced. Since its use in mid-August 1982, the treatment of  $\text{NO}_x$  was basically resolved. Visually, one could see yellow smoke in the nitric acid tank, but no visible gas was discharged. Based on actual data, the average purifying efficiency of new activated carbon was 98.47 percent and the  $\text{NO}_x$  discharge rate was 0.023 Kg/hr. After 2½ months of operation (consuming 2.6 tons of nitric acid and 24 tons of hydrochloric acid), the average efficiency was 87.32 percent and the  $\text{NO}_x$  discharge rate was 0.22 Kg/hr (the national standard is 12 Kg/hr and the Shanghai standard is 0.5 Kg/hr). Two methods to regenerate activated carbon were also discussed. The purifying efficiency of regenerated activated carbon was found to be 99.26 percent and the  $\text{NO}_x$  discharge rate was 0.025 Kg/hr. It was estimated that the activated carbon had to be regenerated every 4 months. The same purifier could also treat waste gas such as hydrochloric acid vapor. The device was simple, convenient, compact and effective in treating  $\text{NO}_x$  pollution to protect the environment and the people.

12553

CSO: 4009/77

## BRIEFS

JIANGHAN OILFIELD ANTIPOLLUTION EFFORTS--The environmental protection work at the Jianghan Petroleum Management Bureau was solid and achieved remarkable success. In 1983, all the major indicators in environmental protection met the standards set by the Ministry of Petroleum Industry. In 1983, the highly concentrated oil and salt sewage generated in the production process at the Jianghan Oilfield was completely recycled into a well after treatment. The sewage treatment rate reached 99 percent in the flushing operation, which effectively controlled the contamination of farmland and bodies of water by the sewage. Fifty-five out of the 61 boilers of the bureau in the Qianjiang area have met the national smoke emission standards by adopting modification and dust removal measures. As a result, air pollution by smoke released from the boilers was better controlled. In the sewage treatment process, they recovered 18,692 tons of waste oil in 1 year, at a value of 2.43 million yuan. [Zhao Xuegang [6392 1331 0474] [Excerpt] [Wuhan HUBEI RIBAO in Chinese 25 Jan 84 p 2] 12553

CSO: 4008/163

## EFFECT OF AIR POLLUTION ON AGRICULTURE ANALYZED

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 3, 1983 pp 14-18

[Article by Fu Kewen [0265 0344 2429]: "The Impact of Air Pollution on Agriculture and Animal Husbandry and Measures To Control Such Pollution"]

[Excerpts]      Impact of Air Pollution on Agriculture and Animal Husbandry

Because of its wide impact and the serious damage it causes, air pollution has become an important factor impeding production increases in agriculture and animal husbandry production throughout the world. Sulphur dioxide, fluorides and acid-rain pollution are relatively common in our country; photochemical smog has also occurred sporadically; and thus damage to agriculture and animal husbandry is very prominent. For instance, fluoride emissions from the phosphate fertilizer industry alone have reduced food production by more than 700 million jin and killed several tens of thousands of animals nationally.

The effects of air pollution on agriculture and animal husbandry are prominently manifested in three areas.

### 1. Air Pollution Affects Plant Growth and Output

Gases that have a great impact on crop growth include sulphur dioxide, hydrogen fluoride, chlorine, ozone and peracetyl nitrate. With respect to paddy rice, sulphur dioxide inhibits the tillering, reduces spike counts, lowers the maturation rate of seeds and reduces per-spike kernel counts and per-thousand kernel weights. In areas polluted by sulphur dioxide, declines in rice production become more serious as one approaches the sources of pollution. It is reported that, if sulphur-dioxide concentrations of 0.027-0.034 ppm are maintained in the air for close to 60 days, paddy-rice dry mass weight may be reduced by 13.2 to 17.0 percent. Sesame, broad beans, barley, cotton, soybeans, buckwheat and wheat are all more sensitive to the gas. Sulphur dioxide discharged from a certain smelting plant in south China has polluted a 500 sq km area and affected more than 100,000 mu of farmland. In places where pollution has been most severe, no grain has been harvested, and almost all the fruit trees have died. Although fluorine pollution is less widespread than sulphur dioxide pollution, the former is

10-100 times more toxic than the latter to plants and thus is clearly harmful to agriculture. The effect of fluorides on plants is also accumulative; and even low concentrations of the gas may, after long-term contact and build-up, still be destructive. When so damaged, rice kernels are not plump and the rate of empty, blighted kernels increases; and wheat kernels become dry and shriveled and produce less flour. Fluoride gases also affect the quality of such fruits as peaches and apricots. Although chlorine pollution is not very widespread, that gas is relatively toxic and thus has a marked effect on the output and quality of crops and vegetables. For example, an accidental discharge of chlorine from a certain factory reduced nearby rice production by 25-50 percent and output of tomatoes, wax gourds and kidney beans by more than 50 percent. If, during the boot stage and flowering period, rice, wheat or other grains are polluted and damaged by harmful gases of any sort, output will be greatly affected. The degree to which air pollution affects crops is related to the type and concentration of harmful gases involved and the duration of crop exposure thereto and is also influenced by such factors as crop type, weather conditions (especially sunlight, temperature and humidity), soil and topographic conditions. Moreover, the effects compound pollution, comprised of many gases, and single-gas pollution are different.

Another pollutant in the atmosphere, acid rain (rain water with a pH of less than 5.6), is also a serious problem confronting agriculture. Acid rain has only recently been discovered in China. In 1982, we carried out a survey of 23 provinces, municipalities and autonomous regions and discovered that 20 of these units, concentrated mostly in the south, had acid rain. Conditions in such cities as Guiyang, Chongqing, Suzhou, Guangzhou and Nanchang are especially serious (with pH levels of less than 4). Our country's acid rain is formed mainly when the large quantities of sulphur dioxide discharged in industrial and household coal burning enter the atmosphere, become oxidized and encounter moisture. Acid rain lowers the pH of lake water, seriously affecting fish life, and sometimes directly affects the crop growth. For example, the 3.9-pH acid rain that fell on Chongqing 1 June 1982 caused the leaves of more than 10,000 mu of paddy rice on one commune to turn from green to red. Some of the plants withered and died several days later, and 800,000 jin of paddy were lost. When acid rain falls on fields, it acidifies the soil. The soil in most areas of southern China is already acidic. Further acidification will cause more heavy-metal toxins to be dissolved from the soil, thereby aggravating pollution damage to crops; promote the leaching and loss of potassium, calcium, magnesium and other nutrients; destroy the soil structure; and lower soil fertility. Acidification will also cause confusion among microflora, affecting in particular the activities of nitrogen-fixing bacteria.

Some particulate pollutants also affect crop growth, and one of these is powdered cement dust. A cement plant in Henan has damaged 40,000 mu of orchards and vegetables in more than 10 production brigades of 5 nearby communes. Powdered cement dust produces both physical and chemical effects. Around the cement plant, large quantities of such dust fell on leaves, first blocking pores and affecting breathing and then impeding photosynthesis and affecting organic synthesis. If the dust should fall on the stigmata of flowers, it could also prevent pollen fertilization. Powdered cement dust

contains large amounts of calcium, potassium and sodium and thus, when combined with water encountered in fog or drizzle, will produce alkaline substances such as calcium hydroxide, which have pH levels of 10 to 12. After entering leaves through surface pores, such alkaline solutions can seriously damage palisade tissue and parenchyma. Alkaline solutions can also cause the cuticle in the leaf surface to become saponified, allowing the solutions to invade the mesophyll directly through the epidermis.

## 2. Air Pollution Contaminates

Regarding pollution of agricultural products and soil, people usually pay attention to the effects of wastewater and pesticides, but actually air pollution also plays an important role. During ore roasting, metal smelting or fuel burning, some heavy metals or other inorganic toxins may be discharged into the atmosphere and stay in the air in the form of floating dust. The chief toxins are cadmium, lead, mercury, arsenic and nickel. Because gasoline contains such antiknock agents as lead tetraethyl, lead will enter the environment through car exhaust. Forty percent of the particles in car exhaust are relatively large and rapidly fall to the ground, while the rest are relatively small and can stay in the air longer.

Crops, through their parts that are above ground, absorb heavy-metal toxins from the atmosphere and through roots, absorb air pollutants that have subsided in the soil and which then accumulate in crops, thus affecting the health of human beings and animals. Cadmium discharged by a certain smelting plant in north China polluted areas as far away as 15 km and the cadmium content in some foods was as high as 1 ppm. (Japan has ruled that contents above 0.4 ppm constitute pollution.) Someone planted radishes in soil containing 0.11 ppm of extractable cadmium, evaluated cadmium contents of the plants' stems, leaves and surfaces, and discovered that over 40 percent of that content came from air pollution. If cows are allowed to graze in pastures polluted by cadmium, the milk these animals produce will generally contain cadmium. Most of the lead in car exhaust which has subsided in the soil combines with halogenides and has relatively great solubility, but after a while, the lead gradually combines with organic material in the soil and thus experiences lowered solubility. Someone put a set of basins containing polluted soil along both sides of a 200 m section of highway and another set in clean air. Radishes were planted in both sets of basins and comparisons were made. It was discovered that at least 40 percent of the lead in the parts of the radish plants that were above ground came from car exhaust and that the lead content in the plants' roots bears almost no relationship to car pollution. Another survey has shown that plants within 90 m of busy highways have lead contents that are 100 times higher than normal.

In addition to inorganic toxins, some organic toxins can also pollute crops through subsidence. For example, while conducting an investigation in the Shenfu irrigation area, the Forestry and Soil Science Institute of the Chinese Academy of Sciences obtained a mixture of paddy and coarse-rice chaff and discovered the benzo(a)pyrene content therein was two to four times higher than the levels common to clear-water irrigation areas. Did this extra amount of benzo(a)pyrene come from the polluted water-soil system? Through simulated experiments, the institute determined from

unpolluted soil and air "natural background levels" of benzo(a)pyrene for various parts of the rice plant. Through research, it was discovered that, although the benzo(a)pyrene content in the soil was directly related to that in rice root systems, this effect rapidly lessened along the root system-stem and leaf-kernel hull-kernel sequence to the point where the last (kernel) value obtained approximated the measurable limits for the institute's instrumentation. This shows that it is difficult for benzo(a)pyrene in the soil to enter the kernels. But when there is air pollution, benzo(a)pyrene contents in rice stems, leaves and seeds show marked increases, sometimes by more than one order of magnitude, over natural background levels. This indicates that the benzo(a)pyrene in the chaff mixture obtained from the Shenfu irrigation area came mainly from air pollution.

### 3. Air Pollution Endangers Animal Husbandry and Sericulture

Besides directly affecting animals' health through their respiratory system, air pollutants can also contaminate feed and thus harm animals through their digestive system. At present, emissions containing fluorine cause the most serious pollution damage to animal husbandry and sericulture production. Such emissions, once discharged by factories and entering the atmosphere, are scattered to far away places by the wind. Forage grass becomes polluted mainly through leaf-surface absorption. If animals consume feed containing fluorine for a long time (in general, forage grass contains up to 40 ppm of fluorine and consumption thereof for one year can induce illness), they will become ill in cases of light contamination or die in large numbers in serious cases. Typical symptoms of fluorine poisoning are pathological changes of the teeth and skeleton. Teeth color changes from white to yellowish brown or dark brown, the enamel shows plaque damage, the front teeth are overworn and the molars are uneven, all of which make eating difficult, and the affected animals therefore gradually weaken and die. Pathological changes of the skeleton include osteoporosis, which makes bones brittle and easily breakable. In such cases, muscle [?] and leg bones of sheep can often be broken because of crowding within herds of careless ambulation, and thus the animals cannot leave their pens to graze. Large livestock such as cattle, horses and donkeys often show such symptoms as limping or even walking while kneeling. In such areas as Baotou, Baiyin in Lanzhou, Qingbai Jiang in Sichuan and Kunming in Yunnan, serious incidents of fluorine pollution have occurred, killing many sheep, crippling and disabling many farm cattle and thus bringing serious damage to agriculture and animal husbandry production.

Mulberry leaves can also absorb fluorine in the air and in general slight damage will appear only when such leaves contain about 100 ppm of fluorine. If leaves containing 10-15 ppm of fluorine (no damage) are fed to silkworms for a long time, cocoon yields will fall and silkworm growth will be slightly affected. If leaves containing 15-30 ppm are used, silkworms will develop chronic poisoning, which will appear as loss of appetite, uneven and retarded growth, bodies becoming thin and elongated, marked loss in weight and some deaths. Use of mulberry leaves with more than 30 ppm of fluorine even for short times (one age period) will cause acute harm to silkworms of all ages.



At present, 30 ppm is generally considered to be the threshold level for fluorine residue in mulberry leaves, at or beyond which point harm will befall silkworms. With the development of such industries as phosphate fertilizer, aluminum smelting, steel, brick tiles, glass and pottery, emissions containing fluorine occur frequently. For instance, in May 1982, a large-scale fluorine poisoning of spring silkworms occurred in the traditional sericulture district centered in Tongxiang, Deqing, Yuhang and Haining in the Jiaxing and Huzhou areas of Zhejiang, and losses were extremely heavy. Investigation by the Zhejiang Agriculture College determined that this poisoning was mainly due to the spurt in brick tile production at local kilns, occasioning large increases in fluorine emissions, which polluted mulberry leaves.

### The Way to Control the Damage to Agricultural and Animal Husbandry Caused by Air Pollution

In order to check damage to agriculture and animal husbandry caused by air pollution, we must coordinate many methods and carry out comprehensive control.

#### 1. Fundamentally Eliminate the Sources of Pollution

In order to reduce sulphur dioxide, smog pollution and acid-rain damage, we must use low-sulphur fuels as much as possible. We must comprehensively develop and utilize the sulphur resources contained in coal, adopt methods to remove sulphur from high-sulphur coal and petroleum, recover sulphur dioxide in smoke, improve burning methods, install equipment to eliminate dust, carry out technical transformation in production to reduce or prevent pollutant emissions, operate equipment strictly and strengthen the management of equipment maintenance in order to prevent gases from escaping or leaking, and carry out the necessary recovery and purification of gases that have to be discharged.

#### 2. Strengthen Factory Management and Control Emission Time

Since crops are characteristically sensitive to air pollution at certain times, factories, in scheduling equipment checks and emissions, should avoid the sensitive periods of nearby crops (for example, we should avoid the boot stages and flowering periods of wheat and rice), as well as weather conditions such as high temperatures and humidity and the absence of wind, which are conducive to the development of poisoning. In this way, crop losses can be reduced.

#### 3. Factories Should be Rationally Distributed

Factories (including small ones run by commerce and brigade enterprises) should not be built in major agricultural (especially high-yield) and animal husbandry (including sericulture) districts and the areas upwind therefrom. Before selecting sites for plant construction, we must complete environmental impact studies, taking into special consideration all the various effects (especially degree and extent thereof) of the air pollutants such

plants will produce on the neighboring agriculture and animal husbandry ecological systems. Only when these studies are completed can we determine if such plants should be built.

#### 4. Formulate Atmospheric Quality Standards for Agricultural Areas and Strengthen Air Pollution Monitoring

Agricultural-area atmospheric-quality standards are the permissible levels, established in order to ensure that crops will not be adversely affected, for various kinds of atmospheric pollutants. The formulation of such standards will provide the basis for the evaluation of agricultural-area atmospheric quality and the monitoring of air pollution by environmental management agencies. By strengthening monitoring, (including of vegetation, as in the case of forage grass and mulberry leaves polluted by fluorine), we can detect pollution problems promptly so that measures can be taken to minimize damage, objectives that are especially significant in the cases of chronic and invisible damage.

#### 5. Select Sturdy and Resistant Crop and Properly Plan the Spatial Distribution of Crop Planting (Including Animal and Poultry Breeding) in Polluted Areas

In each air pollution area, we should, as much as possible, plant crops that have a certain level of resistance to the main pollutants in that area. Crops that are sensitive to air pollution, dairy farms, breeding-stock farms and large-scale feed lots should be located far away from polluted areas. (Animal husbandry farms, in particular, should be far removed from fluorine-polluted areas.)

#### 6. Rationally Apply Fertilizers and Manage Farmlands Properly

Rational application of nitrogenous, phosphate, potassium, calcium and silicon fertilizers can strengthen crop resistance to harmful gases. For example, calcium silicate can increase crop resistance to sulphur dioxide and hydrogen fluoride, and lime fertilizer can lower the effect of such heavy metal toxins as cadmium and lead which have settled into the soil and reduce pollution of the soil by acid rain.

#### 7. Undertake Forestation and Clean up the Atmosphere

Many trees and plants act to absorb and purify air pollutants. Large-scale planting of trees which are resistant to or can absorb toxins and the construction of forest belts around farmlands to prevent pollution in air-polluted areas can greatly improve the atmospheric environmental quality of farmlands.

#### 8. Eliminate Pollutants in Feed and Reduce the Threat of Fluorides to Animals and Silkworms

We can wash mulberry leaves polluted by fluorine with water, especially lime water, which can remove some of the fluorine dust on leaf surfaces. We can also use clean water to wash forage grass which contains fluoride. And by mixing or alternating clean and polluted feed, we can also reduce harm to animals and silkworms.

SIMULATION MODEL FOR PHOTOCHEMICAL SMOG POLLUTION DEVELOPED

Dalian HUANGJING KEXUE XUEBAO [ACTA SCIENTIAE CIRCUMSTANTIAE] in Chinese No 1, Mar 84, pp 33-42

[Article by Tang Xiaoyan [0781 1321 3508], Bi Mutian [3968 2606 1131], Li Jinling [2621 6855 7893] et al: "A Simulation Model for Photochemical Smog in a Petrochemical Complex"]

[Summary] Although automobiles are not very popular in China, photochemical smog has been identified as a problem in the Xigu petrochemical complex in Lanzhou since 1978. The major sources of pollutants are discharged from local petrochemical plants, oil refineries, and thermal power plants. In order to investigate the formation of photochemical smog in China, a suitable model must be developed. In this work, a photochemical smog model (SJMM) for the Jinshan petrochemical complex in Shanghai was established. The SJMM model was based on 1.5 km x 1.5 km grids. It was divided into three levels (100m, 400m, 500m) according to the sources of emission, meteorological conditions and topographical factors. A finite difference method was used to solve the stratospheric diffusion equation. The diffusion term was solved using an explicit second order difference method. The chemical kinetics mechanism used was the S-HSD model. The transport term was obtained by a concentration distribution matrix method. The sources of emission, reaction rate constants, atmospheric stability, meteorological parameters, turbulent diffusion coefficient, initial conditions and boundary conditions were discussed. The model was evaluated against the data obtained on 29 Oct 80. It was found that the SJMM model could basically describe the concentration distributions and daily variations of  $O_3$ , NO, and  $NO_2$ . Finally, the sensitivity of the model was investigated. The model predicted that it would not be probable to have photochemical smog pollution in an area heavily polluted by NO because of the low  $O_3$  concentration.

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12553

## EFFECT OF EXOGENETIC DUST ON AIR QUALITY OVER BEIJING

Beijing ZHONGGUO HUANJING KEXUE [ENVIRONMENTAL SCIENCES IN CHINA] in Chinese  
No 1, 21 Feb 84 pp 10-17

[Article by Chen Jingsheng [7115 7234 3932], Deng Baoshan [6772 1405 1472] and Jia Zhenbang [6328 2182 6721] of Department of Geography, Beijing University: "On the Impact of 'Exogenetic Dust' on the Air Quality Over Beijing--and on Whether It Is Correct to Classify Beijing as a Desertification Area by Nairobi Conference"]

[Summary] This study compares the geochemical characteristics of Beijing's non-industrial area and the dust falling blown in from an upwind wide area of the prevailing winds, in order to understand whether or not exogenetic dust can affect air quality in Beijing. In addition, the study deals with the problem of whether or not Beijing is correctly classified as an area of desertification. It is concluded that the main source of dust under normal weather conditions is from local sources. Occasionally during dust storms in the spring, the fallen dust obviously originates from the wide upwind area; some of the dust may even come from a vast area further north of the Mongolian Plateau. This can be considered as a long-term geological phenomenon ever since the Quaternary Period without being necessarily related to the destruction of the Inner Mongolia Grassland; of course, this geological process can intensify the dust falling phenomenon in the Beijing area. There is no apparent evidence for classifying Beijing as a desertification area, as had been concluded by the Nairobi Conference. Ten tables show dust statistics, grain size, content of organic carbon, chemical composition and characteristics. Three figures show dust sampling sites, composition of topsoil in the upwind area, and the X-ray diffraction spectra of the fallen dust. Two photographs show a dust collecting sampler and a microscopic view of the dust collected.

The authors express their gratitude to the Beijing Municipal Environment Protection Bureau, the Beijing Municipal Environment Monitoring Center, and various meteorological observatories for their support and assistance. Also participating in the study are Guo Xiaozhou [6753 1420 1558], Cao Wei [2580 5898], Wang Xinhao [3769 2500 3185], Dong Lin [5516 2651], and Zhu Faqing [2612 4099 1987]. Huang Runhua [7806 3387 5478] and Yang Lizhuang [2799 4539 5445] carried out some of the experiments. Song Lianfa [1345 6647 3127] conducted classification and discrimination analyses of data.

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CSO: 4009/65

DISTRIBUTION PATTERN OF AEROSOL CONCENTRATION OVER BEIJING

Beijing DAQI KEXUE /SCIENTIA ATMOSPHERICA SINICA/ in Chinese No 4, Dec 83  
pp 450-455

/Article by Zhou Mingyu /6650 2494 3558/, Zhu Cuijuan /2612 5050 1227/, Ye  
Zhuojia /0673 0587 0163/ et. al. of the Institute of Atmospheric Physics and  
Institute of Environmental Chemistry of Chinese Academy of Sciences: "The  
Distribution of Aerosol Concentration and Its Relation to the Synoptic Pattern  
Over Beijing in Late Fall Early Winter"/

/Summary/ Aerosol is one of the major air pollutants which not only affects  
the radiation process and visibility, but also may cause cancer. Although some  
studies on its chemical composition have been conducted, its concentration  
distribution is not well understood. The data of two field tests in the Beijing  
area performed on 21 October-1 November 1981 and 23 November-4 December 1981  
was analyzed. The law of aerosol concentration distribution in the region and  
its relation to the synoptic pattern were discussed. The aerosol concentration  
in the entire Beijing area was found to follow an elliptical pattern with its  
major axis in the NW-SE direction. The pollution was most severe at the Dongjiao  
power plant where the aerosol concentration was found to be  $0.98 \text{ mg/m}^3$ . However,  
the high concentration region was confined to a 2-3 km area. A high aerosol  
concentration band was found to extend from Zhongguan in the northwest to Langfang  
in the southeast. The air in the north and northeast suburbs such as Huairou  
was much cleaner. It was attributed to the high population density in the  
Zhongguan areas and the unfavorable atmospheric environment in the Langfang area.  
The aerosol concentration distribution pattern was found to strongly depend on  
circulation and weather conditions. The aerosol pollution was most severe in  
fine days with gentle breeze and local circulation. The consumption of fuel in  
the heating season had no obvious effect on aerosol pollution. The vertical  
distribution of aerosol concentration was also obtained. The concentration  
decreased rapidly with altitude. However, it remained relatively high in the  
inversion layer. Finally, gust, snow and rain could significantly lesson  
aerosol pollution to the level of  $0.08-0.4 \text{ mg/m}^3$ .

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12553

CSO: 4009/40

GUANGZHOU AIR MONITORING SYSTEM

OW151632 Beijing XINHUA in English 1616 GMT 15 Jun 84

[Text] Guangzhou, June 15 (XINHUA)--An automatic atmospheric monitoring system went into service here today after passing state examination.

The computerized facility consists of a central station and six substations which transmit pollution and weather data to the central station every half hour, according to the city environmental protection department.

Construction of the system was begun in May, 1983. The city plans to build 20 substations within a radius of 30 kilometers during the seventh five-year plan period (1986-1990).

