

China's Agenda 21 And Management Strategy of Hazardous Waste

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In order to solve the outstanding contradiction between environmental and developmental issues, the United Nations Conference on Environment and Development in the year 1992 has formulated and passed the global Agenda 21, and suggested the framework of strategy for global sustainable development. Many countries in the world are launching out into continuous adjustment of their own developmental program and plan for joint

pursuit of an objective, the sustainable development in this planet common to the destiny of mankind. This is an important beginning of the new turning point in the human society of this century.

Chinese Government pays high attention to the achievements of the United Nations Conference on Environment and Development. In order to give effect to the political commitment made in the conference, Chinese Government has authorized from China's national conditions the State Planning Commission and the State Science and Technology Commission to take the lead in organizing 52 ministries, committees and non-governmental organizations with a total of more than 300 experts to work out within two years the China's Agenda 21 - White Paper on China's Population, Environment and Development. This is the first one of Agenda 21 in national level coming on the stage of international society and has been highly praised by United Nations and world opinion, holding as a fine example from China in carrying out the Rio Declaration of the United Nations Conference on Environment and Development. The formulation and implementation of China's Agenda 21 -- the strategy of Sustainable Development in China, in a developing country of the greatest population and most age-old in the world, possess undoubtedly a worldwide significance.

The management strategy of hazardous waste is a component of the strategy of sustainable development in China. This paper integrates these two strategies and expounds the following contents:

1. The outstanding contradiction between

environmental and developmental issues in China

(1) The contradiction between adjustment of economic growth and resource and the limited carrying capacity of environment.

China's GNP in the year 1994 reached 500 billion U.S. dollars. If the objective of 800 U.S. dollars income per capita is achieved at the end of this century, it is necessary to maintain 8-9% of the growth rate of national economy. The problem of resource and environment generated by the present growth has caused the industrially developed regions along the southeastern coast and some large and medium cities to approach or surpass the carrying capacity of local resource and environment. If the pattern of development is not changed, it is conceivable that under such a growth momentum the resource and environment in China will deteriorate continuously.

(2) The contradiction between high rate expansion of population and the population quality as well as between enormous social demand and the limited supplying capability.

At present, China has realized lower natural growth rate of population (reduced from 25.83 in the year 1980 to 11.45 in 1993). But due to the large population base, it will still increase by 15 million each year even such a growth rate is maintained. The area of farmland used in China is less than 7% of the world total to face a population occupying 22% the world total; and the population will approach 1300 million at the end of this century, so China will be subjected to greater pressure of population and resource (see Figure 1 and Figure 2).

(3) The contradiction between high input, high consumption, and high environmental costly traditional industries and huge population, weak foundation and fragile ecological environment.

China's GNP is 12 percent of that of the United States, but its emission of sulphur dioxide is two thirds of the USA; its energy consumption per unit output is 3-4 times that of the developed countries. This development model, if continued, will sooner or later lead to the depletion of resources and greater environmental crises.

The situation and pressures that China faces are more acute than that confronted by other countries. To address these problems is absolutely critical to the formulation and implementation of China's Agenda 21 and will in effect constitute China's contribution to sustainable development around the globe.

Figure 1: China's Population Tendency Figure 2: The tendency of China's population and the area of its farmland

2. The concept of sustainable development and the main content of "China's Agenda 21"

"China's Agenda 21" is the national strategy to which China is going to transfer from now to 21st century. Based on the definition suggested and accepted in the United Nations Conference of Environment and Development, sustainable development means "development which meets the demand of present generation while not damages the ability of future generations to meet their demand". The development

stage, national conditions, nationality and culture of various countries are different, so their understanding of the concept and connotation of the "Sustainable Development" also differs. As I assume, it does not mean simply the economic development or the protection of environment and resource, but embodies the coordination and development of the compound system of nature, society and economy with mankind as the center. From this compound system of three dimensional structure, I define the sustainable development as "The integrated development which can coordinate and control actively the compound system of nature, society and economy so that mankind can promote economic development, conserve resource for ever and raise living standard under the condition of not surpassing the carrying capacity of environment and resource". Therefore, sustainable development involves ecological sustainability as basis, economic sustainability as condition and social sustainability as purpose. The cycling diagram of this compound system is shown in Fig. 3.

