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CHINA'S APPROACH TO ENVIRONMENTAL CONSERVATION

Norman Myers*

INTRODUCTION

The People's Republic of China is now the largest human community on earth.① Although China may become the first developing country to push its population growth rate below 1 percent per year, its present population of 800 million people will soon top one billion.② This mass of humanity exerts steadily increasing pressure on China's natural environments. More importantly, the country is one of the most rapidly developing in the world. A national priority to advance living levels rapidly reflects the Chinese concern for the socioeconomic environment of human communities as well as the physiobiotic environments of air, soil, and water. As living standards improve, dilemmas of imbalance between population, resources and natural environments will grow more numerous and complex.

The Chinese are aware of this problem and are trying to determine which development activities are unacceptably disruptive of ecological life-support systems. They are formulating policies and corrective measures to relieve the disruption, with a marked degree of success. In its policy-making strategies and its management techniques, China's approach diverges notably from that found in market-economy countries of the West, centrally-planned economies of the Soviet bloc, and many developing countries. China's experience offers insights for environmental conservation for both the advanced and emergent nations.

To illustrate, developing nations should consider China's rationale for tackling pollution. As is not unexpected in a country with a tradition of maximal utilization of limited natural resources, refuse,

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① The account and analysis in this paper are based on the author's travels in China, August 18-September 3, 1974. Because of the difficulty of gathering and checking data, neither the author nor *Environmental Affairs* can fully verify the accuracy of all statistics and other data contained herein.

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fouled streams and dirty air are not so much an offense to aesthetic sensibilities as an instance of scarce materials wasted. Thus environmental cleanliness in China is often a consequence of rather than a motivating reason for anti-pollution measures. Indeed, many of China's environmental measures are directed at the utilitarian benefits which derive from conservation. For example, China's extensive projects for water conservancy and afforestation are geared to the pragmatic purpose of increasing agricultural production.

Advanced countries can likewise learn from China's conservation strategies, especially with regard to the institutional context for evaluation of environmental measures. While not ignoring economic factors, the Chinese define environmental values within a socio-political milieu. They first decide what is desirable—for example, better control of industrial waste, or measures to protect wildlife—and thereafter address themselves to economic criteria to determine the best way to achieve these objectives. They do not hesitate to "put politics in command" in order to establish a social-welfare framework for conservation measures. They divorce their approach from cost-benefit analysis and other economic procedures as a starting point for determining environmental policies. Economic analysis arises only after a decision for a conservation measure has been taken, rather than incorporated as part of the decision-making process.

Advanced countries need not adopt China's political system to achieve a similar institutional strategy for environmental conservation. Rather they must recognize that many existing societal systems, especially those of the marketplace, are poorly adapted to safeguarding the atmosphere, large water bodies, forests, wildlife, and other community resources. According to the Chinese interpretation, environmental degradation occurs in developed countries in both the West and the Soviet-bloc because of deficiencies in the institutional structure for conservation of society's resources. In other words, it is a political rather than an economic problem, and should be treated accordingly. This article will discuss the Chinese approach to conservation decision-making in comparison with other nations.

I. Economic Advancement

A. Industrialization

China is on the verge of becoming a major industrial power. With its economy growing at over 10 per cent per year, its economic pros-
pects are encouraging. Steel production has reached 26 million tons per year, roughly equivalent to Great Britain's level. Per-capita energy consumption is low, since China still possesses a labor-intensive economy. While that consumption is only one-twentieth of America's, it is over three times as high as India's, and half as big again as Great Britain's. China's electronics industry provides the country with the advanced-capacity control systems, instrumentation, and electronics-dependent research and development which make a modern industrial society function. Computer technology is sufficiently advanced to equip China's nuclear, rocket and satellite programs. Recent output of digital and analog computers matches East Europe’s (excluding Russia), while third-generation integrated circuit computers are reputedly ahead of the Soviet Union's.