CSO: 4010/117

## BRIEFS

COMPUTERIZED AIR MONITORING SYSTEM--To meet the needs of environmental protection work, upgrade environmental monitoring equipment, and improve the standard of monitoring technology, the government in 1983 focused on assisting 15 cities--Shanghai, Tianjin, Shenyang, Shijiazhuang, Changsha, Wuhan, Chongqing, Guilin, Guangzhou, Nanjing, Xi'an, Taiyuan, Baotao, Anshan, and Luoyang--to build a computerized atmospheric pollution monitoring system. After carrying out integrated systems design, technological design and other tests last year, the various cities are presently conducting systems tests. More recently, the systems in Tianjin and Shanghai have been checked and accepted by the Environmental Protection Bureau of the Ministry of Urban and Rural Construction and put into operation. [Text] [Beijing ZHONGGUO HUANJING BAO in Chinese 22 May 84 p 1] 12581

HENAN ATMOSPHERIC MONITORING SYSTEM--Luoyang, 11 Jun (XINHUA)--An automatic computerized atmospheric monitoring system has gone into operation in Luoyang City, Henan Province, the Environmental Protection Bureau here announced today. The system, which has passed an examination by the Ministry of Urban and Rural Construction and Environmental Protection, consists of a central station and five substations in a scenic site, a communications hub, commercial and industrial districts. Construction of the system started in April last year and was completed a year later. It is one of 263 projects for pollution control and environmental protection in this ancient city. Luoyang has been the capital of nine dynasties and is a major industrial center. The city received more than 600,000 Chinese and 25,000 foreign visitors last year, 33 and 200 percent more than in 1980. [Text] [Beijing XINHUA in English 1851 GMT 11 Jun 84 OW]

CSO: 4010/138

## PRESENT STATUS, PROBLEMS IN AGRICULTURAL ENVIRONMENTAL PROTECTION

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 2, Apr 84 pp 1-6

[Summary of a speech made on 24 January 1984 by border region comrades at the National Conference on Agricultural Work: "Work Hard to Initiate a New Phase in Environmental Protection for Agriculture, Animal Husbandry and Fisheries"]

[Text] First of all, we will convey the essence of the 2d National Conference on Environmental Protection, which was convened by the State Council in Peking between 31 December 1983 and 7 January 1984. Then we will discuss a few ideas on how to implement the spirit of that conference and strive to initiate a new phase in environmental protection for agriculture, animal husbandry and fisheries.

Vice-Premier Wan Li [5502 6849] presided over the opening ceremony of the 2d National Conference on Environmental Protection, and Vice-Premier Li Peng [2621 7720] made a major speech as representative for the State Council. During the conference, Minister Li Ximing [2621 6932 9441], of the Ministry of Urban and Rural Construction and Environmental Protection gave a work report entitled "The Struggle to Achieve Basic Improvements in China's Environmental Conditions." Thirteen ministries and commissions, as well as leading comrades from the provinces, municipalities and autonomous regions, spoke at the conference, and four scientists reported on scientific and technological aspects. At the conference closing ceremony, comrade Bo Yibo [5631 0001 3134] gave an address and Vice-Premier Li Peng made the conference summary. This conference was well conducted and very fruitful.

Through this conference we further increased our understanding of environmental protection work. Comrade Wan Li pointed out in his speech at the beginning of the conference that the ability or inability to do a good job of environmental protection is chiefly a question of whether the leadership at all levels takes it seriously and of whether they have the mass viewpoint. The healthy or unhealthy nature of the environment can influence not only the health of the current generation, but also that of generations to come. Comrade Li Peng pointed out in his talk that the environment is one of the major problems confronting China. For a long time our knowledge of this problem has been slight and our understanding of it insufficient. If we do not now pay close attention and get a grasp on environmental protection, by the end of the century the state of China's environmental pollution and ecological destruction may become problems as difficult to resolve as is our current population problem. We can never do anything so stupid as to destroy our own homeland and ruin our conditions for existence. Consequently, environmental protection is a basic safeguard and a strategic mission in China's modern construction, and it is a major national policy. The



recognition brought about in this conference by raising environmental protection to a major national policy, is truly of crucial significance. It clarifies our fundamental principles and policies in environmental protection. Comrade Li Peng pointed out that economic construction should be developed simultaneously with environmental protection. To sum up what he said, the planning, implementation and development of economic construction, urban and rural construction and environmental protection should be done simultaneously to achieve an integration of economic, social and environmental benefits. This is a relatively systematic and complete environmental protection policy that properly resolves the longstanding contradiction between environmental protection and economic development. Comrade Chen Yun [7115 7189] recently observed that "we must pay close attention to the problem of environmental protection; it is money well spent, and it is better spent sooner than later." He means that we must concentrate on environmental protection work simultaneously with economic construction.

The conference suggested a goal that China will struggle to reach by the end of this century in environmental protection. It is, namely, that by the year 2000 we must do all we can to achieve a basic resolution of environmental pollution nationwide, to bring about a desirable natural ecological cycle, to make urban and rural production and living environments clean, attractive and quiet and to make national environmental conditions basically mutually compatible with national economic growth and with enhancements in the people's material culture and livelihood. In order to implement this strategic goal, it further suggested two tentative courses in the overall plan for the next 17 years: the first 7 years would concentrate on controlling environmental pollution and ecological destruction and ensuring that they do not recur; the latter 10 years, following the nation's entrance into a new period of vigorous economic growth, would develop overall environmental construction.

The conference quite satisfactorily resolved the problems of constructing an environmental management system and organization. Comrade Li Peng said that the purpose for our organizational reform is to resolve problems of overstaffing and inefficiency. Environmental protection is a new endeavor; it is relatively weak in organization and power and should be suitably strengthened. The environmental protection organizations of the State Council and of local government at all levels need to be strengthened. The various economic ministries of the State Council must all be concerned on the one hand with production and on the other hand with the environment. Under no circumstances should they consider environmental work as an added burden. Management of the natural environment must rely in large part upon the various ministries concerned with agriculture, animal husbandry, fisheries, forestry, water conservancy, mining and marine resources to do good jobs of managing the environmental protection work in their own systems, and to establish management systems wherein everyone works and there is coordination of the separate efforts.

The conference quite satisfactorily resolved the problem of funding for environmental protection work. In his summary speech, Comrade Li Peng said that, at present, state finances are limited, and that we should resolve this problem primarily through stronger environmental management. But, he said, we are materialists and we must invariably spend some money to take care of things. This conference reiterated that six channels are still effective: (1) New construction of plants, and transformation projects for old plants should be included in the state capital construction investment plan. (2) To control pollution by established enterprises, we should make full use of the funds for renewal and transformation of enterprises. (3) Municipally retained industrial and commercial profits should be used in city safeguards, including comprehensive pollution prevention and control projects. (4) Fees should be collected for discharging pollution. (5) Multipurpose use, as well as revenues brought about by transforming disadvantages into advantages and recycling wastes, can continue to be used in controlling pollution. (6) Environmental protection organizations should build themselves up and the state should extract some money every year to use for scientific research, monitoring, experimentation and demonstration work in environmental protection.

This conference highlighted the crucial significance of work to strengthen agricultural environmental protection, and it considered protection of natural resources to be a basic environmental protection policy. With regard to agricultural environmental protection, Comrade Li Peng listed work in five areas: The first is that agricultural environmental protection should be integrated with the reasonable exploitation and use of agricultural natural resources, and with the growth of a diversified economy. We should pay attention to protecting land, bodies of water, forests, grasslands and rare wild animal and plant resources. We should make great efforts to plant trees and grass, restore vegetation and establish a desirable natural ecological cycle. All this will benefit the present generation and also generations to come. The second is that we must strictly control the serious pollution from existing commune and brigade enterprises. We must clarify the direction of rural industrial growth and adjust and rectify existing enterprises. Local areas must set up administrative measures, on the one hand to publicize and lead those enterprises that are not serious polluters, and on the other hand to pass restrictive legislation. Some small-scale enterprises have high energy consumption and poor economic results, high administrative expenses and weak administration, and these should be shut down, stopped, merged or transformed. The third is to prevent and clean up agricultural pesticide pollution. The fourth is to employ chemical fertilizers in a reasonable fashion. The fifth is to resolve rural energy problems based on local conditions and thereby reduce the destruction of vegetation.

## II. Explanation of the State of Agricultural Environmental Protection Work and Strengthening of the Idea of Agricultural Environmental Protection Work

It is of extreme importance to a country like ours, with a large population and little cultivated land, to protect the agricultural and natural ecological

environments. We know from practice that destruction of the agricultural environment and the natural ecology is destruction of a fundamental level, and that what takes one day to destroy takes ten to restore. To distinguish the difficulties in agricultural environmental protection, we must make our major task one of protecting agricultural natural resources, preventing pollution and destruction and establishing a desirable cycle in the agricultural resource system.

#### 1. The State of Agricultural Environmental Protection Work

Agricultural environmental protection work was begun quite early, at the end of 1970, when Premier Zhou Enlai instructed agriculture departments to give serious attention to the problem of industrial pollution. For the past 10-plus years we have been working according to the relevant principles, policies and decisions on environmental protection work laid down by the Party Central Committee and the State Council. To summarize, these emphasized four points:

First of all, they emphasized the construction of organizations and contingents. In order to develop comprehensive environmental protection work in agriculture, animal husbandry and fisheries, the ministry first set up environmental protection management organizations and then established subordinate scientific research and monitoring institutes for agricultural environmental protection. In the corresponding specialized institutes of most provincial and municipal agricultural, animal husbandry and fishery scientific research organization, and of the Chinese Academy of Agricultural Sciences and the China Aquatic Products Society, environmental protection research offices (teams) were established. At present there are already more than 10 provinces, municipalities and autonomous regions that have established management and monitoring organizations for agricultural environmental protection. Most other provinces, municipalities and autonomous regions have also allocated full-time cadres to this work and are taking initial steps to form a work system linking higher and lower levels. In 1978 Zhejiang Agricultural University established a specialty in agricultural environmental protection to train qualified specialized people. In order to enhance academic exchange, they also established the Chinese Agricultural Environmental Protection Association. At present, the agricultural system has taken initial steps to form an agricultural environmental protection contingent.

Second, they emphasized surveys and scientific research. We conducted a survey of the state of agricultural environmental pollution in a total of 20 provinces, municipalities and autonomous regions. Through this survey we recognized that agricultural environmental pollution is exceedingly widespread in China, that it has brought about grave losses in agricultural, animal husbandry and fishery production and that it has truly reached the point where it must be dealt with at all costs. In 1974 nearly 10 scientific research units, colleges and other units began organizing to counter problems that appeared at that time in production and foreign trade, and they launched research work to formulate environmental standards for agriculture, animal husbandry and fisheries. In the more than 10 years since then, we have achieved encouraging results in scientific research and have arrived at a positive role in accelerating production and improving the environment.

Third, they emphasized environmental management. Environmental pollution and ecological destruction have fallen most heavily on departments of agriculture, animal husbandry and fisheries. They are not only the recipients of urban industrial pollution, but also of pesticide, fertilizer and rural industrial pollution. If we want to control and alleviate this pollution and destruction, we must establish a vigorous management system and formulate a set of strong measures. In 1977 we convened the 1st National Symposium on Agricultural Environmental Protection Work and the National Symposium on Fishery Environmental Protection Work in Zhuzhou, Hunan and in Beijing, respectively, to research the problem of strengthening environmental management. Afterwards, in addition to strengthening the work system for establishing agricultural environmental protection, we also formulated some environmental laws, regulations and standards; worked out an initial program for environmental scientific research and monitoring in agriculture, animal husbandry and fisheries and for hygienic conditions in agricultural foodstuffs and launched agricultural environmental education and cadre training. Since 1980, from the departments to the various provinces, municipalities and autonomous regions, we have altogether conducted 23 training classes in the environmental protection profession. We have trained the key technological members of the profession, and some provinces and municipalities are making cadre training an institution.

Fourth, we have launched work in environmental monitoring. After 1979 we made a great effort to get a handle on agricultural environmental monitoring work, and the ministry and most provinces and cities set up monitoring organizations. In 1981 we convened the 2d National Symposium on Agricultural Environmental Protection Work, and unequivocally advanced strengthened monitoring of the environment as the most important task of agricultural environmental protection work. Afterwards, we organized forces and for the first time composed and reported the "Bulletin on the Quality of China's Agricultural Environment." This analyzed the expansion of agricultural environmental pollution, in its process of spreading over a whole area from one point and its characteristic of spreading from the cities to the countryside, and it also explored some corresponding countermeasures.

In the past 10 years or so we have primarily been working to counter pollution damage from industry's "three wastes" and this is naturally essential. Nevertheless, it was not until after the 3d Plenum of the 11th Central Committee, and in particular not until after the 12th Party Congress of the Chinese Communist Party, that we progressively began to take seriously the problem of protecting the agricultural ecological environment. Recently, Comrades Yaobang [5069 6721] and Ziyang [4793 7122], while inspecting the great Northwest, appealed for the planting of trees and grass in order to create a desirable ecological environment for the development of agriculture and animal husbandry and also to spur a new enhancement of our understanding.

In short, for the past 10 years, environmental protection work in agriculture, animal husbandry and fisheries has undergone a process of change from lack of understanding to understanding. Through our efforts we have taken the initial steps toward forming a contingent, we have done some work in scientific research and monitoring, as well as in management and other areas, and we have achieved a certain success and accumulated some experience. However, problems still remain. Primary among these are the following: leading cadres at all levels in departments of agriculture, animal husbandry and fisheries attach insufficient importance to, and do not sufficiently recognize the urgency of, work to strengthen environmental protection, so that leadership is weak; we are lacking in long-range planning; management is imperfect and monitoring enforcement is weak; funding channels are obstructed; the division of labor among departments is unclear and so forth. Consequently, we can only call this past work an initial foundation laid down to develop the cause of environmental protection in agriculture, animal husbandry and fisheries. From now on, it is precisely on this foundation of past work that we must base our further efforts in agricultural, animal husbandry and fishery environmental protection work.

## 2. Environmental Pollution and Ecological Destruction Are the Two Major Problems Facing the Agricultural, Animal Husbandry and Fishery Environments

At present, pollution is spreading in China's agricultural, animal husbandry and fishery environments, and ecological destruction is intensifying. In some areas the problems are extremely prominent. Environmental pollution, destruction of natural resources and ecological deterioration have become great hidden dangers in the countryside.

Pollution of the agricultural, animal husbandry and fishery environments is many-sided. Of the urban and industrial sewage that is discharged every year nationwide, more than 90 percent is untreated. It is discharged directly into irrigation sources or into rivers, lakes and oceans and is extremely damaging to agriculture, animal husbandry and fisheries. In some areas the sewage irrigating agricultural fields has caused severe pollution. Water pollution has also caused a notable decline in aquatic resources. For example, in the Songhua river system there have been large fish kills due to water pollution for the last 20 consecutive winters. Atmospheric pollution is becoming more serious day by day. Due to the large quantities of sulphur dioxide discharged, added to the other sources of pollution, acid rain has appeared in some localities and some pH levels are very low. In other countries the economic damage caused annually by acid rain is quite alarming. The economic damage due to acid rain here in China is also extensive. The waste residue discharged in China over the years not only occupies a great deal of land, but the harmful substances contained therein also pollute the environment.

Rural industrial pollution also cannot be ignored. More often than not a small factory can ruin a small river or pollute a village. This is a potential threat to China's agricultural, animal husbandry and fishery environment. The large quantities of highly residual organic chlorine pesticides, and the irrationally employed chemical fertilizers that we used in past agricultural production, have also already caused pollution of the soil and of bodies of water, as well as of agricultural, livestock and aquatic products. This should spur our heightened concern.

Another prominent problem in agricultural, animal husbandry and fishery environmental protection is the ecological deterioration brought about by destruction of natural resources. Destruction of forests, grasslands and aquatic resources; soil erosion; desertification of the land; salinization; destruction of the ecological environment of fishing waters and declines in renewable resources of all kinds are problems even more serious than pollution. Destruction of land resources in China is quite severe. Destruction of forests and grasslands, indiscriminate reclamation of wastelands to grow grain, overgrazing, building of dykes to reclaim and cultivate lake bottoms, overfishing and other phenomena that run counter to nature's laws happen very easily and are quite likely to bring about destruction of the already fragile agricultural, animal husbandry and fishery ecological system. Under the circumstances of large population, land scarcity and food shortages, this is a grave threat facing China's agricultural, animal husbandry and fishery environment.

One major cause of the destruction of vegetation is brought about by shortages of rural energy resources. The Chinese countryside is seriously deficient in energy resources for daily life. In order to solve the fuel problem, people do not hesitate to cut down trees and dig up grass for firewood, searching out everything that can be burned. This destroys forest and grassland vegetation and brings on a series of problems in the ecological environment. A particular problem is the use of primitive combustion methods. Heating efficiency is only about 10 percent, and the majority of thermal energy is wasted to no purpose while large quantities of organic vegetation is burned up.

Because straw cannot be returned to the earth as compost, the organic matter source in the soil is reduced, resulting in lower soil fertility in some localities. Soil erosion in China is also very severe. More than 30 years ago, the state expended a great deal of manpower and material resources and brought erosion under control on 400,000 square kilometers of area. However, as a result of the continued destruction of forest and grassland vegetation, eroded areas are still expanding today. In economic terms, this loss is quite considerable.

The facts listed above illustrate absolutely that pollution and destruction of China's agricultural, animal husbandry and fishery environment is extremely serious. Practice indicates that it is easy to pollute the environment and difficult to control it; easy to destroy the ecology and difficult to restore

it. Consequently, we must be completely cognizant of the severity of ecological and environmental problems in Chinese agriculture, and of the urgency and importance of agricultural environmental protection work. In order to be compatible with the demands of modern agricultural construction, we must adopt relevant countermeasures and effective steps to transform resolutely the grave state of deterioration in China's agricultural environment.

### 3. Strengthen the Idea of Agricultural, Animal Husbandry and Fishery Environmental Protection Work

Agricultural, animal husbandry and fishery environmental protection is a new profession, and the tasks before us are extremely arduous. Based upon the strategic goal suggested by Comrade Li Peng for Chinese environmental protection by the year 2000, hereafter the overall requirements in agriculture, animal husbandry and fishery environmental protection will be as follows: We must handle correctly the relationships between production development and environmental protection, and between the exploitation and use of, and the protection and multiplication of, natural resources. We must insist on synchronic planning, implementation and development of economic construction, urban and rural construction and environmental construction. We must bring about the integration of economic, social and ecological benefits. We must strive hard to achieve initial restoration and improvement in the agriculture, animal husbandry and fishery ecological environment by 1990, and substantial restoration and improvement by the year 2000. We must bring agricultural, livestock and aquatic products up to state hygiene standards for foodstuffs. We must take the initial steps to establish a desirable cycle in the agricultural ecological system and a clean and appealing rural living environment.

To these ends, we must work conscientiously in the following areas:

#### (A) Deepen Understanding and Enhance Leadership.

In the 12th Party Congress Report, Comrade Hu Yaobang pointed out that we must "resolutely protect all kinds of agricultural natural resources and preserve the ecological balance." The new constitution clearly stipulates "state protection and improvement of the living environment and the ecological environment, and prevention and treatment of pollution and other public hazards." It was further suggested in Party Central Committee Circular Number 1, 1983, that we must make "the reasonable use of natural resources and the protection of desirable ecological environments" prerequisites for agricultural production activities. Recently, Comrade Ziyang has also pointed out that it is entirely possible that our future rural problems will not be in ownership, but in destruction of the agricultural ecology. The advancement of these questions is absolutely correct and extremely timely. These major strategic decisions have not only suggested the potential ecological crisis facing us in agricultural production, but they also have clearly demonstrated the direction of our future agricultural development. We must construct a

Chinese-style, socialist, modern agriculture, and one of the characteristics of this is that we must construct a new style of ecological agriculture. One of the characteristics of ecological agriculture is the stress on ecological balance: a new, optimum, dynamic equilibrium. This thereby enables us to establish Chinese agricultural production on the basis of desirable ecological and environmental capacities for regeneration and multiplication of natural resources, for cyclical and multi-purpose usage of materials, for highly efficient energy utilization and for preservation and improvement of soil fertility.

At this conference we stressed study of the question of how to develop rural commodity production and as soon as possible allow the peasantry to devote themselves diligently to prosperity. If we do a good job on agricultural environmental protection work, then this is a fundamental question of the future development of agricultural production, and, of course, of the development of commodity production. The good condition or deteriorated condition of the agricultural ecological environment has an enormous influence on agricultural production and on the livelihood of the people. For example, to expand commodity production we must attach a great deal of importance to the variety and quality of products. This demands conformance with food hygiene standards. If we are to reach this point, then it is impossible not to strengthen agricultural environmental protection work. Furthermore, if we are to increase economic benefits and bring about an integration of economic, social and ecological benefits, it is also impossible not to strengthen agricultural environmental protection work. If we say that agriculture is the major thing adversely effected by environmental pollution and ecological destruction, then if we do not do a good job of agricultural environmental protection work, one billion people will suffer. To counter this, we must have sufficient understanding of it and attach sufficient importance to it. In a special editorial on 25 July 1983 entitled "We Must Attach Importance to Agricultural Ecological and Environmental Protection," RENMIN RIBAO particularly emphasized that agricultural departments at all levels must make protection of the agricultural ecology and environment the major order of the day. The 2d National Conference on Environmental Protection also raised environmental protection to this high level of major national policy. Leading comrades at all levels in agriculture, animal husbandry and fishery departments should focus a high level of importance on this question and place it in its proper position. We recommend that senior comrades in agricultural departments (bureaus) at all provincial, municipal and autonomous regional levels also should act in accordance with Comrade Li Peng's requirements in all respects, and personally take charge of environmental protection (handle production on the one hand and environment on the other hand). Party teams in agricultural departments (bureaus) should also discuss agricultural environmental protection work once or twice a year. In order to implement conscientiously the spirit of the 2d National Conference on Environmental Protection, the ministry is preparing to convene the 1st National Conference on Environmental Protection Work in the Agricultural, Animal Husbandry and Fishery System, to raise consciousness, integrate experiences, formulate programs, discuss measures to strengthen environmental protection work and progressively develop environmental protection work in China's agricultural, animal husbandry and fishery system.



(B) Do a Good Job of Environmental Forecasting, and Research and Work Up an Environmental Protection Program for Agriculture, Animal Husbandry and Fisheries.

At present, the various localities are in the process of formulating agriculture, animal husbandry and fishery development programs in accordance with the economic construction goals advanced by the 12th Party Congress of the Chinese Communist Party. However, the majority of them have not yet taken note of the influences of economic development on the agricultural ecological environment. Looking at it from the viewpoint of our future development and the state of agricultural environmental pollution facing China, even if all of China's discharges of pollutants from enterprise and industry were able to conform to discharge standards stipulated by the state, the total quantity of pollutants discharged would continue to increase rapidly. In the wake of all the exploitation plans, the destruction of the agricultural ecological environment and the damage to overall environmental quality is not easy to ignore. In order to work up an environmental construction program for agriculture, animal husbandry and fisheries in China, to reduce blind actions and to avoid great losses, in accordance with the requirements of the State Planning Commission, the Ministry of Urban and Rural Construction and Environmental Protection and the State Council's Technological and Economic Research Center, we are in the process of organizing concerned scientists to conduct forecasting research into "China's Agricultural, Animal Husbandry and Fishery Environment in the Year 2000." The emphasis is on forecasting environmental development trends and the influence of economic development in these departments and industries on the agricultural ecological environment. On this foundation, and in accordance with strategic goals for China's agricultural environment by the end of this century, we will work up environmental construction programs and advance countermeasures for preventing ecological deterioration and for improving the environment. In addition to this overall forecasting and planning, we also will develop and conduct regional environmental forecasting for different ecological types. Currently, the three provinces of Shanxi, Hubei and Heilongjiang are in the process of organizing to conduct agricultural environmental forecasting in their respective provinces. It is hoped that other provinces, municipalities and autonomous regions can also develop work in this area. On the basis of this environmental forecasting, we will get a handle on formulating a program for environmental construction in agriculture, animal husbandry and fisheries. In researching and working up this program, we must resolve the contradictions between environmental pollution and agricultural, animal husbandry and fishery development. We also must correctly handle the relationships among the departments within agriculture, including farming, reclamation, animal husbandry, aquatic products, commune and team enterprises, land management and so forth. Likewise, we must correctly handle the relationship that economic development of the various professions in the agricultural, animal husbandry and fishery departments of all the provinces, municipalities and autonomous regions has with environmental protection, current and long-term interests, and local and overall interests. In addition to general goals and requirements, the contents of these programs should include the following

points: how to protect, and how to reasonably exploit and utilize, the agricultural natural resources of that locality; how to prevent soil, water and atmospheric pollution; how reasonably to distribute agriculture, forestry, animal husbandry, sidelines, fisheries, industry and commerce, and what the optimum system for them would be; how to resolve the problems of rural energy resources and how to increase soil fertility. The program should also be implemented in the locality and its massif, should be qualitative and quantitative and should bring environmental protection into line with the long-term program and the annual plan for economic development of every profession in that department and that locality, so that the two can be synchronically planned, implemented and developed.