That is, the sustainable development objective SD is a function of the developmental levels of economic system X, social system Y and natural system Z; and it is also related to development stage T and location L. And the system X, Y or Z is also a function of its relevant factors. As resource and environment are in the state of maximum carrying capacity, the natural system possesses the state of growth with minimum renew-ability (Min Z).

The sustainable development objective of the three dimensional compound system is expressed as the

conceptual model as follows:

$$SD = f(X.Y.Z.T.L)$$

constraints: $X^2 + Y^2 \leq Z^2$

$X \geq 0$

$Y \geq 0$

$Z \geq 0$

where:

SD -- sustainable development objective

X -- development level of economic system

Y -- development level of social system

Z -- growth level of natural system

T -- time or stage of sustainable development

L -- location of sustainable development

and: $X = f(x_1, x_2, x_3, \dots, x_n)$

$Y = f(y_1, y_2, y_3, \dots, y_n)$

$Z = f(z_1, z_2, z_3, \dots, z_n)$

Figure 3: Cycling diagram of compound system of nature, society and economy

Based on our understanding as mentioned above, the macroframework of "China's Agenda 21" contains four parts: the general strategy of sustainable development, social sustainable development, sustainable development of economy, the rational utilization of resource and environmental protection.

First: The overall strategies for sustainable development, containing 6 chapters of preamble, strategies and policies for sustainable development, legislation for sustainable development and its enforcement, financial resources and mechanisms, education and capacity building for sustainable development and public participation in sustainable development.

This part discusses in general the background, necessity, strategies and countermeasures of sustainable development in China; and suggests the objectives of development of society and various main industries in the year 2000, and the sustainable development countermeasures corresponding to the objectives mentioned above.

This part suggests also the establishment of legislation system of sustainable development in China, through which the participation of women, children and, national minorities, workers and science and technology circles in the sustainable development and the corresponding decision making process is ensured; the formulation and promotion of economic, technological and taxation policies, including the consideration of bringing resource and environmental factors into economic accounting system; gradually setting up the developing funds for "China's Agenda 21", striving widely for non-governmental and international financial support; the capacity building as a key point to implement "China's Agenda 21" and strengthen the existing network of information system and information sharing; paying special attention to the training of implementing capacity of the leaders and managers at various levels; and information sharing; paying special attention to the training of implementing capacity of the leaders and managers at various levels; and meanwhile taking care to educational building, human resource development and enhancement of science and technology capacity.

Second: The sustainable development of society, composing of five chapters of population,

consumption and social services, eradication of poverty, health and sanitation, sustainable human settlements and disaster mitigation.

This part contains the control of population growth and enhancement of population quality, leading the masses to adopt new consumption and living patterns; the development of medium and small cities and towns and of community economy in the course of industrialization and urbanization, with attention to expand the employment capacity and vigorous development of tertiary industry; reinforcement of urban and rural construction program and rational land use; strengthening the economic development capacity of impoverished area to eliminate poverty as fast as possible; and setting up prevention and control system of natural disaster adaptable to social economic development.

Third: the sustainable development of economy, including four chapters of economic policies for sustainable development, sustainable agricultural and rural development, sustainable development of industry, transportation and communication and sustainable energy production and consumption.

This part includes promotion of sustainable development with market mechanism and economic means to provide new employment chances; improvement of integrated management system of sustainable development of rural and agricultural economy; actively spreading cleaner production of industry with rapid development of environmental protection industry and diversified transportation patterns; and enhancement of energy efficiency and

conservation with disseminating less polluting coal mining and clean coal technologies, and exploitation of new and renewable energy sources.

Fourth: Protection of resources and environment, including conservation and sustainable use of natural resources such as water and soil, conservation of biodiversity, combating desertification, protection of atmosphere and environmentally sound management of solid wastes, totaling five chapters with 21 program areas.