China's developing economy has been helped rather than harmed by recent oil price increases. The country is already more than self-sufficient through home-produced supplies. Oil production doubled in 1972-73 to 60 million metric tons, about as much as Abu Dhabi's or Libya's present output. Oil reserves, notably offshore, are reputed to range from 3 billion to 20 billion tons. By 1980 China may be

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4 Information given to author by officials in Peking, August, 1974; HENLE, supra note 3 at 80. UNITED NATIONS STATISTICAL YEARBOOK 1973 297 (United Nations 1974).

5 640 Kilograms coal equivalent. See UNITED NATIONS STATISTICAL YEARBOOK 1973, supra note 4, at 350.

6 UNITED NATIONS STATISTICAL YEARBOOK 1973, supra note 4, at 347-50.


8 Anon., and Szuprovicz, supra note 7.


10 Anon., supra note 9; and Sigurdson, J., RESOURCES AND ENVIRONMENT IN CHINA, 4(3) AMBIO 112-119 (1975).
producing 400 million tons per year, as much as Saudi Arabia's present level.11 During 1974 China expected to sell 4.5 million tons to Japan at $14.80 per barrel, worth a total of $500 million.12 Future exports of oil should allow China to import the sophisticated equipment needed to make quantum leaps in industrial development.

Many other raw materials are also abundant. China has scarcely begun to exploit over 100 economically useful minerals, including the world's largest known stocks of tungsten ( wolfram), molybdenum, tin, antimony, zinc, and manganese.13 The country also possesses extensive reserves of coal, iron, lead, and aluminum. Therefore, the natural resource base is adequate for large-scale industrialization.

During the second half of the 1970's, China intends to invest increasingly in capital-intensive processes. This will complement the immense pool of manpower underpinning much economic advancement to date. Present patterns of capital investment focus on future needs rather than present consumption, although the current standard of living is better overall than in most developing countries, and far better than in China's recent past. As an example of current investment/production/consumption relationships, China manufactures only 124,000 vehicles each year, and imports few.14 Of this total, only 1500 are passenger vehicles15 since private cars are not permitted. Therefore, China's utilization of oil and steel contributes more, per unit of resource, to community living standards than is achieved in the United States, which produces five times as much steel and fifteen times as much oil, but allows vast amounts of both to be consumed by private automobiles.

B. Agricultural Development

China's agriculture likewise shows much progress.16 Of the national territory's 2400 million acres, an area 25 per cent larger than the coterminous United States, roughly 315 million acres are used for crops—a proportion 5 per cent smaller than in the United States, which is less mountainous and arid. A further 500-530 million acres are used as pastureland, and 530 million are under forests and tree

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11 Supra notes 9 and 10.
12 Supra notes 9 and 10.
14 Henle, supra note 3, at 80.
15 Information given to author by officials in Peking, August, 1974; Waymark, P., A Nation of Bicycles Makes only 1500 Cars a Year, The Times (London), October 2nd, 1974.
16 Henle, supra note 3 at 83; Sprague, G.F., Agriculture in China, 188 SCIENCE 549-55 (1975); and Wortman, S., Agriculture in China, 232 (6) SCIENTIFIC AMERICAN 14-21 (1975).
plantations (including orchards and tea plantations). The rest is urban, industrial or barren land. Since 1949 the area under crops has increased by almost one quarter. There is now 0.45 of an acre of cultivated land per capita, compared with 0.6 in India, 0.65 in Pakistan, and about 0.14 in Japan. During the past 25 years the grain harvest has increased from 110 million to 260 million tons. Although the population has grown from 500 to 800 million in this time, virtually everyone enjoys an adequate basic diet.

China has been so successful in its agricultural expansion that the country may soon export not only oil to developed nations, but also grain to developing nations. Yet China's "Green Revolution" has scarcely begun. High-yielding grains are used in only about one fifth of China's cultivated land. Food output has increased partly through reclamation of misused land and cultivation of unused land. The principal factor in expanding food production, however, has been irrigation, which allows double or even triple cropping each year. China, with almost 35 per cent of its cropland irrigated, and India, with slightly over one quarter, together possess around half of the world's irrigated land. Yet half of China's arable areas carries two or more crops each year, while less than one fifth of India's is double cropped.