In order to assure the implementation of the environmental protection program, they should also consult with the departments concerned and as quickly as possible clearly stipulate funding channels for agriculture, animal husbandry and fishery environmental protection and for protection of the natural ecology. They also should stipulate suitable proportions in the annual plan and create the necessary conditions for development of agriculture, animal husbandry and fishery environmental protection work.

(C) Establish and Perfect Organization, Progressively Form an Agricultural Environmental Protection Management System With a Centralized Management Channel and Based on a Division of Labor and Cooperation Among the Professions.

In view of the great comprehensive intensity and difficulty of agricultural, animal husbandry and fishery environmental protection work, in order to relate to the various professions within agriculture, animal husbandry and fisheries, we must strengthen leadership, replenish personnel and perfect organization. In accordance with the spirit of the 2d National Conference on Environmental Protection with respect to setting up an environmental protection organization, the ministry has already decided upon and is in the process of organizing environmental protection organizations at level one in ministry departments and bureaus. Based on the size of their assignments, the ministry departments and bureaus concerned will also set up corresponding organizations or allocate full- or part-time specialized personnel for environmental protection work. At the same time, we must strengthen the ministry's Institute for Environmental Protection Research and the National Agricultural Environmental Protection Monitoring Center stations, as well as construction of agricultural and aquatic products environmental monitoring stations in the various provinces, municipalities and autonomous regions. We must progressively form a monitoring network to undertake the task of monitoring irrigation water quality, soil, atmosphere, crops, aquatic products and livestock products, as well as ecological conditions. Agricultural, animal husbandry and fishery departments in the various provinces, municipalities and autonomous regions can set up environmental protection management organizations or specialized personnel, in accordance with their particular situations. Recently, Hubei Provincial Department of Agriculture convened the 2d Provincial Conference on Agricultural Environmental Protection Work, and proposed that in the next two years they would establish environmental protection organizations or set up specialists to take charge of environmental protection work in all localities, cities and counties where environmental pollution and ecological destruction is severe. Their method conforms with the requirements of the 2d National Conference on Environmental Protection.

(D) Perfect the Legal System, Strengthen Environmental Management of Agriculture, Animal Husbandry and Fisheries.

Many environmental problems in agriculture, animal husbandry and fisheries arise due to lack of management or to poor management. We must strive to strengthen propaganda and education, and resolutely execute resolutely those environmental laws and regulations already promulgated. In the future we must research and draft "Regulations for Agricultural, Animal Husbandry and Fishery Environmental Protection Work," "Regulations for Agricultural Environmental Monitoring Work," "Regulations for Fishery Environmental Monitoring Work" and "Regulations for the Protection of Rare and Unusual Aquatic Animals and Plants," as well as laws and regulations for preventing and treating pollution in farming enterprises, aquatic enterprises and rural industries. The various provinces, municipalities and autonomous regions can draft local environmental laws, regulations and standards in accordance with their practical situations, and enable us to achieve regulations to follow and laws to abide by in management work.

(E) Conscientiously Protect and Improve Agricultural, Animal Husbandry and Fishery Ecological Environments.

Protection of agriculture, animal husbandry and fishery natural resources was the major topic of discussion at the 2d National Conference on Environmental Protection, and it is a major task of agricultural, animal husbandry and fishery departments. Based on surveys of agricultural natural resources, each locality must draft programs and measures for division into agricultural districts and for protection, multiplication and reasonable exploitation and use of agricultural natural resources. This should be implemented in the locality and in agricultural households (land mass). At present, we are in the process of conscientiously implementing the essence of what was directed by comrades Yaobang and Ziyang with regard to exploitation and construction in the northwestern region. We are clarifying the guiding ideology, determining the correct policy for exploitation and construction and researching and drafting implementation measures. We are also, on the basis of the characteristics of the northwest, doing our best at planning, persisting in long-term tree and grass planting, developing animal husbandry, promoting agriculture through animal husbandry and protecting agriculture through forestry, fundamentally transforming environmental conditions and progressively forming a desirable ecological system. As soon as possible, we must put into effect grass-farm usage rights in animal husbandry regions, establish grass-farm management and a usage responsibility system and put a stop to overcultivation and destruction of grass farms. We must further correct the direction of rural industrial development, strengthen environmental management of rural industries, do a good job of reasonable distribution, implement various technological management measures and actively prevent and treat pollution.

In order to protect and improve the agricultural ecological environment, we also must realistically resolve rural fuel problems. We must conscientiously

carry out the rural energy policy of "suiting measures to local needs, having those who are able to help others, using things for multiple purposes and striving for practical results." We should strive to exploit rural biological energy resources, widely popularize stoves that economize on firewood and coal, steadily develop methane and, according to local needs, develop solar energy, wind energy, hydroelectricity, fuel forests and so forth to resolve the usage versus capacity problem in rural life. Only when the contradiction of rural fuel scarcity is resolved can natural vegetation be effectively protected.

(F) Constantly Increase Scientific and Technological Levels, Emphasize Training of Qualified People.

Develop scientific research on environmental protection step by step in a planned fashion. Stress the essential problems for study, particularly such major research items as evaluation of the environmental quality and environmental influences of agricultural ecology, the effects of acid rain on agriculture, animal husbandry and fisheries and so forth. These problems are far more than a small number of courses are competent to handle, so we should organize cooperation to tackle the key problems. At the same time, we must foresee agricultural environmental problems that may appear by the end of the century and arrange long-term scientific research work accordingly. The various specialized organizations and institutions of higher learning concerned with environmental protection in the ministry's Institute for Environmental Protection Research, the Chinese Academy of Agricultural Sciences, the Chinese Aquatic Products Society, the South China Tropical Crop Research Institute and the Design Institute for Research of Agricultural Projects, as well as the agricultural environmental research units in the various provinces, municipalities and autonomous regions, are a major technological force. Henceforth, we must do a better job of organization and coordination work and bring their functions completely into play in scientific environmental protection research.

Agricultural environmental protection is a new endeavor, and we are very short of qualified people. In addition to continuing to run conscientiously the existing agricultural environmental protection specialties in agricultural schools and colleges, we must also, in accordance with the needs of expansion in this endeavor, set up relevant specialties in most agricultural, animal husbandry and fishery schools and colleges or offer relevant courses on environmental protection. This will allow the graduates of these schools and colleges to have the requisite fundamental understanding and basic technical mastery of environmental protection. Aside from this, we should continue to stress cadre training; run environmental management, environmental monitoring, rural industrial and farming enterprise cadre training classes on environmental protection and increase the ideological and professional level of personnel engaged in agriculture, animal husbandry and fishery environmental protection work.

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## MEASURES TO ASSESS ENVIRONMENTAL QUALITY OF SEWAGE IRRIGATED AREAS PROPOSED

Tianjin NONGYE HUANJING BAOHU AGRICULTURAL ENVIRONMENTAL PROTECTION in Chinese No 2, 83 pp 1-5

Article by Wu Yanyu /0702 3601 3768/, Chen To /7115 3447/, Zhang Xuexun /1728 1331 6104/ and Kong Zingxin /1313 1987 2450/ of the Institute of Forestry and Pedology, Chinese Academy of Sciences: "Principles and Procedures for Evaluating the Environment Quality of Sewage-Irrigated Areas"

Text The evaluation of environmental quality is a basic and theoretical science in environmental sciences and is at present a task in environmental protection work. Because environmental quality is a new and developing subject of the 1970's, principles and procedures for evaluation have not been finalized and are still under study. Evaluating the environmental quality of sewage-irrigated areas is a comprehensive and regional evaluation, because of the complexity, it is much more incomplete than that of water quality and atmosphere evaluation. In 1973, our institute began to take part in environmental quality evaluations of sewage-irrigated areas in Shenyang, Fushun, Zhangshi and Shenyang, we have put forward our views in this article on principles and procedures for evaluating environmental quality of sewage-irrigated areas for discussion.

### I. Principles for Evaluating the Environmental Quality of Sewage-irrigated Areas

The size of China's sewage-irrigated area is steadily expanding along with the demand for water and aggravated pollution of water systems. These districts are mainly in the north and the acreage in the suburbs of Beijing, Shijiazhuang, Xi'an, Tianjin and Shenyang is comparatively large. Because most of the sewage-irrigated areas are using untreated industrial waste and domestic sewage, people are paying a good deal of attention to the state of environmental quality because this bears on how China will treat and comprehensively utilize sewage. Through surveys in different localities in the past few years, a vast amount of environmental monitoring data has been accumulated in sewage-irrigated areas; nevertheless, because principles and procedures for assessing the environmental quality of sewage-irrigated areas are not uniform, there is a divergence of opinion and heated arguments have occurred between various views. We hold that a sewage-irrigated area is a complex, comprehensive regional environment and a specific water-soil-plant-human ecosystem. Therefore, we should study it with the fundamentals and methods of pollution ecology, we must study the patterns of migration and distribution of pollutants in that ecosystem, the ecological impact, the

self-purification ability and environmental capacity of the sewage-irrigated area for pollutants, the formulation of health standards for evaluating the grain and food produced in sewage-irrigated areas, the standards for evaluating contaminated soil and investigating human health in sewage-irrigated areas. Only in this way can an overall environmental evaluation of sewage-irrigated areas be worked out. It will be imperfect if our study only depends on chemical monitoring data but departs from the fundamentals and methods of ecology.

## II. Procedures for Environmental Quality Assessment of Sewage-Irrigated Districts

A set of regional working procedures for environmental quality assessment were put forward by the Coordinating Team for Environmental Quality Assessment of the Western Suburbs of Beijing, they are: investigate sources of pollution → decide on pollutants to be monitored → collect great amounts of data on environmental pollution, then conduct environmental quality assessment.

The first part of the steps in this working procedure are feasible if we apply them to evaluate sewage-irrigated areas. For instance, investigate the water quality of the irrigation district (source of pollution), and the current contamination of the soil, crops and groundwater in the irrigation district, then sort out the data and compile a report. At present, most irrigation areas remain at this standard in China.

Based on our experiences, we must pay attention to the following points when we work on the above procedure.

A. The survey and monitoring of pollutants for irrigated water quality (sources of pollution) should be comprehensive. At present, the monitoring capability of all irrigation districts are limited. In general, the pollutants that are monitored are few, in particular organic pollutants are rare; therefore, pollution sources are probably inaccurate. Experimental stations should be set up in irrigation districts for long-term monitoring of water quality.

In addition, when suburban farmland is surveyed, attention must be paid to other forms of pollution such as air, pesticide, waste residues, etc.

B. In respect of monitoring pollutants, on the basis of understanding the survey on sources of pollution, principal pollutants in sewage-irrigation can be determined and monitoring can be strengthened. For example, in the Shenyang-Fushun petroleum sewage-irrigated districts, we are mainly monitoring petroleum, phenols, Bap and so forth. In the Zhangshi irrigated district, at first we monitored mercury, cadmium, lead, copper, and zinc, but then we discovered that the Shenyang Refinery discharges only 0.087 tons of mercury but 70 tons of arsenic yearly, so we added the latter to the monitoring list.

C. The distribution of monitoring stations: besides being based on the length of the irrigation season, types of soil and the variety of crops, we propose setting up some long-term points for repeated monitoring yearly in order to ensure the reliability of the numerical value. We have been sampling successively for 3-4 years in the irrigation districts of Shenyang-Fushun and Zhangshi. We also set up regular observation sites in the Zhangshi irrigation district to conduct equilibrium counts of the input and output of pollutants.

In order to evaluate the environmental quality of irrigation districts from the angle of pollution ecology, we must fully carry out the following work.

1. Conduct a background level survey on soil and grain.

Because of the complexity of soil formation parent material and procedures in different districts and the diversification of kinds and varieties of crops, data on each district must be collected and accumulated while conducting a pollution survey. While surveying the background, we should pay attention to these points:

(A) We should accurately select sampling points in suburban clean irrigation districts to avoid the impact of air pollution. For instance, the clean background value of Bap in soil is  $< 10$  ppb, but in the soil of vegetable plots in the suburbs of Shenyang irrigated by wellwater, the content of Bap is 120-170 ppb, this is a relative background value.

Another example, the background value of Bap in rice, the content of Bap of cultivated paddy rice in a filtered air chamber in 1979 was only 0.1 ppb, and that of rice planted in fields of clean irrigation districts was 0.2-0.5 ppb. In cities, the content of Bap in the air can contaminate the surface of leaves and enter paddy rice seeds, and the Bap content can reach 1-2 ppb.

(B) The number of background samplings should be more than 10, 30 would be appropriate; data that is obtained must be processed in order to reject abnormal values.

(C) The crop samplings must be treated uniformly.

2. Studying the patterns of migration and distribution of the pollutants within the system of water-soil-plant in sewage-irrigated districts.

After the pollutants, through the sewage, enter irrigation districts, their migration and distribution can be divided into the following six aspects:

a. Pollutants are transported and deposited in the water mainly by physical and physical chemical factors;

b. After the pollutants enter the soil, they act on each other by biological and physical chemical factors;

c. The migration and distribution among water-soil-plant are mainly by biological factors;

d. Redistribution in the plant body is mainly by physiobiochemical actions;

e. Crops enter the human body through the food chain;

f. Pollutants enter the human body through groundwater which has been polluted by permeating the wall of pipelines.

From the above we see that under actions of complex factors, the migration and distribution patterns of various pollutants which enter irrigation districts through the water are different, as are their final outcomes. Let's describe them briefly as follows:

1. The transport and deposit of pollutants in water body. Organic substances such as petroleum float on the surface of water, they can be transported distances to tens of kilometers; the migration of inorganic heavy metal ions are varied according to their properties,  $\text{Cr}^{3+}$  settles within 2 km of the lower reaches from the discharge opening and  $\text{Cr}^{6+}$  can travel tens of kilometers. Suspended substances in sewage are usually carriers of various pollutants. The powdered coal ash contained in sewage of the Shenyang-Fushun irrigation district is more than 300 mg/l, the maximum Bap contained in sewage is only 7 ppb, but the Bap contained in powdered coal ash can reach as high as 3,500-7,000 ppb. The ions of heavy metal can attach to the suspended substances, their stability are Cd Zn Cu Pb; therefore, Cd and Zn can be transported far distance and Cu and Pb can easily settle; 79.4 percent of cadmium and 66 percent of lead is absorbed in 100 mg/l of the suspended substances on the Sanitary Canal in Shenyang, and in the 10 km flow from that canal to the Zhangshi irrigation canal, the suspended substances gradually settle in the subsoil, and the heavy metal content in the water decreases successively, after passing and settling in the Shaling small lake it can be decreased 9-11 times.

2. After pollutants enter the soil, they act on the soil.

Soil is a specific ecosystem, possessing various decomposable organic pollutants in the biotic community and enzymatic system, plays a role of "biotic filter." Data collected by the Institute of Forestry and Pedology, in the Shenyang-Fushun irrigation district show that the soil purification rate there is more than 90 percent for phenol, cyanogen and sulfides, about 40 percent for mineral oil in the summer and 70 percent in potted culture; and that of Bap annually is 45-57 percent. The Coordinating Team for Evaluating Environmental Quality of the Western Suburbs of Beijing has concluded that the self-purifying rate in farmlands of the Beijing district is 98.17 percent for phenol and 98.98 percent for cyanogen annually.

There appears to be another state for the inorganic pollutants, they are mainly absorbed by the organic or inorganic colloids in the soil, their effective forms are varied according to the quality of soil. Different farming methods affect the formation of heavy metals in the soil. For example, Cd may, in the form of  $\text{CdSO}_4$ , exist in arid soil and in the form of CdS, in soil of paddy fields; its effect on crops is also different, absorption by paddy rice is less than that by wheat, but paddy rice absorbs more mercury than wheat. The mercury content of soil in Yingcheng Commune, Tianjin Municipality, is 0.5-0.9 ppm, the wheat planted on it contained Hg 0.017 ppm, but in rice, 0.057 ppm.

3. The movement and distribution between water-soil-plant are mainly by biological factors.

When the concentration of organic pollutants is high, such as acetaldehyde trichloromethane, diphenylether, 2-4-D, phenols..., the harm to crops is acute,



damaging the cell membrane of plants, fading the stems and leaves, decreasing tillerings, even causing the plant to wither and die and to stop yielding. But the amount of retained toxin is not significant. For example, agrotechnicians in the sewage-irrigated districts of Muming County, Guangdong Province once used sewage with high concentrations of phenols--400 mg/l--to irrigate paddy rice, the paddy rice almost stopped yielding but its grain contained only two times the phenols compared with the control group.

Heavy metal pollutants and pesticides generally do not cause acute harm to plants, but the residual toxicity is easily absorbed and accumulated and through the food chain harms human health.

The toxic effects of As, B, Cu and Ni to paddy rice are comparatively strong, our institute test shows that adding 100 ppm of arsenic to calcium salt can make paddy rice stop yielding, but the toxic effects of Cr and Pb are less to plants, the potted culture of our institute indicates that to irrigate with  $PbCl_2$  2000 ppm, the yield of paddy rice is 96 percent compared with the control group, the husked rice contained 0.20 ppm of Pb. The amount of lead absorbed through the root system of plants is small. As for mercury and cadmium, the degree of their damage to plants is medium, but they are easily accumulated by the plant and affect human health. It has also been shown in potted tests of our institute that the yield does not change when the content of cadmium in soil is 20 mg/kg. If the content of cadmium in husked rice reaches 1.78 mg/kg, it greatly exceeds the food sanitation standard, and is at the level of "cadmium-rice." Therefore, close attention must be paid to the control of cadmium and mercury pollutions.

#### 4. The redistribution of pollutants in the plant body.

After pollutants are absorbed by the crop, they are redistributed in the crop body by the vegetative and the reproductive growths in organic pollutants that detoxicate by oxidation, degradation, and catabolism. For example, phenols can be absorbed by plants and transformed to phenolic glycoside or assimilated to ordinary carbon dioxide; cynaide can be transformed in the plant body to serine → aspartic acid and the detoxified. According to the isotope tracer tests of our institute, paddy rice can absorb  $^{14}C$ -hexadecane in the soil, the absorbed rate of the part above ground is 1.0-1.7 percent, only 0.1 percent is redistributed to grain through the plant and transformed to high grade polysaccarose, and only extreme traces are retained in the form of carbon hexadecane. The redistributed determination of polycyclic aromatic hydrocarbon Bap in paddy rice body shows root > stem and leaf > rice bran > polished rice, and the amount contained in rice bran is 12-30 times that in polished rice.

All inorganic pollutants are redistributed in the plant body in crystal or noncrystal forms and settle in the membrane of root cells, they seldom move up. Data collected by the Zhejiang Agricultural University shows that the chromium content of rice straw is 20 to 90 times higher that of husked rice; and that about 92 percent of the total chromium content accumulates in stems and leaves, about 5 percent accumulates in grain hulls and about 3 percent in husked rice. Our institute determined in the Zhangshi irrigation district that the movement rate from soil to grain is Zn > Cd > Cu > As > Pb.

### 3. Research on Environmental Biology to Assess Standards.

The environment of irrigation districts affects human health mainly by indirect contamination through the food chain. First, we must have a crop sanitation standard to assess the crops. The items listed in our present standards on toxins in grain are few and incomplete. Our country has a vast territory and various kinds of grain, the properties to absorb pollutants are varied in different crops, we can not apply the same rule in every case. For instance, in the Baiyin irrigation district, Lanzhou, Gansu Province, under the condition of same amount of cadmium contained in soil, the wheat grain there contained 267 ppm of cadmium, 27 times higher than in corn grain. Data of Shenyang shows that when the cadmium content of soil is 7.05 ppm, its content in paddy rice is 0.48 ppm and only one-eighth of that in corn. If we take 0.4 ppm as the limit, then the cadmium content of corn will not exceed the limit.

We suggest that the state instruct health departments to work out a food sanitation standard as soon as possible, and the scientific research departments of agriculture and forestry should in coordination draw up pollution standards for various crops. If it is difficult to draw up national standards, we should work out regional standards first, and then gradually unify them.

As a reference, we introduce the temporary graded scale for pollutants in husked rice in the assessment of the Shenyang sewage-irrigated district.

Table 1. Shenyang Graded Scale for Pollutants in Husked Rice

(unit: ppm)

Elements	Nonpolluted Value	Lightly-Polluted Value	Medium-Polluted Value	Seriously-Polluted Value
As	0.126	0.27	0.427	0.7
Cd	0.048	0.103	0.198	0.4
Pb	0.332	0.65	1.0	2.0
Cu	2.01	7.33	12.65	23.0*
Zn	9.75	19.3	29.0	42.0*
Hg	0.0107	0.013	0.017	0.020
Alkyl Hydrocarbon	12.2	13.3	14.4	14.0*
Oil				
Aromatic Hydrocarbon	4.66	5.0	5.31	17.0*
Free Phenols	0.41	1.0	7.0	25.0
Bap (ppb)	0.31	1.0	5.0	5.0
Cr	0.046	0.142	0.346	0.55
BHC	0.025	0.1	0.2	0.3

\*Potted Culture

Another problem we face in assessing soil pollution in sewage-irrigated districts is that there is no uniform international "soil contamination standard." The task of formulating a soil contamination standard is very complicated because the types of soil are varied, and soil quality is different in each natural geographic zones. Data on this aspect should be accumulated by means of tests in large field and potted experiments of single factor and multiple factors. Take arsenic as an example, to yield husked rice containing 1 ppm of arsenic, in soil of paddy rice field in Nanking is 8-12 ppm and in limesoil in Beijing, the content is 78.3 ppm. In potted experiment, to yield husked rice containing 0.4 ppm of cadmium with soil from Shenyang paddy rice field in which cadmium content is 8.0 ppm, but in Beijing, the content is 10.7 ppm; to yield husked rice containing 1 ppm of cadmium, the cadmium content of soil of Shenyang is 15 ppm, but that of Beijing is 44 ppm.

The potted experiments are mostly single factor, so the tolerance of crops is strong, but in conditions of complex contaminated fields, the soil contamination standard will be lower. According to our institute's data of on-the-spot determination in large fields in the Shenyang and Zhangshi irrigation district between 1975-1979, in conditions of large fields the cadmium content of husked rice is 0.4 ppm and that of soil, 5 ppm.

Data on soil contamination standards in China at present are listed in Table 2.

Table 2. Data on Soil Contamination Standards

Unit: ppm

(With cultures in soil of paddy rice field as example)

Toxins	Concentration of Growth Inhibited	Concentration of Residue Toxin Produced	Concentration Limits of Growth Prevented from Japanese Data
As	Potted Experiment: 40 ppm--yield decreased 50 percent 160 ppm--died	Potted: 12 ppm	10-25 (Agro-tests in Fukushima)
	Large Field: Over 40 ppm (Shenyang)	Large Field: 20-30 ppm (Shenyang)	40-60 (Agro-tests in Hyogo)
Hg	Potted: 70 ppm out- put decreased 32.0 percent	Potted: 4.69 ppm  Large Field: 0.6 ppm* (Beijing)	40-50 ppm
	Potted over 300 ppm output decreased** (Beijing) Over 200 ppm output decreased 15 percent (Shenyang)	Potted: 44 ppm (Beijing) 15 ppm (Shenyang)  Large Field: over 5 ppm (Shenyang)	12.5 ppm (Agro- tests in Chiba)

\*\*The Beijing Institute of Environmental Protection and others: Potted Experiments on the Affects of Fluorine, Lead and Cadmium Contained in Paddy Rice Soil, 1978.