This part suggests the sustainable development impact assessment system in the decision-making for natural resource management; the integrated exploitation and renovation of key water basin and key region under the direction of science and technology; perfection of the legislation system for conservation of biodiversity to establish and expand natural network of natural conservation areas; setting up national monitoring and information system of desertification; adoption of new technology and advanced equipment to control atmospheric pollution and prevent acid rain and development of products and technology to displace ozone-layer depleting materials; and afforestation of large area as well as working out regulations and technical standards for disposal and re-utilization of hazardous waste.

Under the leadership of national government, various central and local sectors and social organs should put into effect "China's Agenda 21" jointly and conscientiously; further strengthen international cooperation; and make unremitting efforts for the

sustainable development in China, Asia-Pacific regions and the whole world.

3. The characteristics of "China's Agenda 21"

From the of discussion mentioned above, the characteristics of "China's Agenda 21" may be outlined as follows:

1. "China's Agenda 21" holds the concept of compound system of nature, society and economy as closely related with mankind as its centre (see Figure 3). It not only involves how to solve the environmental protection problems in development, but also the sustainability of economy and society systematically; and emphasizes the inseparable combination of economy, society and natural resources and environment from the standpoint of compound system of three dimensional structure, with proposal of strategies, policies and action measures for sustainable development. Some of such critical systems thought and description are presented in chapter 2 of the "China's Agenda 21".

It constructs a strategic framework and corresponding countermeasures of a comprehensive, long-termed and gradually advanced sustainable development, being a new starting point for China going toward 21st century and striving for a glorious future.

It establishes the economic and social systems of sustainable development and the basis of sustainable utilization of natural resource and environment adaptable to these systems.

Ten main countermeasures are suggested in "China Agenda 21" to adjust and control the sustainable development of such a compound system.

Without natural resource and environment, the economic system will move towards degradation; and without the support of economic system, the social system will head for its primitive. Similarly, natural system without developed economy and equal society, resources and environment, will not display their own values; and the environmental quality can not be recovered or improved with economic force and scientific mechanism in case of environmental disruption.

Of course, the understanding, adjusting and improving this compound system are very complex, difficult and it takes time. Along with the accumulation of human practice and development of science and technology, mankind is on the way from "necessity" to "freedom".

2. The main topic of "China's Agenda 21" reflects a new concept of development. For the transition of China from now to 21st century, primary importance should be attached to the development of economy. It can be seen from Figure 4 and Figure 5 that the GNP and annual energy consumption per capita in China are very low in comparison with the developed and medium developed countries in the world; so all work should be arranged around the center of economic construction. Is this in contradiction with social sustainability, sustainable utilization of natural resource and environmental protection? The key point is the type of development. The "development"

indicated in "China's Agenda 21" embodies a new concept striving for extrication from traditional development pattern stage by stage with plan and focal points in the light of national conditions, and transmitting gradually from resource-type to technology-type economic development, to save resource and energy, reduce waste discharge and practice gradually cleaner production and civilized consumption.

Figure 4: Tendency of GNP per capita

Figure 5: Tendency of annual energy consumption per capita

3. China's population is the greatest in the world; and to handle well the relation between

population and development is another strategic key point. Along with continuous practice of family planning control to reduce the growth of population, the quality and structure of population with medical and health system and social insurance system must be improved. The tertiary industry will be energetically developed to expand employment capacity and to put the superiority of human resource in China into full play. These strategic ideas are reflected fully in related chapters of "China's Agenda 21".

4. The strategies of natural resource and environment indicated in "China's Agenda 21" highlight the following characteristics:

In general, China is not a country with abundant natural resources, with the occupancy per capita

32.3% for farmland, 14.3% for forest, 28.1% for water of deficient natural resource and rapid growth of population is the greatest constraint of economic development in China. "China's Agenda 21" arouses people's awareness of resource crisis right now; establishes in 21st century the economic system of resource-saving type, to bring natural resource management of water, soil, mines, forest, grassland, bios and ocean into the national economic and social development plan; sets up accounting system of natural resource to promote ration allocation of resource with combination of market mechanism and governmental macro-control; and puts into effect the policy of paying equal attention to resource protection, utilization and reproduction.