China could use two or three times as much chemical fertilizer as is applied currently. The additional amount is expected to be derived from oil and natural gas, when ten new petro-chemical plants installed in 1973 come into production in 1977 and 1978. In 1973 China used 21 million tons of artificial fertilizer, for an average of 34 pounds per acre—twice as much per acre as in India, one half as much as in the United States, and one tenth as much as in Japan. At least 70 per cent of all fertilizer presently used consists of organic materials, in the form of human and animal waste, mulches, and green crop compost. Animal waste includes 15 million tons of pig manure. China's use of pig manure leads to 6-10 million tons of

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18 Information given to author by officials in Peking, August, 1974; Nien, F., How China Solved Her Food Problem, 24(1) China Reconstruits 2-6, Peking (1975). For details of China's agricultural advances in the first fifteen years after the 1949 Revolution, see Buchanan, K., The Chinese People and the Chinese Earth (Bell & Sons 1966).
19 Food and Agriculture Organisation of United Nations, supra note 17; information given to author by officials in Peking, August, 1974.
additional nutrients being available, the equivalent of about 12 million tons of ammonium sulfate. Pig manure is a high-quality form of fertilizer, with none of the ecological drawbacks of inorganic fertilizer.\textsuperscript{21} Unlike the situation in a country of intensive advanced agriculture such as Great Britain, where pigs are competitors for people for food resources, China’s pigs live mostly off agricultural waste and scavenged material. Agricultural by-products from one acre of cultivated land can feed 3-4 pigs, while each commune household produces enough kitchen garbage to support another pig.

This strategy also enables China to produce one quarter of the world’s pork. A similar approach, although on a smaller scale, applies to poultry, which supplies an additional mode for recycling nutrients. The average Chinese citizen consumes nine times as much animal protein in the form of meat and eggs (though only one twelfth as much through milk) as does his counterpart in India, out of a total animal protein intake which is almost half as large again. This nutritional achievement is accomplished through exceptional economy of production and ecological efficiency.

To date, China’s agriculture owes little to pesticides. Although production now increases by twelve per cent or more per year,\textsuperscript{22} this will still keep application at low levels. Moreover, the Chinese are aware of the concentration dangers of pesticides through, for example, irrigation channels leading to fish ponds. The use of organic mercury compounds for seed treatment is now restricted in some areas, as is use of DDT and other chlorinated hydrocarbons for crop spraying. In the case of certain crops and certain forms of forestry, biocidal measures now give way to biological controls.\textsuperscript{23}

China’s agriculture is still highly labor intensive. China possesses less than 300,000 tractors, a marked increase over the 26,000 possessed in 1952.\textsuperscript{24} In 1973, however, China produced six times as

\textsuperscript{21} Pig manure also assists a further form of intensive agriculture with low energy costs. The Chinese practice much fish farming, for which the main input is organic nutrient. This makes for an efficient method of producing animal protein. Of the 4.5 million tons of freshwater fish produced world-wide each year, half are produced in mainland China. For energy-efficiency comparison, an average bullock in an advanced country consumes around 3 tons of foodstuffs to reach a bodyweight of 10 hundredweight, for a food conversion ratio of 6:1, and a broiler chicken does no better than 2.5:1, but several fish species achieve a ratio of 1:1. In the early 1950’s fish farming in China produced an average of only one ton of fish per acre, but 20-30 tons per acre by 1972. An ordinary fish pond can produce one pound of fish per cubic foot of production space, while optimal conditions can produce 8 pounds per cubic foot. See also Henle, supra note 3, at 124.

\textsuperscript{22} Information given to author on communes near Peking and Canton, August, 1974.

\textsuperscript{23} Id.