Table 2. Limits of Soil Pollution (continued)

Unit: ppm

(With cultures in soil of paddy rice as example)

Toxins	Concentration of Growth Inhibited	Concentration of Residual Toxin Produced	Concentration Limits of Growth Prevented From Japanese Data
Pb	Potted: over 2000 ppm decreased 14 percent (Beijing)  Over 2000 ppm decreased 50 percent (Shenyang)	Potted: 1600-2200 ppm (Beijing)	400-500
Cr		Large Field: 67.2 ppm of grain contained 0.28 of Cr	over 450
Cu	Potted: 500 ppm (Shenyang)	Potted: 350 ppm (Shenyang)	80-150 ppm
Zn	Potted: 1000 ppm (Shenyang)	Potted: 560 ppm (Shenyang)	over 200 ppm (Agro-tests in Gunma)
Ni	Potted: 130 ppm (Shenyang)	Potted: 400 ppm (Shenyang)	over 160 ppm (Agro-tests in Okayama)
F	Potted: 300-500 ppm y.d. 20 percent (Beijing)		
Oil	Potted: over 5000 ppm Large Field: over 1000 ppm (Shenyang)	Large Field: 500 ppm (Shenyang)	
Phenol	Large Field: over 2 ppm		
Bap		Potted: 0.98 ppb in paddy rice body when it is 3.5 ppm  Large Field: over 500 ppb (Shenyang)	

\*Coordinating Team on Investigating Sewage-irrigated Environmental Quality in the Southeastern Suburbs of Beijing Municipality: Survey on Pollution of Several Heavy Metals in Tonghui He Sewage-irrigated District, 1977  
Environmental Protection Division, Beijing Academy of Agricultural Science: The Effect of Mercury on Crops and Vegetables, 1976  
All others are data collected by our institute.

4. Small Dosed Toxicological Tests on Animals. To formulate a sanitary standard, we must evaluate contamination of the food chain in irrigation districts, small-dosed toxicological tests have to be conducted by medical departments. We sent rice produced in the upper reaches of Shenyang-Fushun irrigation district to China Medical University Medical University for chronic toxicological tests for 3 years, it was found that the tested animals--small white mice--in the group fed with sewage-irrigated rice plus rice bran were distinctly backward in length and development of breast bone compared with those in the control group. We also sent rice containing cadmium yielded in the Zhangshi irrigation district to the Shenyang Hospital for Occupational Diseases for toxicological tests on rabbits, it was found that in the large-dosed (50 mg/kg) group, the rabbits' weight and the cadmium content of their urine differed distinctly from those in the control group, their internal pathological changes are under examination. But the period of these kinds of biological tests is too long. To supplement knowledge on the effect of sewage irrigation on animals, we also conducted surveys on epidemiology and on the toxin content in the bodies of domestic animals and poultry in irrigation districts of Shenyang-Fushun and Zhangshi.

In 1980, the Shenyang Institute of Labor Sanitation analyzed the cadmium content in internal organs and muscles of 70 hogs (weight 100-125 kg and around 1 year old), half of them raised in the Zhangshi irrigation district and the other half, in worker-peasant-soldier irrigation districts.

The cadmium content of meat and organs of hogs raised in sewage-irrigated districts were distinctly higher than those raised in control areas, seven to nine times on the average; obviously, it came from the fact that the fodder in sewage-irrigated districts consisted of rice bran and husk which contained a large amount of cadmium.

A chicken farm of the Sifangtai Brigade, Lishizai Commune, is located to the side of the Shenyang-Fushun main canal and water from the main canal is constantly filling into wells of that chicken farm, causing the well water to be seriously polluted by oil sewage. When the chickens are butchered, their livers swell with a coefficient of 0.023-0.024 (the normal one is 0.018-0.019); and the livers of 11 percent (78 chickens) clear dot-shaped and segment-shaped necrosis can be seen.

#### E. Health Survey in Irrigation Areas.

A key issue in environmental quality evaluation of irrigation district is the health of the population, in order to clarify and define the environmental quality of sewage-irrigated districts, efforts must be made to find the correlation between the population's health and sewage-irrigation. It is a pity that the present level of environmental medicine cannot yet provide a clear answer, and this seriously hampers the development of environmental quality evaluation of sewage-irrigated districts.

During the period of 1975-1979, three surveys were conducted in the Zhangshi irrigation district on the health of the population. It was found that the positive rate of cadmium in urine and in hair, and low-molecular protein in

urine of the inhabitants in sewage-irrigated districts was higher than that of the control district, distinct variations also exist between them. But no typical osteocopic patient has been found yet. In Guilin, the soil and rice were contaminated by sewage containing cadmium from the Lead and Zinc Mine of Yangshuo County, calcium loss occurred in the urine of commune members, and is even more serious than the Zhangshi irrigation district.

The epidemiological survey conducted by the Liaoning Provincial Sanitary and Antiepidemic Station in the Shenyang-Fushun irrigation district found that death caused by tumors was two times higher than that in the clean irrigation district, but what kind of pollutant and by what means the pollutant caused tumors has not yet been proven.

7. Ecological Simulated Test in Filtered Air Chamber. In order to explain problems in depth, various experiments may be conducted in simulated ecological environments besides surveys conducted in irrigation districts. The scale and design of the test will be different depending on the subject. Regular potted experiments, field experiments, input and output calculations of the balance field of irrigation districts are all simulated ecological experiments.

The Bap simulated experiment in a filtered air chambers with controlled air pollution clarified that the Bap contained in seeds of paddy rice was from the air, not the root system; research on the pattern of pollutant migration and distribution with traced isotopes  $^{14}\text{C}$ Bap,  $^{14}\text{C}$  n-hexadecane as well as  $\text{Cd}^{115+115\text{m}}$  and  $\text{N}^{15}$  and so forth are all simulated experiments. Through the above experiments, parameters of great importance can be gained, such as rates of purification, retention, movement, etc., of the pollutants and these can be applied to evaluations.

12272

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## WATER QUALITY STANDARDS FOR FARMLAND IRRIGATION LISTED

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 3, 1983 p 21

[Partial list: "Water Quality Standards for Farmland Irrigation"]

[Text] The Water Quality Standards for Farmland Irrigation were formulated jointly by the former Ministry of Agriculture and Forestry and the units concerned and became national standards after being reviewed and approved by relevant departments in the State Council. The standards were implemented on a trial basis, beginning 1 December 1979, and the quality of water used for farmland irrigation is required to meet them. For the reference of the units concerned, we now publish selected control indices for the items covered by the standards.

### Water Quality Standards for Water Used in Farmland Irrigation

<u>Number</u>	<u>Item</u>	<u>Standard</u>
1	Water temperature	Not to exceed 35°C
2	pH	5.5-8.5
3	Volume of all salts	Farmland with nonsaline-alkali soil not to exceed 1,500 mg/l
4	Chlorides (calculation based on Cl)	Farmland with nonsaline-alkali soil not to exceed 300 mg/l
5	Sulphides (calculation based on S)	Not to exceed 1 mg/l
6	Mercury and its compounds (calculation based on Hg)	Not to exceed 0.001 mg/l
7	Cadmium and its compounds (calculation based on Cd)	Not to exceed 0.005 mg/l

8	Arsenic and its compounds (calculation based on As)	Not to exceed 0.05 mg/l
9	Sesivalent chromium compounds (calculation based on Cr <sup>6+</sup> )	Not to exceed 0.1 mg/l
10	Lead and its compounds (calculation based on Pb)	Not to exceed 0.1 mg/l
11	Copper and its chemical compounds (calculation based on Cu)	Not to exceed 1.0 mg/l
12	Zinc and its chemical compounds (calculation based on Zn)	Not to exceed 3 mg/l
13	Selenium and its chemical compounds (calculation based on Se)	Not to exceed 0.01 mg/l
14	Fluorides (calculation based on F)	Not to exceed 3 mg/l
15	Cyanides (calculation based on free cyanogen)	Not to exceed 0.5 mg/l
16	Petroleum products	Not to exceed 10 mg/l
17	Volatile phenol	Not to exceed 1 mg/l
18	Benzene	Not to exceed 2.5 mg/l
19	Trichloroacetaldehyde	Not to exceed 0.5 mg/l
20	Acrolein	Not to exceed 0.5 mg/l

Excerpted from "Water Quality Standards for Farmland Irrigation," TJ 24-79 (Trial), Chinese Construction Industries Publication Co, September 1979.

12380  
CSO: 4008/189



AGRICULTURAL POLLUTION REDUCED THROUGH CONTROL MEASURES AT SUZHOU PLANT

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 3, 1983 pp 4-6

[Article by Pan Rugui [3382 1172 0964] and Wang Caie [3769 1752 1230]:  
"Agro-Ecological Changes Before and After Introduction of Control Measures at the Suzhou Sulphuric Acid Plant"]

[Text] The Suzhou Sulphuric Acid Plant is located at the northeastern corner of suburban Suzhou and is surrounded by vast plains and a network of rivers. Rice, vegetables, wheat and rape constitute the main agro-ecological structure of the plant's environs.

The plant was built in 1959 and used the water purification contact method to manufacture sulphuric acid. Recovery of sulphur dioxide tail gas was not taken into consideration at the time of construction, management of the facilities was not strict and thus reckless discharge of sulphur dioxide--such as letting the gas escape, gush, drip or leak--was relatively serious (according to a survey in 1978, the equipment, leakage rate was as high as 4.2 percent). It was estimated that about 6 tons of sulphur dioxide (equivalent to more than 9 tons of sulphuric acid product) were discharged into the atmosphere each day, not only wasting resources but also polluting the environment. Over the years, sulphur dioxide tail gas caused much damage to surrounding crops, to the growth of vegetables and to the health of residents and at one point affected as much as 2,800-some mu of farmland. By the end of 1979, the plant had rendered a total of 1.9 million yuan in compensation for losses caused to agricultural production, and the average annual payment exceeded 100,000 yuan.

At the beginning of 1980, the plant adopted the 2-step absorption method of double spraying and double grading with liquid ammonia to deal with sulphur dioxide tail gas, and the recovered product was ammonium acid-sulphite. Therefore, the content of sulphur dioxide discharged from tail gas was greatly reduced. According to tests conducted in June 1982, that content declined from 220 kg to 43.86 kg per hour (the stipulated standard for a 60-m discharge stack is 110 kg/hour) and was 1.5 times lower than the discharge standard. From the standpoint of the operation of the equipment, the rate of leakage in 1981 declined to 0.119 percent, while 94.54 percent of that equipment was rated in good condition. A comprehensive

investigation conducted in June-July 1982 showed that the concentration of sulphur dioxide in the atmosphere of the plant's environs had greatly declined from 1976 levels, and the daily average concentrations of sulphur dioxide obtained at various monitoring points generally declined by more than three times (Table 1). At the same time, the surrounding agro-ecology has also undergone marked changes.

Table 1. Daily Average Concentration of Sulphur Dioxide in the Atmosphere (mg/m<sup>3</sup>) at Different Distances from the Plant

<u>Time of Determination</u>	<u>200 m</u>	<u>400 m</u>	<u>600 m</u>	<u>900 m</u>	<u>1000 m</u>	<u>1200 m</u>
6-13 June 1976 (average of 20 samples)	0.792	0.548	0.694	0.355	-	0.313
10-12 June 1982 (average of 12 samples)	0.122	0.090	0.102	0.085	0.074	0.027
Multiples of Decline	5.49	5.09	5.78	3.18	-	9.79

Note: The above averages are those of concentrations obtained at fixed points along five sampling lines.

#### I. Changes in Crop and Vegetable Damage

In 1973, we carried out an agro-ecological investigation and discovered that crops and vegetables within 150 m of the plant all had varying degrees of acute damage, and leaf damage area usually exceeded 50 percent (Table 2). But in the 1982 survey, we did not see any sulphur dioxide damage in any crops or vegetables.

Table 2. Leaf Damage Areas for Crops and Vegetables within 150 M of the Plant (%)

<u>Time of Survey</u>	<u>Rice</u>	<u>Wax Gourd</u>	<u>Towel Gourd</u>	<u>Corn</u>	<u>Watermelon</u>	<u>Eggplant</u>
19 July 1973	>90	>90	>90	>90	50	30
22 July 1982	All crops and vegetables show no damage					

#### II. Changes in Crop and Vegetable Output

Before control measures were implemented, output of crops and vegetables markedly declined. According to 1978-1979 statistics on rice production, for example, in the area within 800 m of the source of pollution, average yields varied directly to distance (see graph). The average yield of Production Team No 5, which is located closest to the source of pollution, was only 38.6 percent of that of Production Team No 6, which is farther away (Table 3).

Table 3. Comparison of Rice Yields in Some Production Teams of a Certain Production Brigade Before and After Control Measures Were Introduced at the Plant

Time	Yield (jin/mu)	Teams				
		6	2	3	4	5
1978-	Average Yield	459.3	439.5	279.8	238.7	178.0
1979	Index	100.0	95.7	60.9	52.0	38.6
1980-	Average Yield	511.9	489.8	299.5	314.0	335.5
1981	Index	100.0	95.7	58.5	61.3	65.5

After control measures were implemented, the decline in crop and vegetable production was no longer so marked. According to statistics for 1980 and 1981, rice yields of the two production teams closest to the source of pollution and whose crops had previously suffered the most damage were actually slightly higher than the yield of one production team located farther away (see Table 3). According to detailed statistics for 1981, vegetable (the general term for melons, fruits and leafy vegetables) output in all the production teams located near the plant was generally higher than 1979 levels, the year before control measures were introduced, and the average yield of Production Team No Five, which suffered the most damage and which is closest to the plant, actually exceeded the 1979 level by 1.3 times. All of this indicates that air pollution is not enough to cause a decline in the output of crops and vegetables. Yet the agricultural output of teams closer to the plant has declined in comparison to Team Nos Six and Two, which are more distant. This might be caused by other factors.

The investigation of July 1982 discovered that although rice plants close to the source of pollution were still affected to a certain degree by sulphur dioxide--for example, boot leaves have become shorter, chlorophyll content has been reduced and spike and paddy weights have decreased (Table 4)--yet these changes were slight, occurred slowly and had no obvious undesirable effect on the output of crops and vegetables.

Tests were conducted on the effect of sulphur dioxide on early-rice leaf chlorophyll content between paired, contiguous locations. Such tests revealed that no significant differences were found, except for the 500 m-900 m pair ( $t=6.054$ ,  $p<0.001$ ). Therefore, it is apparent that, after control measures were instituted, air pollution around the plant has had little effect on crops and vegetables and caused little decline in agricultural production. Nevertheless, both the decline in agricultural production and sulphur dioxide pollution were obvious prior to the initiating of control measures.

### III. Changes in Sulphur Content in Crops and Vegetables

A July 1976 survey revealed that leaf sulphur content in crops and vegetables was markedly higher than in polluted areas than in nonpolluted areas (Table 5). For example, sulphur content in the leaves of early rice

Table 4. Comparison of Growth, Chlorophyll and Fructification of Early Rice (Guang Lu Ai) at Different Distances from the Plant

Distance	Length of Boot (cm)	Leafa	Chlorophyll Content (mg/dm <sup>2</sup> ) <sup>b</sup>	Paddy Weight (gm) <sup>c</sup>	Spike Weight (gm) <sup>d</sup>	Weight of 1000 Grains (gm)	Ratio Empty Grain (%)
150	21.45±2.19		3.92±0.35	66.0	1.29±0.23	23.4±0.4	10.4
350	26.36±3.68		4.03±0.47	75.5	1.68±0.41	21.8±0.2	16.1
500	26.95±3.90		4.11±0.42	84.0	2.19±0.33	22.3±0.6	18.5
900	24.66±2.80		5.00±0.20	86.5	2.32±0.53	23.2±0.5	9.6
1200	24.38±3.17		5.16±0.18	85.5	2.28±0.36	21.7±0.4	12.7

a. Average length of 20 leaves

b. Average content in 10 leaves

c. Weight of paddy from 50 spikes

d. Average weight of 20 spikes

located about 200 m from the plant was 8.05 mg/g, which was 3.5 times the level in nonpolluted areas. In 1982, we conducted another determination at the same locations and discovered that the sulphur contents of all plants generally were one to two times lower than those of the same period in 1976. For instance, the leaf sulphur contents of the same breeds of corn and cowpea were 11.70 mg/g and 11.40 mg/g, respectively, in 1976 but in 1982 were only 4.78 mg/g and 4.40 mg/g, or 1.45 and 1.59 times lower than the levels of 1976. Although the sulphur content of each crop or vegetable at different locations still varied according to distance, the variance had been greatly reduced.

Table 5. Sulphur Content\* (mg/g) in Crops and Vegetables in Different Areas

<u>Area</u>	<u>Rice</u>	<u>Corn</u>	<u>Sweet Potato</u>	<u>Castor-Oil Plant</u>	<u>Cowpea</u>
Polluted	8.05	7.55	11.70	15.70	11.40
Nonpolluted	2.30	4.40	6.50	7.85	6.35
Index**	3.50	1.72	1.80	2.00	1.80

\* Refers to the total sulphur content in plant leaves.

\*\* Refers to the multiples of polluted areas to nonpolluted areas.

Table 6. Sulphur Content (mg/g) of Crops and Vegetables at Different Distances from the Plant

<u>Type</u>	<u>About 200 m</u>	<u>About 400 m</u>	<u>About 600 m</u>	<u>About 800 m</u>	<u>About 1100 m</u>
Early Rice (Guang Lu Ai)	4.23	3.99	3.51	3.41	3.22
Kidney Bean	4.51	4.38	4.34	3.76	3.42
Tomato	11.97	11.78	9.08	8.98	-
Towel Gourd	5.43	5.36	5.23	5.19	5.05

It can be seen from Table 6 that spatial differences in leaf sulphur content for similar plant types were not too obvious.

Summing up, after the initiation of control measures at the Suzhou Sulphuric Acid Plant, crops and vegetables have generally grown well, the decline in agricultural production is less obvious and crop sulphur content has been greatly reduced. Such agro-ecological changes indicate that the environment has indeed improved markedly. Thus it is apparent that agro-ecological survey provides an important means by which to examine the effects of pollution control measures adopted by factories.

#### IV. Conclusion and Recommendations

1. Through technological reform, the Suzhou Sulphuric Acid Plant adopted the two-step absorption method, which has led to a marked decrease in the sulphur

dioxide content in discharged tail gas and has reduced the daily average concentration of sulphur dioxide in the surface atmosphere below the health standards established by the state. Therefore, the pollution of the environment by sulphur dioxide discharged by the plant is no longer very obvious.

2. Crops and vegetables in the vicinity of the plant generally grow well and have shown no obvious harmful effects from atmospheric sulphur dioxide pollution, the decline in agricultural production is no longer obvious, in 1980 and 1981 compensation rendered to agriculture fell to 15-25 percent of that paid in 1979, and crop sulphur contents have been greatly reduced. These and other agro-ecological changes indicate that the environment has improved markedly, and this is the result of the implementation of control measures and the strengthening of enterprise management on the part of the plant. Therefore, control measures undertaken by plants provide an important way to eliminate environmental pollution.

3. Once it began treating its sulphur dioxide tail gas, the Suzhou Sulphuric Acid Plant not only obtained definite economic results, it also gained environmental benefits. Therefore, plants with sulphur dioxide pollution should actively adopt technical transformation measures to obtain greater economic results.

4. Because the market for products recovered through treatment is not good, tail-gas absorption facilities might occasionally be forced to shut down, thus leading to marked increases in sulphur-dioxide discharge. Thus, in order to consolidate the economic benefits already obtained, the plant invested another 770,000 yuan in 1982 to add facilities employing ammonium to manufacture liquid sulphur dioxide and solid ammonium sulphide, thereby ensuring normal operation of tail-gas recovery equipment and basically solving the problem of tail-gas damage.

5. With the development of "the five small" industries in China, sulphur-dioxide pollution of agriculture is relatively widespread and causes agro-ecological changes. However, by merely stressing treatment of pollutants, we can overcome this problem. The obvious agro-ecological improvement engendered by the institution of control measures at the Suzhou Sulphuric Acid Plant provides an example of this.

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## YANGZHOU RURAL ENVIRONMENT, PROTECTION MEASURES DISCUSSED

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 3, 1983 pp 24-26

[Article by Zhang Bingqing [1728 4426 3237]: "An Investigation of Conditions in Yangzhou Prefecture's Rural Environment and Ways To Protect That Environment"]

[Text] 90 percent of the population in Jiangsu's Yangzhou Prefecture live in the countryside, and the food of the urban population comes mainly from this area. Therefore, the state of rural environmental pollution and the quality of rural environmental protection work not only affect agricultural production and the health of the rural population but are also directly related to the health of the urban population and the entire "four modernizations."

### I. Rural Environmental Pollution in Yangzhou Prefecture Is Serious

Ever since the founding of the People's Republic, with the expansion of industrial and agricultural production, rural environmental pollution has become increasingly serious in Yangzhou Prefecture. Throughout the prefecture, not a single unaffected area can be found, and in some areas pollution is extremely serious. Relatively speaking, areas along the Chang Jiang are the most heavily polluted, because in these areas commune and brigade industry is more developed, and large quantities of pesticides and chemical fertilizers are employed. Next come the hilly and dry-valley districts. Pollution in the Lixiahe area is comparatively light, because that area boasts less commune and brigade industry, possesses many streams and vast expanses of water, which have greater dilution and purification capabilities, and uses more organic and phosphate fertilizer. In the hilly areas of Yizheng, gravel pits and rock quarries have been opened indiscriminately, in the Lixiahe area farmlands have been reclaimed from lakes and thus destruction of ecological balance has been relatively serious in these places.

#### A. Pollution from the "Three Wastes" of Industry

Among the "three wastes," wastewater causes the most serious pollution of the rural environment. Wastewater consists mainly of water discharged by the chemical, electroplating, chemical fertilizer, paper and dye industries and contains such toxic and harmful materials as cadmium, chromium, arsenic,

mercury, lead, cyanide, phenol, benzene, acids and alkalis. Emissions consisting principally of sulphur dioxide, airborne dust and fluorides discharged from phosphate fertilizer plants also cause definite damage to the rural environment.

#### B. Pollution by Pesticides and Chemical Fertilizer

Because of the development of industry and agriculture, the pesticide usage has increased every year in our country and has risen even more sharply since the mid-1970s. In the past 3 years, roughly 25,000 tons of pesticides were annually applied throughout the prefecture, with an average of 250-300 gm (effective component) per mu, 25-30 times the level of the 1950s. In the areas along the river in Jingjiang and Taixing Counties, the amount reaches 350-400 gm. If the 25,000 tons of pesticides are broken down into their raw chemicals (about 2,000 tons) and diluted to become wastewater with a concentration of 1 gm/l, there would be about 2 billion tons of wastewater, which is 19 times greater than the 110 million tons of wastewater discharged by the prefecture's industries every year. Pesticides that seriously pollute the environment consist mainly of preparations manufactured with organic chloride and heavy metals, whose chemical properties are stable, residue volume high and residual effect long, as well as Di Ku Shuang and insecticide dust, which have the dangerous potential of causing deformities and cancer. Throughout the prefecture, organic chloride pesticides comprise more than 30 percent of the total amount of pesticides used, while the deformity- and cancer-causing pesticides account for about 10 percent. In a very few areas, such as the Liangxu Orchards of Tai County, calcium arsenate is applied deep into watermelon fields to control subterranean pests. A day or two before vegetables are harvested and during fruit picking, pesticides are commonly sprayed in fields and orchards. Heavy application of pesticide during the ripening of hybrid rice also occurs everywhere, increasing environmental pollution and toxic threat to humans.