The core of environmental strategies of 21st century in China is to turn the externalization to the internalization of environment. As environmental protection is an important component of "development", development should not be of old pattern to leave pollution for environmental protection section to handle with, and facts have proved this is not successful. The strategy, policy and management pattern of separating environment with economy, society and resource must be transmitted into a closely combined entity of environment and development of sustainable development management pattern. From now on, the main pressure to the environmental protection in China still comes from the environmental problems caused by industrial and agricultural development and urbanization. The key point of solution is the coordination of industrial and environmental policies, scientific management and adaptable technical

selection; and "China's Agenda 21" has given a definite answer to the problem.

5. The global environmental problem will be more acute; and "China's Agenda 21" pays full attention to the coordination of China's national strategy and the strategy of global environment and development. Corresponding strategies, counter measures and action programs have been proposed on the problems of global climate change, ozone depletion of stratosphere, protection of biodiversity, cross-boundary transfer of hazardous waste pollution, water and soil loss and desertification, which reflects the strong commitment of Chinese government on historical task and responsibility to accomplish the international social duty and make greater contribution to the common cause of the whole mankind.

6. Capacity building is the basic guarantee of implementing the strategies of sustainable development. "China's Agenda 21" have suggested major measures of capacity building in the aspects of mechanism, legislation, education, science and technology and public participation; and created adaptable chances and favourable environment for international cooperation of sustainable development in China.

7. "China's Agenda 21" and the program of priority projects step up on the stage at the same time, and thus ensure the implementation, international cooperation and its integration into the plan of national economic and social development. The first tranche of 62 priority projects have attracted

attention abroad and at home. Based on necessity, the program of priority projects will be developed in a rolling way for continuous adjustment and perfection and integrated closely with the economic and social development plans of various sectors and regions in China, to form the project system of "China's Agenda 21", and stress the feasibility of strategies. This is a great characteristic of "China's Agenda 21".

4. Strategies of hazardous waste management in China

The strategies of environmentally sound management of solid waste in "China's Agenda 21" involves the following 4 program areas: disposal and management of solid waste, disposal and management of radioactive waste, management of domestic refuse and its environmentally sound system, and environmentally sound management of trash and waste materials.

Hazardous waste occupies about 5% of solid waste, with an annual output of 30 million ton. Based on the macro-statistic calculation of economic loss from environmental pollution, the economic loss from solid waste and the value of usable waste resource not re-utilized total up to 300 billion yuan RMB.

1. The objectives of solid waste management by the year 2000 in China

The objectives of solid waste management by 2000 are establishment of an all-sided scientific mechanism of solid waste management, benign development of solid waste recycling and fundamental control of pollution from hazardous

waste. The concrete objectives are:

(1) To establish a basic system of environmental laws, policies and standards for solid waste; to perfect management organizations at different levels, especially the management mechanism of hazardous waste; and to set up waste management centres in pilot cities.

(2) The comprehensive utilization ratio of solid waste should be 45-50%; that of solid waste generated by township enterprises should increase by 15-20%; the decontamination and disposal ratio of key hazardous waste should be 10-20%; and the comprehensive utilization ratio for hazardous waste from chemical industry should exceed 50%.

(3) To provide technical assistance for minimizing, recycling and decontaminating waste and establish corresponding demonstration projects respectively, including cleaner production, comprehensive utilization, waste exchange, centralized recycling, treatment and disposal of hazardous waste.