\textsuperscript{24} Id.
many tractors as in 1965. During this period the tractor-ploughed area has about doubled. Clearly however mechanization on the land could be greatly expanded.

When these various techniques—high-yielding grains, irrigation, increased fertilizer, and expanded mechanization—are fully utilized, China should be able to increase its production of rice, wheat and coarse grain by between 15 per cent and 40 per cent, thus providing for population increases, improving diets, and supplying a surplus for export.

### C. Welfare Services

Welfare services are well developed. During a brief tour in the country, the visitor can easily see one million persons—city workers on their way to factories in the early morning, peasants in the fields during the day. Everybody appears adequately dressed, soundly nourished, and basically healthy. As several observers have remarked, community hygiene has reached an unusually high level for a developing country. Priority in health services is directed at rural communities, with emphasis on preventive rather than curative medicine. Medical services in the countryside are matched by education facilities and other “social capital” such as community halls and recreation centers, all of which help to reduce the general poverty and backwardness which afflict the rural areas of many developing countries.

This development of the countryside, where 80 per cent of the populace lives, helps to eliminate the “pull” phenomenon exerted by cities in virtually all other parts of the developing world. The population explosion of developing countries often expresses itself through the flood of people trekking to the cities, seeking work, shelter, and subsistence. Moreover, this “pull” factor is often

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25 Henle, supra note 3, at 152-55.
27 Arriaga, E.E., Urbanisation and City Growth in Africa 9-18, paper read at African Regional Population Conference, Accra (December 1971); Breese, G., Urbanisation in Newly Developing Countries (1966); Breese, G., The City in Newly-Developing Countries (1968);
compounded by "push" pressures from the countryside; due to insufficient land to ensure every peasant a tolerable-sized plot. In some cases, such as several countries of East and West Africa, this movement is due to a shortage of land. In other cases, notably in South America and parts of Southern Asia, it is due to maldistribution of land: feudalist landlords owning disproportionate amounts of land. Prior to the 1949 Revolution, 80 per cent of China's farmland was in the hands of landlords and rich peasants. A principal priority of the new government was to redistribute land.

In most other Third World countries, the combined consequence of the pull/push phenomena is that cities are no longer urban communities in the usual sense. Rather they are aggregations of people enduring an exceptionally abject living style, with all manner of pollution for the human condition through unsanitary environments, disease, and general breakdown of life-support systems in settlements of extreme squalor and poverty. By contrast, China now experiences an appreciable emigration of people from cities to countryside. To be sure, this outflow is state-directed, a consequence of the Cultural Revolution. Yet the author finds, so far as he can determine through conversations with scores of professional persons, students and workers, that the process does not seem to have been resisted as much as the outsider might expect, since welfare levels in the countryside are rapidly catching up with those of urban areas.

II. Present Conservation Practices

While tackling environmental problems of current economic development, China has had to deal with a huge backlog of environmental impoverishment—a consequence of centuries of over-stress of physiobiotic systems. Thus China's attempts at environmental conservation can be considered under two broad headings, restoration of natural environments and management of technological environments. The first includes measures to halt and reverse soil

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Information given to author by officials of communes near Peking and Canton, August 1974. See also Buchanan, supra note 18.
erosion, regulate water systems, and replenish forest stocks. The rapidly expanding technological environments are managed through control of pollution in the atmosphere and water bodies, and through recycling of industrial waste.29

A. Restoration of Natural Environments

As soon as the Communists came to power in 1949, they instituted a policy of regeneration of natural environments. A heritage of deforestation, erosion, floods and droughts had led to greatly decreased carrying capacity for natural environments in a country which depended almost entirely on the land to support itself.30 Natural catastrophes reached proportions known in few other parts of the world. For centuries disasters were regular, after 1800 they became normal, by 1900 they were continuous. Especially in northwestern parts of the country, the light loess soils (actually unstratified loam, formed from dust blown in from the desert over millennia) had been eroded until extensive tracts of landscape were barren. Equally critical, the eroded soil accumulated as silt in the lower reaches of the Yellow River, raising the riverbed above the surrounding plain and thus making floods more frequent and more destructive. As in other river valleys of China, the alluvial soils supported peasants at high densities,31 so these areas were exceptionally susceptible to natural disaster. During the past 2000 years, the Yellow River has burst its banks and dykes 1500 times, and has changed its course 26 times with massive loss of life on each occasion.32 Following the start of Communist rule, the goal has been to stabilize a fragile situation, through therapeutic programs such as water conservancy and reforestation.