Nitrogenous fertilizer is the major chemical-fertilizer pollutant of the environment. According to incomplete estimates, in the last 3 years the entire prefecture annually employed 40 tons of standard nitrogenous fertilizer, with an average of 100 jin per mu (amounting to 20 jin of nitrogen). In the areas along the river in Jingjiang and Taixing Counties, the amount reached 200-250 jin (amounting to 40-50 jin of nitrogen). Since spreading and broadcasting are generally employed as application techniques, only about 30 percent of the nitrogen is actually utilized. Thus every year 56,000 tons of the chemical volatilize or get washed into rivers and streams, polluting the atmosphere and water bodies.

#### C. Pollution Caused by the Opening of Gravel Pits and Rock Quarries and the Reclamation of Land from Lakes

The operations of gravel pits and rock quarries in the hilly areas of Yizheng have severely damaged land and forest resources and seriously affected ecological balance. The county has about 50 fully operable gravel pits and rock quarries. Opening a single such operation necessitates the destruction of about 30 mu of farmland, and thus approximately 1,500 mu of farmland



have been ruined throughout the county. Two factors cause this destruction, the first being that the gravel and rock extracted in the process take up land space, and the second being that large quantities of sand and mud get washed away by water and deposited on farmland, rendering the latter unsuitable for cultivation. Pit and quarry operations have ruined much of the original forest in the mountains. According to incomplete estimates, about 4,000-5,000 mu of forest land in the county have been destroyed. 2,000 mu of that loss occurred in Qingshan commune alone, while nearly 1,000 mu of locust trees managed by Tongshan Commune as a joint enterprise have also been completely logged over.

Lake reclamation occurs mainly in the Lixiahe area, and in Gaoyou county alone, 70,000 mu of farmlands have been created. Once completed, reclamation causes reductions in waterweeds, reeds, fish, shrimp and commune members' incomes.

## II. Fully Implement the Policy of Putting Prevention First and Effectively Protect the Prefecture's Rural Environment

Since the pollution of the prefecture's rural environment is extremely serious, it is imperative that we initiate full-scale protection work without delay. Rural environmental protection work is broad in scope and will require much effort. Further, pesticides and chemical fertilizers, once they have entered the environment, make pollution difficult to control in terms of technical, human and material resources. Therefore, we must fully implement the policy of putting prevention first and check calamity before it occurs. Concrete preventive measures are as follows.

A. In order to eliminate pollution of the rural environment by the "three wastes" of industry, commune and brigade industries should, in accordance with the principles of adapting to local conditions and giving full play to one's strengths, focus on developing such nonpolluting industries as cultivation, breeding and rough processing of agricultural and sideline products. Polluters such as electroplating and chemical plants should be focused around the county as a unit, and the latter should adopt overall planning and rational distribution and concentrate these enterprises so as to facilitate management and control of the "three wastes." Plants producing pollution that is both seriously heavy and difficult to control should be closed down, suspended, merged or retooled during readjustment. Those plants that have to be retained should be required to pay pollutant-discharge fees, and time limits should be imposed for bringing these plants' pollution under control.

B. Pesticide pollution can be checked mainly through full implementation of the policy of "putting insect-damage prevention first and integrating prevention and control" to protect vegetation and through coordinated application of comprehensive insect prevention measures incorporating agriculture, biology, artificial components, physics and chemistry. In particular, we must protect and exploit natural enemies to effect control of insects by insects, insects by bacteria, and bacteria by bacteria.

Agricultural prevention and control involves utilizing various agricultural measures to create environmental conditions that are not conducive to the survival and propagation of insect pests and employing resistant crop strains to avoid insect damage. This is a most economical preventive and control measure. For example, we can popularize many varieties of rice, such as BG90-2, to prevent and control bacterial blight in the plant. Another measure consists of rational management of water to prevent disease and insect infestation. Examples of this include draining paddies to control sheath and culm blight of rice and opening ditch systems in wheat, barley and oat fields to drain off water, reduce dampness and eliminate conditions conducive to wheat scab. Using farmland management measures to eradicate pests is another means of effecting agricultural prevention and controls. For example, integrated pruning of cotton plants can eliminate about 30 percent of bollworm eggs. Moreover, planting barnyard grass around rice fields can prevent appearance of the second and third generations of the pink rice borer. This method proved more effective than pesticides in the results obtained in 1981 from hybrid- and late-rice fields at comprehensive-prevention stations in Jiangdu's Shanggou Commune. Agricultural chemicals still play an important role in comprehensive prevention and control and are especially indispensable in emergencies. In order to control or reduce pesticide pollution, we must focus on existing problems in the use thereof (mainly indiscriminate application and the use of prohibited pesticides) in our prefecture.

1. Implement the "four don'ts": Do not use such deformity- and cancer-causing pesticides as Di Ku Shuang and ethyl insecticide dust; do not use preparations manufactured with heavy metals such as mercury and arsenic; do not apply pesticides to grain and oil-bearing crops during ripening stages or to vegetables and fruit trees 7-15 days before harvest; and do not use organic chlorine and extremely poisonous pesticides on tea, fruits and vegetables.
2. Adjust standards for the prevention and control of pests. In the past, such standards tended to be set high, thus leading to an expansion in the area sprayed and to an increase in the number of treatments, thereby wasting a large amount of pesticides and increasing environmental pollution. Therefore, the adjustment of these standards is an urgent task. Results obtained at comprehensive cotton-pest prevention stations in Jiangdu's Huayang Commune in 1981 proved that--if we change from the previous standard for controlling the cotton aphid, the ratio of aphid-affected plants (20-30 percent), to the aphid-damage index (200 and 300 for the periods before and after 3 leaves, respectively) and from the previous standard for controlling the bollworm, the egg index, to the number of young worms--we can, under the general policy of reducing the chemical-spray area and the number of applications, control pest damage within levels permitted by the economy.
3. Adhere to the standards for prevention and control and do a good job of "the two investigations and the two determinations." With the adjustment and relaxation of the standards for the prevention and control of primary pests as a basis, we should adhere to these standards and do a good job of "the two investigations and the two determinations," i.e., to investigate

the period when pests appear and determine the time for prevention and control and to investigate the magnitude of infestation and determine the farmlands to be targeted for prevention and control. When necessary, we should employ agricultural chemicals; when such chemicals are unnecessary, we should not insist on applying them. We should not apply pesticides just for insurance and deal with the problem in only one way. Rather, we should use pesticides where they are needed most.

4. Look to the future and the past, think comprehensively and control many pests at one time. There are many kinds of rice and cotton pests, and in July, August and September, particularly, many types of insects appear in succession and cause damage. In the past, different types and many applications of spray were usually employed for each pest, so that pesticides were sometimes used every 7 days. During cotton bud and boll periods, pesticides are frequently applied 10 to 15 times, which constitutes heavy usage, increases costs and causes serious pollution. Different pests appear at different times but often overlap, as do the various generations of each type of insect. Thus we must look to the future and the past, think comprehensively, select pesticides with long-term effectiveness and a wide range of usefulness so that we can control many varieties of insects with single applications of one type of pesticide. For example, when a moderate infestation occurred at comprehensive cotton-pest prevention stations in Huayang in 1981, pesticides were applied only three times during the budding and boll stages, and damage was completely checked.

C. To resolve the problem of chemical-fertilizer pollutions, we should focus on the three imbalances in soil fertility: "between nitrogen, phosphorus and potassium; between organic and inorganic fertilizers; and between cultivated and fallow fields." First, we must vigorously develop organic fertilizer, appropriately expand cultivation of green manure, promote the return of rice and wheat straw to the fields and vigorously develop the livestock and poultry industries, placing special emphasis on the pig raising. Second, we must appropriately reduce usage of nitrogenous fertilizer and increase that of phosphate and potassium fertilizer so as to eliminate the serious imbalances that exist among nitrogen, phosphorus and potassium. (In Japan, the ratio among these elements is 1:1:1; in India, it is 1:0.3:0.2; in our country, the ratio in 1979 was 1:0.2:0.004, respectively.) Once this is done, we can markedly increase usage of nitrogen, thereby increasing productivity and reducing environmental pollution. Third, we have to improve fertilizer-application techniques and change from the present methods of broadcasting and spreading to sub-surface application.

In order to increase organic fertilizers, we must continue vigorous development of methane production in rural areas, which will save fuel, enable most production teams to return rice and wheat straw to fields and provide large quantities of thoroughly decomposed organic fertilizer for rural production.

D. As for gravel pits and rock quarries, counties and communes should strengthen leadership, unify planning, make extraction more rational and correct the current situation in which there is no planning and people care only about mining and not about the serious destruction of forests and soil resources. Once existing pits and quarries are exhausted, we must promptly replant them with trees and make the environment green.

## RESTORING AGRO-ECOLOGY IN GUIZHOU

Beijing RENMIN RIBAO in Chinese 15 Feb 84 p 5

[Article by Yang Junping [2799 0971 1627], Zheng Wende [6774 2429 1795] and Hu Shengui [7579 3932 6311]: "Adjust Agricultural Structure, Restore Ecological Balance"]

[Text] Yan Junping (board member of the provincial geology society, lecturer) and Zheng Wende (lecturer of Guizhou Agricultural Management Cadre Institute): The ecosystem includes the forestry ecosystem, agricultural land ecosystem, pastureland ecosystem, and water area ecosystem. The natural environment is an integrated entity comprised of many mutually related and restraining ecosystems. A series of reactions may occur when the proportion in one link is out of control. It may even lead to the destruction of the entire ecosystem.

Several years ago, "Foodgrain as the key link" was overemphasized in the mountain areas. Land on a slope of more than 25 degrees was cultivated blindly. The total area of farmland increased by one-fold. However, grain yield did not go up, and the ecological balance was disturbed. Mountain land evolved in the direction of "forest and bushes--farmland--naked rock mountain." Soil erosion was very serious. Based on survey data, the soil erosion area in the province is approximately 35,300 square kilometers annually, out of which 17,900 square kilometers have severe soil erosion. The amount of sand and mud washed into the rivers reached 61 million tons per year. In other words, over 5,000 cubic meters of rich soil is moved away by water each year in Guizhou. This is equivalent to a loss of the cultivated layer of 400,000 mu of farmland, which is one important reason why 80 percent of the farmland in Guizhou does not have a high productivity.

Hu Shenggui (engineer, provincial science society headquarters): The total area of Guizhou is 176,000 square kilometers and 97 percent is mountains and hills. A little over 16 percent is suitable for farming at a slope of less than 25 degrees. There is a lack of reserve farmland resources, which limits the development of grain products. Moreover, the current cultivation index has reached 18.9 percent, exceeding the maximum limit of land suited for farming. On steep slopes above 25 degrees, measures should be taken immediately to gradually retire cultivation and return forest and grass to the area. The mountain range in Guizhou is wide. The area suited for forestry and livestock farming is over 70 percent of the total

land, equivalent to more than 4 times of the land suited for farming. At present, most of the land is still waiting to be developed. Furthermore, the hydrothermal resources in Guizhou are abundant. Grasses and trees grow relatively fast. The potential to develop forestry and animal husbandry is very high. Moreover, in order to prevent soil erosion and to protect the farmland, it is also urgent to plant trees and grasses to restore the stability of the mountain agricultural ecosystem. The manpower in the rural areas of Guizhou is sufficiently capable of afforesting barren hills and improving pastures to gradually build it into a giant agricultural base where foodgrain is self-sufficient, and forestry and livestock farming are highly developed.

12553

CSO: 4008/163

## DEVELOPMENT OF AFFORESTATION IN GUIZHOU

Beijing RENMIN RIBAO in Chinese 15 Feb 84 p 5

[Article by Jin Xiaoqi [6855 1420 7784] and Liu Wenzhi [ 0491 2429 5347]: "Large Potential To Develop Forestry"]

[Text] Jin Xiaoqi (provincial forestry science institute): Guizhou is known as the "mountain kingdom of forests." The forest area in the province is over 34.6 million mu. The cover rate is 13.1 percent. The forests are mainly concentrated in Qiandongnan, Zunyi, Qiannan, Tongren, and other prefectures.

The potential to develop forestry is high in Guizhou. There are many mountains and over 100 million mu of barren hills and wasteland, of which over 6 million mu are suited for afforestation. The forest cover rate may reach 40 percent if retired farmland on the slopes is included.

Since liberation, afforestation in Guizhou has obtained encouraging results. However, there are many problems. According to statistics, the afforestation area in the province is 50 million mu and the retention area is less than 10 million mu. The retention rate is less than 20 percent. In addition, denudation and destruction of forests to reclaim wasteland cause the decrease of forestry resources.

Liu Wenzhi (vice chairman of the provincial forestry society, senior engineer): There are many reasons why the retention rate in past years has been low. The main reasons are in the following three areas: 1. The afforestation area as reported to superiors was "inflated." One county reported the afforestation of more than 96,000 mu in 1983. The county forestry bureau checked the numbers from two communes, and the results were that one commune "inflated" 60 percent and the other 80 percent. 2. The afforestation task was assigned blindly. One county originally planned to afforest 34,000 mu; however, it was increased to 70,000 mu. Due to a shortage of nursery stock, all the seedlings were planted and all the seeds were spread. Many of them did not survive and the survival rate was low. 3. People only plant trees but neglect to raise them. Many planted trees emerged and perished by themselves because nobody managed them. And they were abused by men, animals, and forest fire. As a result, very few trees survived.

As the agricultural economic policy of the party was implemented, many prefectures practiced a forest contract responsibility system, which significantly motivated the enthusiasm of the peasants for afforestation. For example, in the three counties of Qianxi, Anshun, and Xingyi, the "three fixes" was implemented for barren hills in recent years. Certificates of afforestation were issued to production teams and specialized households. A tide of turning the mountains green was initiated.

Key households and specialized households in afforestation are a new force in the line of forestry. The emergence of this fresh force can change the "low survival rate" situation in forests to accelerate the development of forestry in Guizhou.

Recently, the provincial committee and provincial government decided to accelerate contracting work on barren hills and wasteland. This is an ambitious plan.

12553

CSO: 4008/163

## SUGGESTIONS PRESENTED FOR DEVELOPING WESTERN LIAONING

Shenyang LIAONING RIBAO in Chinese 13 Dec 83 p 1

[Article by Chen Shiping [7115 1102 1627] and Yan Changsheng [0917 2512 0581]: "Water and Soil Conservation Are Central, Grass and Tree Planting Are Key: Liaoning's Scientific and Technical Workers Provide Plans for Agricultural Development in the Arid Areas of the Western Part of the Province"]

[Text] After conscientious discussions, more than 200 scientists, technicians and specialized teachers in agriculture, forestry, animal husbandry, pedology, water conservancy, agricultural machinery, meteorology, energy, agricultural economics, agricultural engineering, environmental protection, geography, botany, zoology and the dialectics of nature offered suggestions for the development of agriculture in the dry areas of western Liaoning to counter soil erosion, aridity and soil infertility.

Many comrades argued that to eliminate the problems of aridity, wind-blown sands, infertility and poverty in western Liaoning, we must pay close attention to water conservation work, resolutely plant grass and trees, build a strong "ecological defense," gradually establish "a big tree umbrella above and a big grass rug beneath" and check soil erosion by tackling the root of the problem. In water conservation, we must integrate engineering and biological measures; use small river basins as units; undertake overall planning and comprehensive management of mountains, rivers, forests, grasslands, fields, roads and villages; and form a three-dimensional, integrated ecosystem and an all-round developed economic body.

The scientists and technicians all urged rational exploitation and utilization of limited water resources and development of irrigated and semi-irrigated agriculture in accordance with local conditions. According to statistics, the Chaoyang and Fuxin areas together have 3.77 billion cubic meters of water resources, of which 640 million cubic meters has been developed. Another 600 cubic meters can be developed if we pay close attention to the conveyance systems of existing irrigation works and then build some essential small and medium projects. Thus about one-third of the cultivated land will be irrigated. As for the other two-thirds, "when the water route does not work, take the overland route": we should set up a dry-cropping system. That is, through basic farmland construction, cultivation management, soil enrichment and the like, we should create an even,



banked [?], fertile and thick "soil reservoir." And, through adjustment of crop distribution, variety improvement, and strengthening of cultivation management, we can establish economic and effective cropland vegetation which requires limited amounts of water.

The scientists and technicians were all very concerned about the firewood shortage in western Liaoning. It is estimated that 2-2.5 billion jin of straw and 6-6.5 billion jin of firewood are burned in this area every year. This wastes much of organic material and nutrients that can be used to fertilize the land. To solve this problem, we should set up fuel-forest bases; enthusiastically develop and utilize new energy sources such as methane, solar energy and the like; and widely popularize firewood-conserving stoves so as to save straw and leaves.

We should bring into full play the area's advantages and develop diversified management. For cultivation, the area's strengths are in cotton, sugar beets, peanuts and sunflowers. The area also enjoys advantages in fruit (apples and pears) and dried fruit (haws, big dates, walnuts, Chinese chestnuts, wild mountain almonds, mountain dates, hazelnuts, etc.). In terms of breeding, with the increase in forage grass, herbivores also enjoy good prospects.

The scientists and technicians made some suggestions regarding organizational leadership, intellectual development, strengthening research and the like. The symposium ended on 3 December and was jointly sponsored by the Liaoning Association for Science and Technology, the Rural Development Research Center and the Agricultural Group of the Chinese People's Political Consultative Conference.

12369

CSO: 4008/104

## SUGGESTIONS FOR MANAGING LOESS PLATEAU OUTLINED

Beijing RENMIN RIBAO in Chinese 12 Dec 83 p 3

[Article by Zhang Weibang [1728 4850 6721], Institute of the Geography of the Loess Plateau, Shanxi University: "Ideas on the Management of the Loess Plateau"]

[Text] The loess plateau has an area of 530,000 square kilometers and a population of about 60 million people. With the exception of a few river basins, most of the plateau is crisscrossed by gullies, soil erosion is very serious and the ecology has greatly deteriorated. Many places have fallen into a vicious cycle in which "the more people cultivate, the poorer they become; the poorer they become, the harder they cultivate."

Management of the loess plateau has a decisive influence on the fundamental control of the Huang He and the Hai He. The plateau, which is located at the middle reaches of the Huang He and the upper reaches of the Hai He, is the major source of water and silt for these rivers. If the soil erosion problem is not solved, we shall not be able fundamentally to control these rivers.

Management of the loess plateau is also key to the control of the Huanghuaihai Plain. The loess plateau provides an ecological defense for the Huanghuaihai Plain and lies in the upper reaches and the waterhead of the plain. Drought, waterlogging, alkalization, sandiness, etc., which plague the plain, stem largely from the destruction of the plateau's ecology, the deterioration of water retention capability and serious soil erosion. If, through tree and grass planting, the plateau's soil erosion is brought under control, the plain's problems can also gradually be resolved.

According to the lessons of history, the policy of "centering on water and soil conservation and emphasizing forestry and animal husbandry while comprehensively developing these sectors and sideline industry" should be adopted in the management of the loess plateau. Since the problems of the plateau stem from soil erosion, when this is not solved, it will not make sense to talk about anything else. The economic activities of the plateau have to abide by the central task of water and soil conservation, and to do this task well we must correct the previous tendencies of

stressing construction projects over living things, emphasizing management of ditches rather than of slopes and focusing on the upper reaches while ignoring the lower reaches. We should adopt the principle of centering on biological measures, integrating these with engineering measures, and simultaneously managing ditches and slopes and upper and lower reaches. And we should undertake overall planning, comprehensive management and concentrated management by basin or mountain system. Practice proves that the tree and grass planting require the least amount of investment and manpower, yield the fastest results and obtain the greatest benefits. For example ever since closing its ditches in 1973, Fanjiagou of Shanxi Province's Youyu County regained its vegetation in 3 years; completely checked soil erosion; promoted the development of agriculture, forestry and animal husbandry; and accomplished great economic and ecological results.

Since about 80 percent of its land is hilly or mountainous, the loess plateau is unfavorable to the development of cultivation but is very advantageous to that of forestry and animal husbandry. Therefore, we should bring the advantages of mountainous areas into full play, vigorously develop diversified management and set up an economic structure which emphasizes forestry and animal husbandry. In forestry, stress should be placed on water-conserving shelter forests, fuel forests and waterhead forests; and we should combine grass, bushes and trees and plant grass according to local conditions.

In agriculture on the loess plateau, the pernicious practices of extensive cultivation, fallowing land and indiscriminate reclamation must be replaced with intensive cultivation and organic dry-cropping. We should conscientiously establish basic farmland, provide about 2 mu of this per person and, on this basis, gradually return steep and infertile land to forestry and grassland. When basic farmland is properly established and each person has retained 1-2 mu of regular farmland, it will not be difficult for us to be self-sufficient in grain if we practice intensive cultivation and integrate land utilization and maintenance.

Management of the loess plateau affects the basic interests of hundreds of millions of people. Implementation of this work depends on the masses' consciousness, while the state plays organizational, leading and supporting roles. Implementation of the production responsibility system in rural areas has greatly facilitated the mobilization of the masses for this work. In Shanxi Province, there are already successful examples of the masses' contracting to manage small basins. As long as policy is correct and the state, collectives and individuals all work together, it is absolutely possible to bring the loess plateau under control.

12369

CSO: 4008/104

MINISTRY REPORTS 400 NATURE RESERVES BY 1990

OW240956 Beijing XINHUA in English 0926 GMT 24 Jul 84

[Text] Beijing, 24 July (XINHUA)--China will establish 138 more nature reserves by 1990, bringing the total to 400, the Ministry of Urban and Rural Construction and Environmental Protection reported today. The 400 reserves will cover a combined area of 240,000 square kilometers--2.5 percent of the nation's territory. Priority will be given to protection of grasslands, forests, islands, sites of glaciers, fossils, and endangered plants and animals. By the end of October 1983, there were 262 nature reserves covering a total area of 156,000 square kilometers. They account for 1.62 percent of the country's territory.

Administrative organizations staffed by 4,332 people have been established in 134 reserves. Between 1979 and October 1983, 223 new reserves were established nationwide. Some of the protected animals and plants are giant pandas, golden-haired monkeys, red-crowned cranes, alligators, and metasequoia and dove trees.

The 210,000-hectare Zhalong Reserve, where red-crowned cranes hatch eggs, has been set up in the southern part of Heilongjiang Province, northeast China. A 40,000-hectare reserve has been designated a winter habitat for rare birds on the beaches of northern Jiangsu Province, east China.

Covering 45,000 square kilometers, the Altun Mountains Reserve in southeastern Xinjiang is China's largest and is host to such protected animals as wild yaks, Asiatic wild asses, snow leopards and golden eagles. China has 2,100 species of wild animals and 30,000 types of plants, accounting for 10 percent of the world's total, respectively.