2. Countermeasures for management of hazardous waste in China

To realize the objectives suggested in "China's Agenda 21" and create favourable conditions for international cooperation and commercial opportunities, the following countermeasures for management will be adopted:

(1) Establishment of perfect legislation and standards for solid waste management

China's "Act of Prevention and Control of Solid Waste

Pollution" has been stipulated as the basic law for environmental management of solid waste; and will be issued for implementation after approval by the national People's Congress. In order to coordinate with its implementation, the " Provision of Hazardous Waste Management" will also be promulgated; those regulations of application for registry, report of waste transport and transfer, and certificates of waste utilization, treatment and disposal will be set up; and series of standards and methods for distinguishing the characteristics of these wastes will be issued.

(2) Practice of waste minimization, the focus point of solid waste management

In the program of priority projects of "China's Agenda 21", "cleaner production" is defined as a very important area. The first step of this work is to set up the regulations, standards and management mechanism for waste minimization; and to select at first the industries with large production of waste, such as chemical, metallurgical, paper making, printing and dyeing, and electroplating, for establishing demonstration projects and enterprises to practice waste minimization.

(3) Adoption of economic means for solid waste management

*** Improve the pollution fee regulation of solid waste, especially reinforce that of hazardous waste;**

*** Encourage and carry out the centralized treatment and disposal of solid waste, and adopt the regulation of fee for treatment and proposal on the waste produces to support normal operation of these**

facilities and practice industrialized management and social service;

*** Establish compensatory fund for pollution control and damage from hazardous waste, mainly used for subsidy of construction of the pollution control facilities, compensation of the pollution damage, management of the closed facilities of storage, treatment and disposal, the supervision and management of import or export and cross-boundary transmission of hazardous waste, and emergent incidence;**

*** Practice concessional loan to ensure the construction of prevention works for solid waste pollution.**

3. Strengthening the work of scientific research and development so as to provide technical support for effective management and pollution control of solid waste.

It is planned to launch out widely international cooperation based on the key research projects of science and technology in China's Eighth Five Years Plan, to absorb foreign practical techniques for setting up demonstration works to form a complete set of techniques and standards for minimization, recycling and decontamination of the hazardous waste in China, to accumulate the experiences of the construction work for laying down a foundation of the pollution control of solid waste in future.

4. The international cooperation on the hazardous waste issues in China.

The management, technical development and construction of demonstration works all require international cooperation.

(1) The management of hazardous waste:

- * Assessment of current legislation in China with reference of experiences and learning from developed countries for drawing out the "Provisions of Hazardous Waste Management in China" on this basis;**
- * Stipulation and implementation of the "Handbook of Hazardous Waste Minimization" to reduce its generation, based on the technological level or conditions existing in China;**
- * Setting up the appraisal methods and criteria for the characteristics of the waste in China;**
- * Setting up the methods and criteria for the risk assessment of hazardous waste in China;**
- * Setting up the standards for treatment and disposal of the hazardous waste;**
- * Revising and perfecting the complementary regulations for putting into effect the "Basel Conventions" in China;**
- * Establishment of national information system for management of hazardous waste;**
- * Training of personnel for management of hazardous waste.**

(2) The technical development:

- * Development and transfer of less or no waste technology;**
- * Development and production technology of anti-percolation materials for safety land fill;**
- * HDPE welding technique and equipment for construction;**
- * Manufacturing technique and cooperative production of large scale incinerator;**
- * Exploitation and transfer of software for the water balance system of safety land fill site.**

(3) The construction of demonstration works:

- * Construction of safety land fill site for hazardous waste;**
- * Construction of incineration plant for hazardous waste;**
- * Construction of national centre for characteristics appraisal and risk assessment of hazardous waste.**
- * Construction of demonstration works for minimization of various hazardous waste;**
- * Construction of national waste exchange centre.**

The cooperation contents mentioned above have been brought into the program of priority projects in "China's Agenda 21". The pattern of cooperation includes technical transfer, joint exploitation and commercial investment. In the coming five years, a certain number of the centre of hazardous waste management, the land fill site and the incineration

plant with certain scale will be constructed in Beijing, Guangzhou, Shanghai, Wuhan, Nanjing, Shenyang and Shenzheng. And the relevant policies and legislation, training of personnel and capacity building are also key projects of international cooperation; and all active participation are most welcome.

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