CSO: 4008/385

## CREATION OF NATURAL PRESERVES ADVOCATED

Beijing DAZIRAN [NATURE] in Chinese No 4, 8 Dec 1983 pp 3-5

[Article by Dong Zhiyong [5516 2535 0516]: "Establish Natural Preserves Possessing Chinese Characteristics"]

[Excerpt] What is the situation concerning the protection of China's natural environment and natural resources? In terms of major national forests, the tree cover ratio is only 12.7 percent, and with the constant exploitation of forest resources, as well as forest fires, damage from disease and pests and indiscriminate cutting and reclamation, consumption of forest reserves far exceeds the growth rate each year. In the period right after Liberation, Hainan Island had 13 million mu of subtropical forests, but now only 3.7 million mu remain. Since the founding of the People's Republic, the subtropical forest of Xishuangbanna, which covered over 9 million mu, has been reduced by over 3 million mu. Exploitable reserves in major national forest areas in the northeast, Inner Mongolia, the southwest and the northwest have been greatly reduced, and forest lines are everywhere in retreat. The reduction and destruction of forest cover has hastened "the eastward flow of western soil and the southern shift of northern sand." Nationally, soil erosion already affects 1.5 million square kilometers, and each year more than 5 billion tons of topsoil are carried away. Of this, as much as 1.6 million tons of silt flow into the Huang He through Fengling Du. There is also serious desertification of the land. Nationally, deserts have expanded from 1.6 billion mu right after Liberation to 1.9 billion mu, and an additional 100 million mu of cultivated and pasture land are imperiled by desertification. Certain representative, classic types of natural landscape and foliage in China's different natural zones are undergoing extremely rapid change, reduction and damage, and some are beyond redemption. Particularly grave is the fact that more and more wild plants and animals are or are becoming extinct. In the case of animals, for example, over 10 rare species, such as the rhinoceros, saiga tatarica, Xinjiang tiger, and [?guanma] duck, are already extinct; and another 20-odd species are nearly so, such as the giant panda, scarlet ibis, *Grus japonensis*, *Lophura nychthemera nychthemera*, gibbon, tiger, Hainan [?po] deer, Yangzi crocodile, and *Lipotes vexillifer*. The Convention on International Trade of Endangered Wild Plant and Animal Species, in which China participates, has mandated protection for over 700 species and subspecies of wild plants and animals that face extinction. China has over 100, or one-seventh, of these. We must pay particular attention

to the fact that China has a massive population and that per-capita allotment of natural resources is extremely small. Moreover, with the development of industrial and agricultural production, natural-resource usage has expanded constantly, and such latent factors as the indiscriminant felling of trees, reckless fishing and hunting and the destruction of forests for reclamation still have not been thoroughly eliminated. Under these circumstances, for the benefit of the nation and our posterity, we must adopt further measures to rescue endangered species and do everything possible to preserve the natural environment and species resources that have an important value in the fields of scientific research, education, culture and economics. Consequently, the demarcation and establishment of natural preserves is an important and urgent task in China's four modernizations.

In 1956, the Third Session of the First National People's Congress raised Proposal No 92, which recommended the establishment of natural preserves in each province and autonomous region. In October of the same year, Jilin, Heilongjiang, Shaanxi, Gansu, Zhejiang, Guangdong, Sichuan, and Yunnan established more than 20 preserves. Since the Third Plenum of the 11th Party Central Committee and through the end of 1982, 106 preserves having a total area of 3.9 million hectares and constituting 0.4 percent of the nation's territory have been established. The National Conference for Forestry System Work in Natural Preserves which recently convened at Urumqi and reviewed plans for demarcating forestry-system preserves throughout the country and discussed problems that exist in the establishment and management of preserves and suggestions for the solution thereof.

Concerning the establishment and management of natural preserves, we feel that we must uphold the principle of proceeding from actual conditions and go our own route. We must consider the following points in our general policies and guiding ideology.

1. China has a vast territory and a wide variety of forests, wild plant and animal resources and vegetation types, each of which possesses special characteristics. In determining the types and distributions of preserves, we should be completely rational and preserve essential rare, endangered and other species that should be protected so as to enable these species to propagate.

2. China's four modernizations involve many fields, the nation's financial resources are limited, so in establishing preserves we must practice self-sufficiency, thrift and hard work.

3. Most preserves have people living in and around them, and for generations mountain forest resources have been one of the main sources of these people's livelihood. The establishment and management of protected areas thus must take into consideration these historical and practical circumstances and uphold the principle of reliance on the locality and the masses. We must adopt the practical measures of education, guidance and support, such as organizing the people to contract to undertake tree planting, seedling growing, forest protection and various types of construction work. We must set aside a certain amount of land to be used for production; help the people

develop breeding, farming and other forms of production that are conducive to the preservation of the environment; and guide the people along the path of relying on the mountains, of nurturing the mountains and of enrichment through industry.

4. About one-half of China's forest resources are owned by commune and brigade collectives, and most of the forests that are state owned have already been developed or are under development. When we demarcate and establish new preserves, we must pay attention to these circumstances and appropriately handle the relationships between protection and utilization. Generally, in nationally owned forests, we should avoid as much as possible establishing preserves in areas that are just beginning logging. In collectively owned forests, we must strictly limit the size of preserves, disperse preserves around a bit more, set up management and protection systems, establish clear methods of reward and punishment and rely on the communes and brigades themselves to administer forests. We can use our discretion in giving subsidies to collective forests that have a fairly great effect on commune and brigade incomes.

5. China's preserves vary in type, size and conditions. Moreover, mountain and forest ownership systems also differ. Consequently, the size, management systems and organizational forms of preserving cannot be forced into a single mold. As long as preserves contribute to resource protection and management, they should be allowed to take varied forms. Regardless of type, all preserves must place priority on protecting resources. On this foundation, we must actively create conditions for the expansion of natural resources, develop scientific research and explore methods for the rational utilization of natural resources. In preserves that possess the proper conditions, we should initiate diversified management and fully exploit these areas' many resources. Only in this way can the path of establishing protected areas become ever broader and a whole new state of affairs be engendered.

6. To invigorate preserves, those with the proper prerequisites may be divided into core and experimental areas. The core areas are to be the essential part of preserves, will serve as venues for scientific research and absolutely must be well protected. Those areas lying outside of core areas shall be designated as experimental areas and may be used for experimental activities and diversified development. As a prerequisite for improving the protection and management of natural resources, to create even more wealth for society and to reduce the state's burden, we must in all cases actively initiate diversified development incorporating cultivation and breeding and employ the income thus obtained to establish and improve welfare services for the workers and staffs of natural preserves.

Many of our preserves boast beautiful scenery. We must pay heed to and exploit this advantage and develop tourism, which should be placed under the unified guidance and management of the agencies administering these areas. We must prepare good plans in advance; clearly define the routes and areas for sightseeing; design relevant management methods; establish concrete measures to prevent pollution, destruction, forest fires and the like; and prepare appropriate travel facilities and accommodations. We welcome financial assistance from relevant domestic and international agencies and individuals, as well as investment and joint ventures.

7. Scientific research is an important form of work in natural preserves. In recent years, many specialists and professors from domestic research and academic units have enthusiastically carried out research in preserves, raised ideas and proposals on their own, risked hardship to conduct in situ surveys and provide local survey guidance, spent much effort on behalf of research work in preserves and achieved gratifying results. But generally speaking, research work has developed very slowly in preserves, and from here on out we must promote this work in a selective and planned way. Everyone knows that preserves are comprehensive, multidiscipline research bases and cannot be operated by relying on only one unit or discipline. Rather, preserves require organization and cooperation to obtain good research results. We should invite scientists, scholars and technical workers to conduct research in preserves, and preserve management agencies should provide vigorous support and the requisite conditions for these workers.

National preserves and the longer, well-established local preserves should set up crack research organs, provide a certain number of scientific and technical personnel and carry out routine or specialized research in order to lay a scientific basis for protection management and the rational utilization of natural resources. At the same time, we invite relevant departments to conduct summer camps in preserves on topics such as biology, geology, forestry, zoology and botany; and we welcome the organization of college and middle-school students to come and do practice teaching in preserves so that these areas truly become great classrooms for spreading scientific knowledge and for practice teaching.

12452

CSO: 4008/102



ZHANG YOUYU ON REVIEW OF DRAFT FORESTRY LAW

Forestry Law Report

OW140813 Beijing XINHUA Domestic Service in Chinese 1437 GMT 11 Sep 84

[Text] Beijing, 11 Sep (XINHUA) -- Zhang Youyu, vice chairman of the NPC Law Committee, this afternoon made a report to the Seventh Meeting of the Standing Committee of the Sixth NPC on the result of a review of the "Forestry Law of the People's Republic of China (Revised Draft)." He said the NPC Law Committee held four meetings in August and September this year to discuss the forestry law (revised draft), on the basis of the opinions offered by some members of the NPC Standing Committee and some provincial, autonomous regional, and municipal, as well as central, departments concerned. These meetings were of the opinion that the draft is basically practical. Some amendments were suggested at these meetings.

Speaking about handling disputes over who has the right to forest trees and forest land in question. Zhang Youyu said the draft stipulates that, where forest trees and forest land rights are in dispute, consultations should be held for settlement under the auspices of the local county government. If no settlement can be reached, a complaint may be filed with the local people's court. When such disputes are between administrative regions above county level, they should be settled through consultations organized by their higher level people's government. If no settlement can be reached, the people's government organizing the consultations may make a decision, and both sides in the dispute must implement that decision.

It was pointed out by the Supreme People's Court, Supreme People's Procuratorate, Ministry of Civil Affairs, and Ministry of Agriculture, Animal Husbandry and Fishery that one provision in the draft was not very appropriate, as it stated that some of the disputes over forest trees and forest land rights may be settled by bringing a suit with the court, but some may not. It is therefore suggested to amend the provision to read: Disputes over ownership rights to any forest trees and forest land, and the right to use them between units under ownership by the whole people, between collective ownership units or between a unit under ownership of the whole people and a collective ownership unit, shall be handled by a people's government above county level. Disputes over ownership and usage rights to any forest trees and forest land between individuals, or between an individual and a unit under the ownership of the whole people, or ownership by the collective, shall be handled by the local county-level or township-level government. When the person concerned finds the settlement decision by the people's government concerned unacceptable, he may bring the case to the people's court within a month of receiving notification of the settlement decision.

Zhang Youyu said: Regarding examination and approval of the use of state forest land, the draft stipulates that approval of a requisition of a piece of state forest land for national construction purposes should come from the forestry departments. But the State Planning Commission, the Ministry of Urban and Rural Construction and Environmental Protection, and other departments feel that this stipulation contravenes the provision in the "Regulations on Land Requisition for National Construction Purposes" and is hardly realistically enforceable. It is therefore suggested that this stipulation be changed to read: When carrying out surveys and design, building construction projects or mining mineral deposits, no requisition, or as little requisition as possible, of the forest land should be the rule. When a piece of forest land must be taken or requisitioned, this should be handled in accordance with the relevant law or regulations. To take, or requisition, a tract of forest land more than 1,000 mu in area, approval must be obtained from the State Council.

Dwelling on the management of lumbering, Zhang Youyu said: The revised draft stipulated that a unified timber production plan should be enforced by the state and, that unplanned lumbering must be prohibited. The State Planning Commission and the State Administration of Supplies pointed out that, since timber for use in local capital construction projects, in building rural houses and as firewood by the masses are not covered under the state plan, the above provision would make many people's use of timber unlawful, and is therefore impractical. Hence, it was proposed that the above provision be revised to the state setting out a unified annual timber production plan, while the State Council formulates rules governing the scope of planned management.

Zhang Youyu said: Some members of the NPC Standing Committee and some localities have also pointed out: The provision requiring that peasants must apply for permits before cutting trees in their front and back yards is too strict, and stifles the peasants' initiative in planting trees. Hence, it is proposed that rural residents no longer be required to apply for permits to cut trees in their front and back yards, or in their private plots of land.

Zhang Youyu continued: Some members of the NPC Standing Committee and some localities have pointed out that many localities lay stress on lumbering, while paying no attention to afforestation work. Consequently, the cutovers are not properly regenerated, and forest lands are being increasingly depleted. We must, therefore, attach importance to afforestation work, and concomitantly lay stresses on lumbering and tree-planting.

To reverse the trend of excessive lumbering while neglecting afforestation work by some localities and units, and to enforce the principle of forest cultivation, it was proposed to add the following provision under the chapter on lumbering: A lumbering unit or individual must regenerate the cutovers within a time limit set out in the lumbering permit, and the number of trees planted must not be less than that lumbered. No further lumbering permits must be issued by departments concerned to those who have failed to accomplish afforestation tasks.

Some members of the NPC Standing Committee and some localities also called for unequivocal stipulation in the forestry law that collectives and individuals are allowed to contract afforestation tasks. Hence, they proposed the following provision be added to the draft: Publicly-owned forest lands can be contracted for afforestation by collectives or individuals, while collectively-owned forest lands can be contracted by individuals.

Dwelling on punishment for cases of illegal or indiscriminate lumbering, Zhang Youyu said: The Supreme People's Court, the Supreme People's Procuratorate and some provinces, autonomous regions, and municipalities have noted that, currently, some localities are leniently handling cases of illegal and indiscriminate lumbering.

They pointed out: Punishment is not meted out to serious cases according to the "criminal law" governing illegal and indiscriminate lumbering. At the same time, it is too lenient to mete out punishments of under 3 years' imprisonment to culprits of major cases, involving illegal or indiscriminate lumbering of gigantic proportions. A study by the NPC Law Committee, the Supreme People's Court, the Supreme People's Procuratorate and the Ministry of Forestry held that very large-scale illegal lumbering of other people's forests can be punished according to the article on larceny, as stipulated in the "criminal law." Hence, it was proposed to add the following provision under the chapter on legal responsibility: Criminal responsibility must be pinned on those who have illegally lumbered other people's forests in gigantic proportions, in accordance with Article 152 of the "criminal law."

#### Forestry Law Discussed

OW141145 Beijing XINHUA Domestic Service in Chinese 1221 GMT 13 Sep 84

[Excerpt] Beijing, 13 Sep (XINHUA) -- Members to the Seventh Session of the Sixth NPC Standing Committee held group discussions to examine the revised draft of the forestry law 12-13 September. They held that currently China is in urgent need of enacting a forestry law, and that the revised draft of the forestry law submitted for examination by this session is concise and precise in contents, with its guiding ideology more clearly set forth and practical for implementation. The revised draft shows marked improvement over the previous document and every member at the session favors approving the draft and promptly promulgating the forestry law so that China's forestry can be better restored and developed.

#### The Revised Draft of the Forestry Law Is Feasible in the Main

Vice Chairman Seypidin said: To protect forests and to promote forestry development by law is of utmost importance. It is even more important to enforce the law after its approval and promulgation since China has a vast expanse of land but with little forest resources for lumbering. First of all, leading party, government and military comrades, and leading organs from the central authorities down to the grassroots units must pay attention to and take part in afforestation work, and strive to fundamentally change the current situation of depleted forest resources and turn China into a country with extensive forest covers in the next 10 to 20 years. He proposed to institute the responsibility system for afforestation work and for sanctions against those who destroy forest resources.

Vice Chairman Zhou Gucheng said: Enactment and promulgation of the Forestry Law can ensure that the motherland's forest resources be regenerated and bring about a balanced ecological environment. Theoretically, the forestry law gives the forestry scholars and experts the means and a free hand in developing forestry. He expressed the hope that the current session will examine and approve the revised draft of the forestry law.

CSO: 4008/406

NATIONAL FORESTRY CONFERENCE URGES FASTER REFORM

OW021748 Beijing XINHUA in English 1033 GMT 2 Sep 84

[Text] Yantai, September 2 (XINHUA) -- China is taking steps to encourage faster progress in the reform of the management of forest farms. A national conference ending here Sunday urged whatever experiments in this direction provided they were beneficial to the protection and development of forests. The ultimate goal of the reform was faster growth of forestry and greater wealth for the people, said the conference. Emphasis of the present reform was further relaxation of policies governing forestry and provision of greater decision-making powers for those managing mountain forests, it said.

In an address to the conference, Liu Kun, vice-minister of forestry, outlined the following points aimed at accelerating the pace of the present reform:

- Collectively-owned timber forests could be contracted to individual households or to new economic complexes, with products and income shared by the contracting parties;
- Collective forest farms, originally managed by communes and production brigades, must operate as economic entities. Leading bodies must be elected by the masses and democratic management practised. Such farms must be independent of local governments;
- State forest farms would be managed by prefectures or counties and given more decision-making powers. Smaller state forest farms could be contracted to staff members or peasants in the neighborhood;
- Timber not purchased by the state could be sold through a variety of channels at flexible prices.

Liu Kun said that the reform must be carried out actively, but with caution. He urged special efforts to strengthen protection of forests and check indiscriminate felling of trees. He said the relaxation of forestry policies was aimed at mobilizing the people to accelerate afforestation and enabling people in forestry regions to receive greater benefits. This by no means signified a relaxation in the management of forests, Liu said. Otherwise it might encourage wanton felling and bring harm to the people's long-term interests, he added.

CSO: 4010/138

## GUANGDONG COUNTY ACTS ON FORESTRY DESTRUCTION

### Three Cadres Dismissed

HK080656 Beijing RENMIN RIBAO in Chinese 1 Sep 84 p 1

[Report by Li Guifang: "Guangdong's Wuhan County Sternly Handles a Case of Destroying Forests in Rongfu Township"]

[Text] In early July, the Wuhan County CPC Committee of Guangdong Province seriously dealt with a case of massive destruction of forests which took place in Rongfu Township of Qiling District between late May and early June. Three responsible district and township leading cadres were dismissed from office.

Rongfu Township had been exercising fair management over its forests until in recent years people from outside the township kept coming to fell and steal its forest's trees. As a result, the township's people had a mistaken idea that "they would rather fell the trees for themselves than see people from outside the township fell and take away the trees" and that "early felling is better than late felling." On 23 May the township party branch and government called a meeting at which 18 production team leaders attended. Under the pretext of distributing private hills and responsibility hills, the meeting decided to let each peasant household fell three to five forest trees. The meeting required every peasant to deliver 50 fen to the township government for paying the rangers who had carried out the distribution of forests. Thus, on 24 May massive destruction of forest trees by the township's 500 peasant households, consisting of some 2,400 peasants, began to take place. Up to 6 June, they destroyed 1,283 mu of forest and felled 38,490 trees.

This incident aroused the attention of the Wuhan County CPC Committee and government and the Meixian Prefectural CPC Committee and Commissioner's Office. They demanded that the departments concerned organize persons to conduct an investigation, and on 11 and 18 June they issued circulars to the whole county and prefecture. After this, the Wuhan County CPC Committee sternly dealt with the responsible persons involved in this incident. It ordered the Qiling District CPC Committee to strictly examine its mistakes, since it had not taken effective measures before and after the incident. It dismissed Liu Jinyun from the post of deputy secretary of the Qiling District CPC Committee, Kong Zhaochao from the post of secretary of the Rongfu Township party branch, and Zhang Yaquan from the post of township chief. The Wuhan County CPC Committee suggested that the Judicial Department deal with these people according to law. It demanded that compensation should be paid at market price to the township government, which will use the compensatory money for afforestation and protecting forests. Apart from being fined, the 2,400 peasants were required to afforest, between this winter and next spring, the areas on which forest trees had been destroyed and to guarantee that the trees they plant will grow. Those who reported the incident to the higher authorities were praised and awarded.

## Commentator's Article

HK080654 Beijing RENMIN RIBAO in Chinese 1 Sep 84 p 1

[Commentator's article: "Carry Out Strict Forest Management and Protection While Relaxing the Policy on Forestry"]

[Text] The "Emergency Instructions on Stopping the Random Felling of Forests" issued by the CPC Central Committee and the State Council in 1982 points out that the crux of stopping the random cutting of forests lies in the leading comrades, and that the county CPC committees and People's Governments concerned are required to supervise the implementation of forest protection decrees. The Wuhan County CPC Committee of Guangdong Province has seriously dealt with the masses of Rongfu Township who destroyed forest trees. This reflects the spirit of "immediately and resolutely curbing acts of felling forest trees at random."

This year, in the course of implementing central Documents Nos 1 and 3, the policy on forestry has been further relaxed, old conventions hampering the development of forestry production have been smashed, large areas of barren hills have been distributed among commune members, and a large number of afforestation specialized households have emerged. As a result, afforested areas have increased and the quality of afforestation is better than that in the past. However, cadres in some localities take a one-sided view of relaxation of the policy on forestry. They have abolished some of the effective forestry management and protection measures and regulations and relaxed supervision over lumbering, transporting, and selling timber. Some of them have distributed collective forests among individual commune members in such a way that individual commune members can fell trees at will. As a result, forestry resources in some areas have been seriously ruined.

The purpose of relaxing the policy on forestry is to bring into play the initiative of the masses in carrying out long-term management of private hills for afforestation on a contract basis, to speed up the work of greening the motherland, and to enable peasants in mountainous areas to become well-off as soon as possible. Strengthening forestry management and protection, resolutely curbing acts of felling forest trees at random, and safeguarding the legal right of the state, the collective, and the individual to go in for forestry are indispensable measures for protecting the initiative of the masses and are important parts comprising the overall implementation of the central instructions on afforestation. Relaxing the policy on forestry and carrying out strict forestry management and protection are in dialectical unity. If we pay attention only to relaxing policy to the neglect of strict management, if we pay attention only to immediate interests to the neglect of long-term ones, and if we do not curb acts of felling forest trees at random, the ecology will be destroyed, soil erosion will occur, and the peasants' enthusiasm in contracting barren hills for afforestation will be dampened. Therefore, it is quite important to understand in an all-round way the relationship between relaxing the policy on forestry and carrying out strict forestry management and protection.

The right to run forestry being undefined and infringing upon the rights of those engaged in afforestation are important factors causing the random felling of forests. In further relaxing the policy on forestry, it is necessary to conscientiously implement the policy on forest trees among the planters so as to stabilize the right to run forestry on a long-term basis. State tree farms are run under all-people ownership; they must be run well. The management system reform for state tree farms is not a change in ownership. It is definitely impermissible to carve up or occupy state tree farms and to fell and steal trees on state tree farms. Those who do so

will be sternly dealt with according to law. With regard to collectively-run tree farms and forests, it is necessary to clearly define the right, the responsibility, and the interests and to conscientiously implement the management and protection responsibility system. To protect the rights of those who run private hills and responsibility hills from being infringed upon, it is all the more necessary to severely punish criminals who fell and steal trees planted by forestry specialized households. At present it is necessary to keep an eye on those who avail themselves of loopholes in some regulations in the course of relaxing the policy on forestry so as to prevent them from felling forest trees at random.

Forestry reform is progressing in depth. In the course of forestry reform, it is necessary to pay equal attention to both relaxing the policy on forestry and carrying out strict forest management and protection. Relaxing the policy is beneficial to carrying out strict forest management, and only by carrying out strict forest management can the policy be relaxed in a better manner. In this way, we will be able to successfully fulfill the task of protecting forests and developing forestry.

CSO: 4008/406

## CADRE INTERVIEWED ON AFFORESTATION POLICY

HK221004 Beijing RENMIN RIBAO in Chinese 17 Aug 84 p 2

[Report: "Responsible comrade of the Ministry of Forestry interviewed on the policy of afforesting barren hills and beaches"]

[Text] Following the further relaxation of the policy on afforestation, the masses have been more active in exploiting barren hills and beaches and in planting trees. A large number of households and integrated bodies specializing in afforestation have emerged in various localities, vying with one another to invest money and labor force in barren hills and beaches. The mass movement to make the motherland green is in the ascendant and the situation is very good.

In this new situation, some problems have emerged and demand prompt solutions. With regard to these problems, a responsible comrade of the Ministry of Forestry granted an interview to our reporter, demanding that various localities properly implement the policy on afforesting barren hills and beaches.

1. The problem of the contract period for afforesting barren hills and beaches. People in some localities said that the contract period for afforesting barren hills and beaches was too short, that contractors could receive no benefits within the contract period, and that this hampered the initiative of the masses in carrying out afforestation. As the period of forestry production is long and capital turnover is slow, it is impossible to make a profit within a short time, and it is reasonable to ask for an extension of the contract period. This problem merits close attention and demands a conscientious solution. Central Document No 3 (1984) carries explicit stipulations with regard to this problem. These stipulations correspond to the demand of the masses. We should propagate and implement the spirit of the Central Documents No 1 and No 3 issued this year and make the party's policy known to the masses so that they can properly implement the party's policy on extending the contract period for afforesting barren hills and beaches. How long should the contract period be? It depends on local natural conditions, the type of forest and trees, and other items stipulated in the contract. For example, in planting a timber forest, the contract period should at least cover one lumbering period, which is generally 30 years, 50 years, or even longer. Whether we can say that the contract period is appropriately fixed depends on whether the contractor can make a profit within the contract period.

2. The problem of the contracted area.

As barren hills and management ability are different, it is normal that different people choose different areas in contracting land. Some people with skills and a talent for management have undertaken larger areas of land than others. This is beneficial to accelerating the work of making the motherland green. It is good thing and should be allowed and supported. Generally speaking, those who are bold in making a heavy investment in barren hills and beaches are pioneers who dare to take risks. They represent the advanced productive forces in forestry. It is necessary to protect the legal rights and



interests of households contracting to afforest large areas of barren hills and beaches. It is absolutely impermissible to cancel contracts which have been signed and to reparcel barren hills and beaches contracted out to those households because some people have objected to the division of the barren hills and beaches. In regions where there are many barren hills and beaches, the masses should be allowed to pool capital to contract to afforest large areas of barren hills and beaches, and no limits should be set on the area to be contracted so long as the contractors have the ability to manage it.

3. The problem concerning the right to inherit and transfer contracted barren hills and beaches.

Some people are afraid that after the distribution of private hills and responsibility hills, there will be a change in the policy as it takes so long to grow trees and to make profits from growing trees. In fact, with regard to solving this problem, the central authorities have an explicit stipulation, which clarifies that "the right of contract can be inherited and transferred." In other words, in compliance with the conditions provided by the contract, the contractor is allowed to transfer in terms of money the wealth he has created or to ask that others inherit the wealth. Transferring or inheriting wealth does not mean the termination of a contract but the replacement of one contractor by another. The terms provided by the contract will continue to be implemented by the transferee or the inheritor. In the course of growing a forest, the contractor is allowed to transfer in terms of money the wealth to which he is entitled, such as adult trees, young trees, or middle-aged trees. This is a very important policy which reflects that the masses are the masters of forests and mountains. Only with this policy, can the commercialization of forestry have a new content. This policy will enable the contractor to benefit earlier, to enjoy the results of his labor earlier, and to fully and incessantly display his initiative in investing money and labor force in barren hills and beaches.

CSO: 4008/395

## MINISTER DISCUSSES FORESTRY LAW

OWO62313 Beijing XINHUA Domestic Service in Chinese 1246 GMT 5 Jul 84

[Text] Beijing, 5 Jul (XINHUA) -- While discussing the revised draft of the forestry law and Minister of Forestry Yang Zhong's explanation on the revision of the law at group discussions today and yesterday afternoon, members attending the sixth meeting of the Sixth NPC Standing Committee maintained that forests are extremely precious and important natural resources of the nation, that how well the nation's forests are preserved has an important bearing on national development, and that revising the forestry law is entirely necessary.

Many NPC Standing Committee members pointed out that because of poor management, the nation's forest resources have been seriously ravaged, and that China has become one of the countries in the world with the lowest percentage of forest cover. Not only has this given rise to serious soil erosion and upset the ecological balance, they said, it has also destroyed the good natural environment essential for our country's industrial and agricultural development and the people's livelihood. They said that if the people fail to attend to this issue, the ill effects of today will continue to affect future generations.

The NPC Standing Committee members pointed out that the fundamental solution to the scarcity of woodlands in the country lies in nationwide afforestation, in educating the people on the need to protect the woodlands, and in administering the forests according to the law. They said that these measures are important for preserving the available woodlands and promoting afforestation, and that the revision of the forestry law will stabilize the ownership of and the rights to utilize forest resources and effectively safeguard the rights and interests of their owners and their right to utilize these resources.

They added that those who use the revision of the forestry law as an excuse for ravaging forest resources must be harshly punished.

Geng Biao, vice chairman of the NPC Standing Committee, said that forest resources can be preserved only when efforts of various quarters are coordinated. He said that a forestry law is highly indispensable in our country where people have suffered immensely from abusive logging in the already limited wooded areas in a large country. Since the domestic timber supply cannot meet the people's needs, he said, departments concerned should import some timber to meet the needs of the people who have now become affluent and are in need of a great quantity of timber for housing construction. He said this will also help preserve the nation's woodland. Geng Biao also urged the industrial departments to strive to solve the fuel problems in the rural areas.

NPC Standing Committee member Giu Weifan maintained that the nation's woodlands cannot be effectively protected if the crimes of ravaging forest resources are handled leniently. He said that three steps should be taken to preserve the nation's forests: 1) The problem of processing and utilizing timber must be thoroughly studied so that the nation's limited forest resources can be utilized most efficiently; 2) fire prevention, eradication of insects, and disease control are three important aspects in preservation of forests. The forest law should emphasize all three aspects and not just fire prevention, as it does now, and 3) those who have violated the forestry law and ravaged the forest resources should not be treated leniently because this is unfavorable for protecting the nation's woodland.

NPC Standing Committee member Liu Ruilong pointed out that the forestry law, after revision, should fully embody the concept of relying on the efforts of 1 billion people in protecting and developing forest resources, and that it is necessary to promote the development of forest resources by various contractual means and responsibility systems and by codifying correct policies into law.

NPC Standing Committee member Fu Hao proposed that forestry affairs committees be established in NPC standing committees at all levels and afforestation associations be formed among the masses to propagate the forestry law and promote and supervise its implementation.

CSO: 4008/395

## SHANXI'S LI LIGONG WRITES ON AFFORESTATION

SK200536 Taiyuan SHANXI RIBAO in Chinese 28 Jun 84 pp 1, 2

[Article by Li Ligong, secretary of the Shanxi Provincial CPC Committee: "Step Up Afforestation and Accelerate the Greening of Shanxi"]

[Text] Recently, the central leading comrades gave instructions on stepping up afforestation in the rainy season and strengthening propaganda regarding greenery. We should conscientiously implement this instruction and promote the province's afforestation in a down-to-earth manner. Forestry is an important component of the national economy. The afforestation of the motherland is work of the highest priority in realizing improvement of the natural ecological system, and it is also a major strategic matter in quadrupling the annual industrial and agricultural output value by the end of this century. Thanks to our efforts to earnestly implement the series of policies and to many effective measures on forestry development issued by the CPC Central Committee and the State Council, our province has remarkably advanced forestry construction and our forestry production situation has improved every year since the 3d Plenary Session of the 11th CPC Central Committee. A good trend in forestry work appeared this spring as a result of our efforts to carry out the guidelines of the CPC Central Committee's Document No 1; the instruction of the CPC Central Committee and the State Council on launching an in-depth campaign for afforesting the motherland; and the 10 regulations aiming at relaxing forestry policies issued by the provincial CPC Committee and People's Government in response to this instruction. The masses of cadres and people have enhanced their understanding of the importance of afforestation. All localities have combined the efforts to develop forestry and afforest the land with those to develop the commodity economy, eliminate poverty, achieve prosperity, and double production. Cadres at all levels have become more willing to attend the afforestation. The province allocated an additional 9.1 million mu of barren hills to peasants. As of now, the province has allocated 27.06 million mu as private hills, responsibility hills, and voluntary afforestation hills for peasants to plant trees. This figure accounts for about 70 percent of our barren hills suitable for afforestation. Specialized and key tree planting households have increased to 200,000.

Compared with the same period last year, we have afforested more areas and bred more saplings. Our forestry work is more solid than in previous years. This is the major aspect of the situation. Under the excellent situation, we should remain clearheaded and note problems regarding minor aspects. At present, the various rural policies, including forestry policies, have not been carried out very successfully. A commune in a county advanced in forestry, which has more than 300 peasant families, has not allocated private or responsibility hills to even one family, and is still eating from the same big pot in planting trees. Some localities have allocated private hills to the people, but have not clarified the acreage and responsibilities, nor issued barren hill utilization certificates to the people in a timely manner. The people still cannot keep their minds on afforestation. Another problem is slack technical service. Primarily because some specialized forestry households and family-based forest farms fail to master the scientific tree-planting techniques of planting on suitable areas at the proper times, fail to select fine strains, fail to prepare the soil meticulously, and fail to take good care of trees, the tree survival rate is low, or the trees grow slowly even though they survive. What merits our special attention is the fact that some localities, instead of doing solid work, allow formalism to appear, have a fondness for the grandiose, and seek quantity at the expense of quality; some pay attention to flourishes and foster some tree planting models for others to visit and inspect while neglecting the work in the entire area; and some disregard the necessary conditions of labor, funds technology, and saplings of specialized households and strive to enlarge the scale of these households. In order to consolidate and develop the current excellent situation in forestry construction, we should face up to reality and take timely effective measures to solve problems. Only by so doing can our forestry construction develop soundly and steadily.

Historically, our province has had many forest areas. For many years, these forest areas were seriously damaged. As of the early post-liberation period, only 2.4 percent of the land was covered with trees. Although our province has scored relatively good achievements in afforestation since the PRC's founding, forest area is still limited and the forest cover rate is below 20 percent, lower than the national average and 21st among all provinces, cities, and autonomous regions. The limited forest area, serious soil erosion, and frequent natural calamities are a grave problem which should be urgently solved. In particular, along with the development of building the energy, heavy, and chemical industrial bases, the problem of environmental pollution will become increasingly conspicuous. Therefore, rapidly making Shanxi green and building a fair ecological environment is an extremely urgent task.

There are two attitudes toward afforestation: One is that some people consider the work of making the land green the practice of the foolish old man who removed the mountains and the practice of "one generation planting the trees under whose shade another generation rests." They also think that depending on tree-planting to become prosperous is just like putting out a fire that is close at hand with distant water. Thus, they lack confidence and enthusiasm in planting trees. Of course, this is wrong. The other attitude is that some people are unrealistically optimistic and think that so long as the trees and grass have been planted, the land will certainly become green in 3 to 5 years. This is impractical. What is the criterion for making the land green? According to the opinions of some specialists, making the land green means to cover all areas possible with perennially green plants. For instance, about 70 percent of the mountainous Taihang areas should be covered with trees and grass. At the same time, making the land green means to create a forest environment in which perennial forage grass grown densely with a certain height, and where 80 percent of this environment is covered by forage grass capable of really raising the productive forces of the land.

In line with this criterion, the province really shoulders heavy responsibilities in afforestation and should make sustained and unremitting efforts in this regard. First, we should make efforts for many years to extensively and penetratingly preach the importance and urgency of afforestation and we should mobilize everyone to plant trees every year so as to gradually form a general mold and habit of transforming the land. By so doing, we can have high hopes for success in making Shanxi green.

The rainy season is very good for planting trees. Over the past several years, most areas in our province have been accustomed to planting trees in the spring and fall and have neglected afforestation during the rainy season. Experience proves that rainfall is sufficient, the soil is damp, the air is humid, and temperatures are high in the rainy season. Therefore, if we seize the right time to plant trees using good technology, the survival rate of those trees will be raised. Over the past few years, our province has scored some achievements in planting trees during the rainy season, but this work has not yet been stressed across the province. Comrade Mao Zedong told us long ago that "we should plant trees in three seasons where it is possible, and in two seasons where that is possible." If most areas change one-season afforestation to two- or three-season afforestation, the pace of making the whole province green will be accelerated.

To achieve success in the rainy season's afforestation, we must immediately go into action; pay close attention to rainfall; make proper preparations for the planning of forest areas, for raising saplings, and for organizing workers; and strengthen services to "key and specialized households" in forestry. In our province, the period from early July to early August is the best time of the rainy season for afforestation. The rainy season's afforestation is valued for its bountiful rainfall. We should use the successive cloudy days right after a saturating rain to plant trees or sow seeds. This year's rainy season has come early, and thus the rainy season's afforestation should be shifted to an earlier date. Those counties which have been assigned the task of sowing tree and grass seeds by plane should make proper preparations for their work in order to ensure the fulfillment of their tasks.

In accelerating the development of forestry, our province should not only depend on policy and science, but also on propaganda. This is an important experience for our province. Over the past few years, our province's forestry propaganda work has continually strengthened and all journalistic and propaganda units have done lots of work to publicize the afforestation work. At the same time, the province has commended a number of units and individuals that were outstanding in afforestation and commended a number of leading cadres at the county level who ardently love forestry and made contributions to forestry. As a result, a gratifying experience has been gained. However, the propagandizing of forestry work is still far from meeting the demands for developing forestry on a large scale. Generally speaking, in the afforestation season, various localities have paid attention to conducting afforestation activities and publicizing the deeds of advanced persons. This is essential. However, they have not given enough publicity to the management and protection of forests and to ecological efficiency. Propagandizing of forestry work has not been regularized and the popularization of afforestation technologies has not been strengthened. At present, reform is being conducted on the forestry front in such areas as making rural and urban areas green and reforming the forest zones and forestry administrative units. Now, household tree-planting has become a major situation in rural areas. In making urban areas green, the system of units assuming responsibility for planting a fixed number of trees is being established. All forestry units are being changed to units with a business nature, giving economic services. Propaganda in this field should be strengthened.

In propagandizing forestry experiences and examples, great attention should be paid to the 10 measures put forward by Comrade Hu Yaobang at the conference on north China's dry-land agriculture. These 10 measures are: Emancipating the mind, centralizing the people's will, mobilizing the people's enthusiasm, depending on the masses to develop work, giving priority to ensuring seed supply, improving technologies, conducting conscientious inspections, implementing policies, cadres taking the initiative in work, and being resolute to raise the quality and persuasiveness of propaganda reports. In sum, we should conscientiously strengthen the propagandizing of forestry and make forestry propaganda play its due role in organizing, inspiring, and promoting our province's forestry construction in order to mobilize all people in the province to actively plant trees and make Shanxi green.

CSO: 4008/395

SYMPOSIUM ON SHELTER-BELTS HELD IN XINJIANG

HK271224 Urumqi Xinjiang Regional Service in Mandarin 1300 GMT 26 Aug 84

[Text] The on-the-spot symposium on building farmland shelter-belts in northeast, north, and northwest China, being held by the Ministry of Forestry, opened in Hotan on 23 August.

The tasks of this symposium are to seriously implement the instructions of the CPC Central Committee and the State Council on penetratingly and thoroughly launching the drive to afforest our country and to implement the spirit of the speeches of leading comrades of the central authorities on growing grass and trees and getting rich. The tasks also include on-the-spot investigations, exchanges of experiences, and study of the problems in building farmland shelter-belts and improving the quality of building.

The representatives attending the symposium come from 12 provinces, municipalities, and autonomous regions in northeast, north, and northwest China, from all ministries and commissions of the central authorities, and from relevant scientific research, education, and press units.

Over the past few days the representatives have inspected farmland shelter-belts in two counties -- Hotan and Lop -- and windbreak and sandbreak belts and [words indistinct] on floodland, sandy shores, and shoals.

CSO: 4008/395



UN AIDS NORTHWEST CHINA SHELTERBELT PROJECT

OW251347 Beijing XINHUA in English 1306 GMT 25 Jun 84

[Text] Yinchuan, June 25 (XINHUA) -- A United Nations aided shelter-belt project, aimed at controlling soil erosion and promoting agriculture in a formerly poor area of northwest China, is making good progress.

So far, 36,000 hectares of trees have been planted and survived between 1982 and spring, 1984, in Xiji County, in the Ningxia Hui Autonomous Region, and 29,000 hectares of grass sown. According to officials in charge of the project, this has quadrupled the area's forests since 1981, and trebled the grasslands. Based on an agreement signed between the Chinese Government and the World Food Program (WFP) in 1981, the latter is providing the country 23,268,000 U.S. dollars worth of grain and food for the project, which involves planting a total of 43,000 hectares of trees and 45,000 hectares of grass by 1986.

Last year, 5,082 tons of grass were reaped and 10,000 tons of fuel from the new forests and grassland were provided for the peasants. Total grain output was 24 percent higher than that of 1981, and beef and mutton output nearly doubled. The total income from agriculture showed a 63.8 percent increase, and the peasants' per capita income rose by 85 percent.

Last week, the Chinese Ministry of Agriculture, Animal Husbandry and Fisheries arranged a five-day visit to Xiji for officials of the WFP in Beijing, and diplomatic envoys of some of the major contributors to the organization including Britain, France, the Federal Republic of Germany, Japan, New Zealand, Sweden and the United States. The visitors showed great interest in the primary economic progress achieved in the past two years and the ecological effects. Soil erosion has been reduced by nearly two thirds.

According to John Murray, WFP deputy representative in Beijing, the project reflected a bright prospect for the cooperation between the organization and the Chinese Government. He said the WFP's projects to aid China already reached 275 million U.S. dollars, and the organization was talking with China about other projects.

CSO: 4010/138

UNESCO OPENS EROSION, SEDIMENTATION CENTER IN PRC

OW211503 Beijing XINHUA in English 1430 GMT 21 Jul 84

[Text] Beijing, July 21 (XINHUA) -- The International Research and Training Center on Erosion and Sedimentation, co-sponsored by China and UNESCO, opened here today, in response to a decision by the 22d Session of the UNESCO General Conference.

Qian Zhengying, minister of water resources and electric power, Gao Yi, chairman of the China National Commission for UNESCO, and Amadou Mahtar M'Bow, director-general of UNESCO, spoke at the inauguration ceremony. Director-General M'Bow is here at the invitation of Chairman Gao. He visited China in 1975, 1979 and 1983.

Soil erosion and consequent river sedimentation are an urgent issue. It is estimated that about 60 million square kilometers of land have been eroded in the world today. The center will promote technical cooperation among member states. It will provide foreign experts with laboratories and field experiment sites. Its English language INTERNATIONAL JOURNAL OF SEDIMENT RESEARCH will record its progress.

Mass afforestation campaigns in China are a long-term measure against soil erosion.

CSO: 4010/138

INTERNATIONAL DESERT EROSION SYMPOSIUM OPENS

OW060735 Beijing XINHUA in English 0712 GMT 6 Sep 84

[Text] Lanzhou, September 6 (XINHUA) -- A two-week international symposium on the problems of controlling shifting sands opened in Lanzhou, capital of the northwest Chinese province of Gansu, on Wednesday. Attending the meeting, jointly sponsored by the UNESCO and the Chinese National Committee of Man and the Biosphere, are scientists from Australia, Egypt, India, Pakistan, Mexico, the Soviet Union, the United States and China.

At present, deserts in many parts of the world are expanding at the rate of 50,000 to 70,000 square kilometers annually, and desert areas account for 35 percent of the earth's land surface, threatening the livelihoods of 600 million to 700 million people. The participants mainly attributed desert erosion to the ecological imbalance caused by excessive land reclamation, livestock grazing and tree felling, in addition to sustained dry climates.

China has made progress in the battle against shifting sands and desert erosion by organizing people in the affected areas to work on project to half sand advance, and afforestation, as well as the establishment of various protective green shelter belts. As a result, 12 percent of the country's 320,000 square kilometers of desertified land has been improved and desert erosion controlled on a further 10 percent. China has also set up a desert research center in Inner Mongolia in a bid to reclaim deserts by studying ways of halting shifting sand, such as planting trees and grass, and developing the areas through forestry and agriculture.

CSO: 4010/143

DESERT RESEARCH CENTER SET UP IN NEI MONGGOL

OW040649 Beijing XINHUA in English 0631 GMT 4 Jul 84

[Text] Hohhot, July 4 (XINHUA)--A research center has been established in northeast China to study ways of developing desert areas.

Situated in the Alxa League, west Inner Mongolia, the center is headed by Wang Jiuwen, a 48-year-old desert specialist.

Methods of preventing the shifting of sands will be studied, such as planting trees and sowing grass, and the center will investigate the best ways of developing the areas through forestry, husbandry and agriculture.

This is part of the work being carried out in response to a call to open up the northwest made by party General Secretary Hu Yaobang a year ago when he toured the area.

The center in conjunction with Lanzhou University will publish a monthly magazine "Desert Research."

Deserts and barren land in China are mainly scattered in the northwest. They cover an area of 1.49 million square kilometers, accounting for 15.5 percent of the country's total territory.

As early as in 1958, the Chinese government began taking steps to control the deserts. People in these areas have been organized to work on the fixing of sand, planting of trees and the establishment of various protective green shelter belts.

CSO: 4010/117

PRC OFFERS SITE FOR DESERTIFICATION CENTER

OW221905 Beijing XINHUA in English 1831 GMT 22 May 84

[Text] Nairobi, May 22 (XINHUA)--A Chinese delegation to the 12th session of the governing council of the United Nations Environment Programme (UNEP) formally proposed today that the recommended international desertification research and training centre be established in China. "We have already made necessary preparations for setting up such a centre," said Yang Keming, head of the delegation.

He said dialogues on environment between the developed and developing countries "can coordinate environmental development and social and economic development, promote the realization of the strategic goals of the third United Nations development decade and create a harmonious and favourable atmosphere for international cooperation."

Yang endorsed a proposal to create a clearing house within UNEP and said the creation of such a mechanism will help solve environmental problems, and make possible the use of contributions outside the UNEP fund to aid the development countries in their environmental protection.

He said the Chinese government has in recent years made environmental protection one of its priorities. Its fundamental policy is to coordinate economic development and environmental protection, and integrate active preservation of natural resources with their rational exploitation and full utilization.

China has formulated a new program for protecting the environment through the year 2000, striving to keep a good nationwide environmental situation abreast with the development of its national economy and the raising of the people's living standards, he said.

CSO: 4010/117

PRC ACHIEVES SUCCESS IN CONTROLLING EROSION

OW122136 Beijing XINHUA in English 1441 GMT 12 Jun 84

[Text] Beijing, June 12 (XINHUA)--China has registered new success in the battle against shifting sands and desert erosion which has turned 320,000 square kilometers of formerly arable land into wastelands.

Li Jingzhao, president of the Chinese Society for Environmental Sciences, said today that 12 percent of such land has now been improved, and the erosion processes were being controlled on a further 10 percent.

He was speaking at the opening ceremony of the third symposium on international desertification here today. 20 scientists and specialists from 11 countries, including Argentina, Guinea and Syria, attended.

Li said the Chinese government has long attached great importance to fighting the problem. People in the afflicted areas had been organized to work on the fixing of sand and afforestation, controlling sand from drifting as well as the establishment of various protective green shelter belts in north China.

According to the Ministry of Urban and Rural Construction and Environmental Protection, deserts and the desertified land in China are mainly distributed in 12 provinces and autonomous regions in northern China, which cover an area of 1.49 million square kilometers, accounting for 15.5 percent of China's total territory.

Li said the problem was worldwide. The Chinese government has always maintained that international cooperation and exchanges in environmental protection should be further strengthened and expanded.

He said through consultations with the U.N. environment programme, an international research and training center on the prevention and control of desertification would be set up in China for the activities of scientists from many countries.

CSO: 4010/117

## AFFORESTATION ACHIEVEMENTS IN SICHUAN

Chengdu SICHUAN RIBAO in Chinese 9 Apr 84 p 1

[Article: "The Area of Spring Afforestation and Cultivation of Saplings Surpassed that of the Same Period Last Year"]

[Text] According to incomplete statistics compiled by concerned departments of 14 prefectures and cities suitable for developing spring planting of trees and afforestation as of 26 March, more than 2.6 million mu of land have been afforested. Of this area, more than 1.12 million mu of land were afforested as the base for fast-growing timber forests. Eight hundred million trees were planted on the four sides, and more than 154,000 mu of land were newly planted to cultivate saplings. They showed respective increases of 1.5 times, 2.6 times, 1.1 times and 2.2 times over the same period last year. The three prefectures and cities of Luzhou, Daxian and Yibin surpassed their annual afforestation tasks. The five prefectures and cities of Nanchong, Neijiang, Mianyang, Chongqing and Yibin completed over half of the annual task of planting new trees to cultivate saplings.

This year's spring afforestation and cultivation of saplings were carried out better than past years mainly because party and administrative leadership at each level emphasized greening work, conscientiously emphasized forestry, carried out ideological and organizational work well, the ownership and responsibility systems in forestry were further implemented, and the enthusiasm of tens of thousands of families and all professions in planting trees and afforestation was mobilized. The in-depth development of the mandatory afforestation movement by the people, the prosperous development of the "two types of households" in afforestation, the planning and design carried out prior to afforestation and cultivation of saplings, the balancing of saplings and grown trees, the gathering and shipping of seeds, the training of technical forces and preparatory work were greatly strengthened, and the coordination and support by bank credits and loans, water and power, transportation departments served to promote afforestation and greening work.

To consolidate the achievements of spring afforestation, each locality is concentrating on the work of winding up spring sapling cultivation and afforestation. At the same time, each locality has begun to organize forces to develop inspection and delivery work after afforestation and to implement management and maintenance work.

## AFFORESTATION ACHIEVEMENTS IN SHANXI

Taiyuan SHANXI RIBAO in Chinese 12 March 84 p 1

[Article by Chen Hongde [7115 1347 1795] and Wang Zhiguo [3769 1807 0948]:  
"Relax Afforestation Policies, Support Afforestation Enterprises, Our Province  
Afforested More than 6 Million Mu Last Year"]

[Text] Since last year, every locality in Shanxi has relaxed afforestation policies, extended the number of years of afforestation contracts, continued to develop and perfect the production responsibility system in afforestation, and greatly mobilized the enthusiasm of the masses to plant trees and create forests. Last year, the whole province afforested 6.44 million mu, an increase of 45 percent over the previous year. Individual afforestation efforts constituted 63 percent; 810 mu were used for cultivating saplings, an increase of 26.9 percent over the previous year. Two hundred fifty million trees were planted, an increase of 27.3 percent over the previous year. Of these, 93 percent were planted by individuals, and the percentage of live trees increased from the original 60 percent to 70 percent.

Zoning "two types of mountain land" and developing "two types of households" engaged in afforestation" were a visible characteristic of afforestation in our province last year. Trees planted on private mountain lands belonged to whoever did the work and they were inheritable. The contract period for afforestation of responsibility mountains was extended. The implementation of these two policies created enthusiasm for contract work in the rural areas and created a new situation of relying mainly on the individual, and the state and collective making concerted efforts. Linqiu County implemented the household "reclamation of four types of wasteland" and last spring, the county zoned more than 117,000 mu of private mountain lands and 623,000 mu of responsibility mountain land. The area of the "two types of mountain land" accounted for 64 percent of the present area of the county suitable for afforestation. Yuanqu County had 140,000 mu of waste mountain land suitable for afforestation. Of this, 117,960 mu has been zoned and distributed, and every family has private mountain land. According to incomplete statistics, afforestation of private mountain land in 1983 throughout the province developed from 8.8 mu to 9.9 million mu, an increase of 1.2 times. The total area of the "two types of mountain land" reached 15.55 million mu, accounting for 40 percent of the area of waste mountain land suitable for afforestation throughout the province.



While afforesting the "two types of mountain land," the special afforestation households and key families in afforestation throughout the province also developed rapidly. Last year, they numbered 300,000, accounting for 6 percent of the total number of rural households throughout the province, and 20 percent of the total number of all types of professional households throughout the province. There were also 70,000 households of commune members throughout the province that started small family-size forest farms, and there were 1,021 commune and brigade forest farms which were contracted out to households to operate. More than 20 counties including Xiangyuan, Zhangzi, Lucheng, Huguan, Pinglu, Fangshan, Xiangning established afforestation techniques services companies for tracts of land or in communes to provide technical services to the "two types of households" in afforestation.

Last year, individual commune members throughout the province invested 3.28 million yuan to develop forestry, and loaned 1.09 million yuan. A total of 19,537 special households engaged in forestry realized over 500 yuan in income, and of these, 3,824 households realized over 1,000 yuan in income. There were 34 households that realized 10,000 yuan in income.

9296

CSO: 4008/385

## YUNNAN PEOPLE'S CONGRESS DISCUSSES FORESTRY

### Forestry Department Report

Kunming YUNNAN RIBAO in Chinese 19 Nov 83 p 2

[Excerpts from "A Report on the State of Yunnan's Forestry Development," delivered by Wang Min [3769 3046], Director of the Yunnan Forestry Department, at the Fourth Meeting of the Standing Committee of the Sixth Provincial People's Congress on 11 November 1983]

[Text] Yunnan is a mountainous province with abundant mountain and forest resources, and possesses outstanding advantages and great potential. To become rich and to make proper contributions to the state, Yunnan's populace should rationally develop and utilize the province's mountain and forest resources as soon as possible. To realize the magnificent goal of quadrupling gross annual output value of industry and agriculture by the end of this century, we must stress the word "mountain," further re-adjust the economic structure of agriculture and maintain a good ecological cycle. Meanwhile, we should utilize our mountain and forest resources rationally and vigorously develop forestry and animal husbandry. This is where the potential and hope for the development of our province's economy lie and poses a significant problem of economic strategy.

In recent years, our province has enthusiastically carried out the Party Central Committee's relevant instructions and decisions, done much work and achieved remarkable results. Since 1981, we have sent more than 1,000 work groups to thoroughly carry out the State Council's emergency circular concerning reckless deforestation and have sternly handled many such cases, thereby strengthening forestry management and basically stopping the unhealthy practice of deforestation. In 1982, we organized more than 50,000 people in work groups to launch the "three fixes" of forestry work: stabilizing forest ownership, demarcating private mountain plots and establishing the production responsibility system in forestry. This approach has been employed to handle many disputes concerning, and has basically resolved the issue of, mountains and forest ownership. On this basis, the provincial party committee and people's government have further liberalized policy, and decided, as in agriculture, to implement collective ownership and family management in forestry; to establish private mountain plots on collectively owned afforestable barren mountains, sparsely wooded areas and

shrub lands; and to contract out to households all collectively owned, afforestable barren mountain land that cannot be divvied up into private plots. Meanwhile, grass mountains, grassland and rotation land have been fixed. It was clearly announced that private mountain plots still belong to collectives but that peasant households retain the rights to the trees they plant on such plots and that these rights are heritable in perpetuity. Since May of this year, work teams comprised of more than 80,000 members have been dispatched to launch a large-scale project to contract the "three mountains and one land" out to households. Up to the present, more than 180 million mu of land have been divvied up, including 64-some million mu of private mountain plots, 86-plus million mu of mountainous responsibility fields, 25-some million mu of grass mountains and more than 10 million mu of rotation land.

Delimiting private plots; contracting out responsibility fields; handing forestry management over from the collective to peasant families on a contractual basis; and closely integrating the masses' responsibilities, rights and interests in forestry development constitute big changes in forestry management; provide an effective way of overcoming the problem of "eating from the same big pot;" mobilize the enthusiasm of hundreds of thousands of households to exploit mountainous areas, develop forestry, protect forests and plant trees; and thus invigorate forest production. When the "three mountains and one land" are contracted over to households, forest fires occur much less frequently; when these fires do break out, and when they are extinguished much faster than before; deforestation is further curbed; and the masses' enthusiasm for afforestation increases. The province has afforested more than 4 million mu of land this year, exceeding the annual plan by 64 percent, and the quality of tree planting and the tree survival rate have improved. For instance, Huize County originally planned to afforest 90,000 mu of land, but after the "2 mountains" were assigned to households 170,000 mu of private mountain plots alone were planted. Across the province, more than 30,000 specialized and key forestry households have emerged. Practice proves that the "three fixes" and the assignment of the "three mountains and one land" to households accord with our province's actual conditions, represent the people's interests and thus are enthusiastically supported by the masses. These policies provide dynamism and vitality for, and a good way to accelerate the pace of, forestry development. However, we should note that this work has not progressed evenly. The "two mountains" policy still has not been carried out in some areas, and many problems have not been completely resolved in many places. To carry the task through, we must increase and improve our efforts.

To comprehensively exploit the barren mountains and develop forestry and husbandry, the next step we have to take is to concentrate our efforts and pay close attention to the following work. (1) Make barren mountains green by planting many trees and much grass; and (2) protect and manage existing forests and administer and utilize mountain and forest resources carefully. The guiding ideology for good management of the afforestation of barren mountains is proceed from realities, engage in rational resource exploitation, plant trees where appropriate, practice herding where suitable and simultaneously stress tree and grass planting. Next year, we should

strive to afforest about 10 million mu of land so as to provide experience for the major development of forestry in the next few years. To this end, we must pay special attention to several key measures. First, we should work out a scientific forestry development program as soon as possible, tailoring measures to suit local conditions, developing strong points, avoiding weak points and fully exploiting advantages; concentrate on forestry while practicing diversified management; integrate strong points with weak points and nurture strong points by improving weak ones; combine trees, bushes and grass and plant trees and practice herding where suitable. In the near future, we should vigorously develop plants which will yield results in a short time, such as medicinal materials, tea, spices, oil, bamboo, mushrooms and *Auricularia auricula-judae*, and we can also properly intercrop and interplant grain and other industrial crops. From a long-term point of view, we should develop timber, economic, fuel, valuable wood, waterhead, scenic and shelter forests; conscientiously stress the establishment of seedling bases; and effect overall planning and comprehensive development. Second, we should stress implementation of nurseries and the policy of coordinated advances among families, collectives and the state. State-run tree farms and nurseries of all levels should serve as key demonstration centers, and all units possessing the proper conditions should set up nurseries to grow good varieties and sturdy seedlings. Enthusiastic support should be given to specialized and key nursery households so that more commercial seedlings can be produced. As for impoverished areas, assistance can be provided in the form of low-interest bank loans or by having provincial, prefectural and county financial agencies undertake interest payments on loans. Forestry funding procedures should be reformed, and the results of afforestation should be linked with investment so as to improve economic results. We should also appropriately readjust the current practice of distributing the largest share of tree-growing funds to the province, a medium share to the prefecture and the smallest share to the county. Instead, we should allocate 60 percent of these funds to counties and units administering reforestation and 20 percent each to prefectures and the province. Third, we should improve forestry technology. When planting trees or grass, we should seek practical results and improve the survival rate and the economic results. We should set up a sound system of forestry technology extension where prefectures, autonomous prefectures, cities and counties all have their own forestry technological centers, forestry schools, specialized classes and short-term training classes to train forestry cadres and technical personnel. We should encourage technical personnel in forestry and animal husbandry to work in the mountains. Forestry and research departments must stress and strengthen research in applied science, organize joint assaults on key problems, enthusiastically cultivate improved and viable tree varieties and vigorously popularize scientific and technological results and advanced experiences in forestry and animal husbandry.

Concerning current problems in forest protection and management, we should conscientiously study the special characteristics of our province's mountainous areas. An important feature of our province's forestry is that forests and villages are intermixed, and many peasants live in forested areas. Therefore, in order to ensure that forests are well protected and

managed, we must rely on the broad masses of forest residents, practically resolve the problems of these peasant masses' dependency on the mountains and of the need to regenerate the mountains, and enable these people to obtain material benefits through forest management. Specific measures to achieve this are the following. First, we must plan tree harvests scientifically and rationally; keep harvests lower than the growth rate; eliminate excessive logging but cut mature and over-mature trees timely and rationally; adhere to the requirement of maintaining "one account book" in logging by gradually and rationally determining annual harvest sizes and by setting and maintaining these for 3 to 5 years. Cut plans for collective forests should be determined in accordance with the state's needs, the amount of mature timber possessed and transport conditions. State-run tree farms and forestry-industry enterprises must thoroughly carry out the policies of "giving priority to forestry and practicing diversified development and comprehensive utilization"; and vigorously popularize the experiences of the Jiangbian Forestry Bureau and the Yipinglang Tree Farm; and practice rational cutting and prompt replanting so as to keep mountains green and ensure permanent, continued use thereof. We should employ different organizational forms, such as state-commune joint management, to mobilize neighboring communes and brigades and expand forestry production. Second, we must comprehensively develop forestry, industry and commerce. We should vigorously support the efforts of forest-area communes and brigades to develop processing industries for wood and tree by-products and gradually end these areas' dependence on sales of only logs and raw materials. Forestry departments should continue to improve allotment plans, issue extra-provincial transport permits and improve supervision and control.

Wood that is not subject to central distribution--including trees that are blown over by the wind, minor economic lumber, miscellaneous lumber and "the three boards and the one construction material"--should be handled by forest-industry and trade enterprises or entrusted to supply and marketing cooperatives. Meanwhile, prefectural and county forestry departments should be allowed to meet directly with forestry departments inside or outside the province to discuss production and marketing. Most of the profits earned by forest-, industry and -trade enterprises should be returned to the peasants in the forested areas. Impoverished, minority nationality regions, can retain, on approval from the State Council, an appropriate amount of timber to trade for productive materials and daily necessities. Third, we should try every means to conserve wood and remedy as soon as possible the serious practice of consuming more than our province's forests can produce. The primary task is to solve the energy problem in rural areas. We should, on the basis of the preliminary progress achieved this year in popularizing store change-overs, and coal conservations place great emphasis on the establishment of small coalpits beginning next year, ensure balanced allocations of coal supplies and strive to advance substitution of coal for firewood. We should use barren mountains and wasteland, to vigorously plant fuel forests, and counties that are short of coal and firewood should all launch pilot programs to carry this out and achieve results. Measures regulating wood burning should be formulated as soon as possible, and no burning of

virgin trees or good wood should be permitted. We should vigorously popularize fire-stoves that conserve wood and substitute coal, electricity and methane for wood. From now on, we should strictly prevent the establishment of enterprises using wood as fuel, and existing enterprises that are so fueled should vigorously implement technological transformation and try to find substitutes. Fourth, we should strengthen forest management and insist on using law to administer forests. We should continue to set up sound forestry public security and judicial organs and have these serve as police substations in the forested areas. Protect the legal rights and interests of the state, collectives and individuals in forestry management by sternly cracking down on illegal activities that damage forests. We should strengthen the forestry management system. Commune forestry work stations should be built as soon as possible in places where they do not yet exist. Production brigades should provide personnel who dare undertake forestry management and who understand technology, so as to build good forestry organization from the basic level up. We should support and uphold village rules and regulations established by people who love and protect forests, integrate the laws of the state with "popular law," give full play to the power of the people to manage, maintain and protect forests, and conscientiously protect and effectively manage Yunnan's forest resources.

#### Decision to Accelerate Forestry Development

Kunming YUNNAN RIBAO in Chinese 19 Nov 83 p 2

["Resolution to Accelerate Forestry Development," passed 16 November 1983 at the Fourth Meeting of the Standing Committee of the Sixth Yunnan People's Congress]

[Text] At its fourth meeting, the Standing Committee of the Sixth Yunnan People's Congress discussed "A Report on the State of Yunnan's Forestry Development" delivered on behalf of the Provincial People's Government by Forestry Department Director Wang Min [3769 3046]. The meeting found that the report's analysis conformed to reality and that the main tasks and measures the report proposed were positive and feasible. The meeting resolved:

1. Ours is a mountainous province with many nationalities, and this forestry plays a very important role in economic development. Vigorous development of forestry and the acceleration of mountain-area development are two significant strategic measures for carrying out the magnificent goals put forward by the 12th Party Congress. Since the 3rd Plenum of the 11th Party Central Committee, our province has undertaken much work to protect and develop forestry. Especially enheartening have been the results achieved since May of this year; when policy decisions concerning the assignment of the "two mountains" to households were implemented. Practice proves that this fully reflects the masses' ideas and demands and arouses their enthusiasm and therefore will undoubtedly become the basis for the future development of forestry. However, we should recognize that this work has not developed evenly, some areas have not carried out the above policies and many places still have some problems to solve. For this reason, we

should continue to pay close attention to the execution of the "two mountains" policy, the study of new situations, the solution of new problems and improvement of the management of the relationship of interests among the state, collectives and individuals. Meanwhile, comprehensive management of forestry, industry and commerce should gradually be implemented so as to improve economic results and to further arouse the enthusiasm of the broad masses for afforestation and forest protection.

2. To develop forestry, scientific and technical guidance has to be strengthened. Counties (cities), communes and brigades should all proceed from actual conditions, make adjustments according to different places and forests and immediately work out plans for planting trees and grass. Not only should there be long-term plans, there should also be short-term arrangements so that the broad masses can benefit from forestry development as soon as possible. We should emphasize seed growing; encourage cooperation among families, collectives and the state; and vigorously gather, plant and grow seeds and seedling. We should also strengthen the extension system for forestry science and technology, train forestry science and technology personnel, study and popularize tree varieties that grow rapidly and have high yields, spread advanced experience in the scientific growing of plants and grass, and prevent and control plant diseases and pests. Special measures should be adopted to support the development of forestry in large mountain areas with sparse populations.

3. State-run tree farms and forestry industrial enterprises should conscientiously undertake readjustment and consolidation, correct management ideas, adhere to the policy of concentrating on forestry while practicing diversified management and comprehensive utilization, set up healthy management responsibility systems, rationally determine the tree harvests, and thus keep mountains green and in use forever and set examples for collectives and commune members in afforestation. After summarizing experience, we should reform management systems and practice various forms of management, such as contracts, joint enterprises and delegated management, to involve the masses in forested areas in forestry management. We should depend on the masses for afforestation and forest protection.

4. We must ensure that existing forests receive good protection. We should conscientiously investigate and resolve energy problems in rural areas by further adopting such effective measures as planting fuel forests, popularizing firewood-conserving stoves, substituting coal for wood and developing methane and small hydropower stations so as to reduce wood consumption. We should set up good forestry public security and judicial organizations and insist on managing forests by law. The unhealthy practice of reckless deforestation must be stopped resolutely and immediately. Any act causing damage to forests during reclamation should be sternly punished on discovery, and criminals who severely damage forests should be promptly and strictly punished in accordance with the law.

5. The meeting decided to organize, with counties as units, people's representatives from all levels to undertake comprehensive inspection of the execution of forestry policies and the development of forestry

throughout the province this winter and next spring in order to promote down-to-earth advancement of forestry production.

Ideological as well as political work should be vigorously strengthened in forestry development. Continuous and thorough propaganda should be used to publicize the significance of the acceleration of forestry so that the broad masses of cadres and people really understand that this is a question which concerns the development of the entire agricultural economy, the maintenance of ecological balance and the long-term interests of our posterity and so that we can continue to raise the masses' consciousness in afforestation and forest protection. People of different walks of life should all energetically support forestry production. We should create a new situation throughout the province in which everybody cares about forests, protects and plants trees, and works conscientiously to fulfill and over-fulfill the glorious tasks of planting trees and grass next year.

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## BRIEFS

NEI MONGGOL AFFORESTATION--In the first half of this year, the Nei Monggol regional forestry front witnessed a gratifying situation. The region afforested 5.3 million mu this spring, a 28-percent increase over the corresponding 1983 period and overfulfilling the annual target by 6 percent. At the same time, the region raised 104,000 mu of saplings, a 7.2-percent increase over the corresponding 1983 period, and planted 50 million trees around houses and along rivers, roads, and ditches for a 30.9-percent increase. The region also experienced good results in spring forest protection, fire prevention, and forest administration. The number of fire accidents and the area afflicted by forest fires dropped respectively by 60 and 94 percent from the corresponding 1984 period. [Summary] [SK030649 Hohhot Nei Monggol Regional Service in Mandarin 1100 GMT 27 Jun 84]

GUANGDONG ENVIRONMENTAL PROTECTION COMMITTEE--The provincial government has recently decided to set up a provincial environmental protection committee to implement the relevant state principles and policies on environmental protection, lead, organize, and coordinate the environmental protection work of the whole province, examine and revise environmental protection plans, and handle major environmental protection problems. [Text] [HK120112 Guangzhou Guangdong Provincial Service in Mandarin 1000 GMT 5 Jun 84]

HEILONGJIANG SHELTERBELT CONSTRUCTION--The shelterbelt in western Heilongjiang Province has begun to take shape. As of mid-August, a total of 8.01 million mu was planted with shelter-forests, 2.01 million mu more than the planned figure. After listing the 28 cities and counties in the western part of the province as places for building the north, northeast, and northwest China shelterbelt, these 28 cities and counties have afforested an average of 1.1 million annually, and the survival rate of trees has risen from 56 percent in the past to 86 percent. In building the shelterbelt, the focus has been on construction of farmland shelter-forests. Thus far, the acreage of farmland shelter-forests has reached 2.7 million mu. [Summary] [Harbin Heilongjiang Provincial Service in Mandarin 1000 GMT 22 Aug 84 SK]

JILIN AFFORESTATION--Jilin Province completed the first phase of the "Northwest, North, and Northeast" afforestation project ahead of schedule. Seventeen counties were included in the first phase of the afforestation program in Jilin. The goal is to afforest 6 million mu in the 7-year period between 1978 to 1985. As of the end of last year, these 17 counties had afforested over 8.20 million mu and preserved over 6.028 million mu of land as a net result. This has exceeded the specified target. [Excerpt] [Beijing RENMIN RIBAO in Chinese 16 Feb 84 p 3] 12553

SOIL CONSERVATION IN NEI MONGGOL--Nineteen key banners (counties) in charge of water and soil conservation in the Nei Monggol Autonomous Region issued permits to 500,000 families to use the resources which they harness under contracts. The soil erosion area in Nei Monggol reaches a total of 186,000 square kilometers. For many years, only 13,000 square kilometers have been controlled. Last year, the household responsibility system to harness small river valleys was promoted in 19 key banners (counties) and began to turn the situation of slow speed and poor efficiency around. The progress in tree planting, grass seeding and terrace field building was significantly accelerated, and benefits were noticeably improved. This year, the 19 banners (counties) continue to implement the household contract responsibility system. In order to uphold the enthusiasm of the farmers and herdsmen in harnessing the basin area, and to relieve their worries concerning policy changes, contractors were issued user permits. The permit specified that: small river valleys contracted to families to control, whoever does the work deserves the benefits. Their sons and daughters have the right to inherit. The newly flooded land will not be given fixed quotas for grain production, and will not be taxed in the next 5 to 10 years. [Tian Bingxin [3944 3521 0207]] [Text] [Beijing RENMIN RIBAO in Chinese 17 Feb 84 p 2] 12553

HUBEI AFFORESTATION--The winter afforestation in Hubei is encouraging. Up to now, 1.07 million mu have finished soil preparation, which is 73 percent of the total plan. Afforestation was completed on over 620,000 mu of land, 1.26 times more than that in the same period last year. Quality was especially emphasized in afforestation this year. Over 15,000 mu have been afforested in Jiayu County, and quality is in general higher than that in previous years. They planted over 10,000 mu of Italian willows. One of the important characteristics of afforestation this year is to absorb the advantages of the household contract responsibility system and to strengthen the construction of bases for forestry products. In the province, over 117,000 mu have completed soil preparation for fast growing forests and over 338,000 mu have been prepared for timber forests and economic forests, representing 68 and 58 percent of the total plan, respectively. Chongyang County used a centralized planning method to contract blocks of mountains to families. The soil preparation was done by joining together pieces of land and by assigning tasks according to the amount of labor available. Forty thousand mu of soil has been prepared for manual plantation, and 95,000 mu of soil has been prepared for airplane seeding. Many areas considered the construction of bases for forestry products as a focal point in the build-up of agricultural economy. In areas where firewood is in short supply, fuel forests

are the focal point in forestry construction. On plains and hills, farmland shelter forests should be the emphasis, and ditches, roads, dams and beaches are to be fully utilized. While constructing bases for forestry products Xiangyang city emphasized planting shelter forests and fuel forests. Over 100,000 mu have been afforested. [Qi Genshen [3344 2704 3234]] [Excerpts] [Wuhan HUBEI RIBAO in Chinese 4 Feb 84 p 1] 12553

KEY SOIL EROSION PROJECT--The harnessing of the Wuding He basin, a key national water and soil conservation project, has attained significant accomplishments. The total area controlled as of the end of last year was 1,100 square kilometers in the first phase of the project covering 170 small basin areas, exceeding the annual plan by 33 percent. Over 1.21 million mu were afforested; 320,000 mu were planted with grass and more than 120,000 mu of basic farmland have been restored. The Wuding He originates in Baiyu Shan in Dingbian County, Shaanxi. It flows through the Ih Ju League in the Inner Mongolia Autonomous Region, and Yulin and Yan'an Prefectures, Shaanxi to join the Huang He in Qingjian County. The river basin area in Shaanxi is 21,600 square kilometers. Annually, it carries 270 million tons of sand and mud into the Huang He, and is one of the most serious erosion areas in the middle reaches of the Huang He. At the fourth national soil and water conservation meeting held in 1982, the Wuding He was listed as one of the eight key soil erosion areas in the country. Beginning in 1983, the state issued a special fund to treat the problem. The first phase of the project involved the harnessing of 170 small river basins. The total area reached over 7,900 square kilometers, which is 36 percent of the total river valley. This key project will continue for 8 years. Shaanxi Province, Yan'an and Yulin Prefectures and 11 related counties, have set up command organizations for the project. Biological and engineering measures were combined to improve the quality of the project and to conserve the national investment. [Text] [Beijing RENMIN RIBAO in Chinese 15 Feb 84 p 2] 12553

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