Since the 1959-61 drought, China has encountered no catastrophe of too little or too much water.33 The poor rains of 1972, which brought food shortages to many parts of southern and eastern Asia, did not prevent China from increasing its grain output to a record

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29 In Tanzania and Zambia, where Chinese engineers have been constructing a railway, local people have been struck by how the Chinese look out for nails and other scraps of metal for recycling during their daily rounds.


31 The eastern one third of the country supports nine-tenths of the populace.


33 Id. HENLE, supra note 3, at 193-98; Chen Shang-Kuei, Small Projects First, 8 CERES 38-40 (1975).
level. Throughout Hopei Province surrounding Peking, an area with a record of 400 droughts and 400 floods in the past 600 years, 1972’s precipitation amounted to only one-quarter the average. Despite this driest year since 1920, the province’s 44 million people produced more food than ever, due to mammoth projects for water conservation. In this and several other provinces, enormous numbers of dams and canals have been constructed by virtue of 25 billion man-days each year devoted to water conservation and other land-rehabilitation schemes, undertaken during slack periods of the agricultural year. Extensive waterworks likewise permit an expansion of irrigation systems. Around 35 per cent of China’s cultivated land is now irrigated, as compared with a mere 15 per cent in 1949, thus explaining why China can now feed almost twice as many people, and feed them better, as it could 25 years ago.

Unfortunately irrigation brings an environmental backlash through bilharzia. As water channels spread, so do parasite-bearing snails, especially in China, due to the widespread use of “night soil”—a first-rate fertilizer derived from human wastes but a potential source of much infection. Bilharzia is now reckoned to be China’s most serious health hazard, notably in the Yangtze and Si Kiang (Pearl) River systems. It is particularly prevalent among paddy-field workers, but has been reduced to very low levels. Vector snails are killed through spraying toxic chemicals into irrigation ditches, or through mechanical means such as burying them in channel bottoms. A further approach is to cover human excrement fertilizer with earth for twelve days, so that increased temperature can kill pathogenic organisms.

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34 Information given to author by officials in Peking, August, 1974. See also Henle, supra note 3, at 199. According to the recent report, Food and Agriculture Organization of the United Nations, State of Food and Agriculture 1974, (F.A.O., Rome, 1975) mass labor during the 1973/74 winter season brought 4.2 million acres into new cultivation, levelled 6.8 million acres of hilly land, terraced 1.2 million acres, and opened up 2.1 million acres of former wasteland for food production. Other developing countries, with massive un- and underemployment in rural areas during slack times of the year, could well emulate this use of manpower, their principle agricultural resource. The aim of the economy of a developing country should often be production by the masses rather than mass production.

35 Information given to author by officials on communes near Peking and Canton, August 1974. See also Henle, supra note 3, at 136-39.

36 According to the World Health Organization, bilharzia is now the world’s most prevalent parasitic disease, ahead of malaria. It is estimated to afflict 250 million people. It is also spreading more rapidly than any other disease. As mammoth water projects such as the Aswan Dam in Egypt extend irrigation, bilharzia claims millions more peasants each year. China is the only country to achieve widespread control of this form of pollution of the human environment.

37 As illustrated on a commune visited by the author near Canton, August 1974. See also Cockrill, supra note 20.
There is much evidence of the effectiveness of China's reafforestation program. Valleysides and hilltops are covered with plantations. From 1949 to 1960, 130 million acres, an area almost the size of Texas, were planted with trees. Since the start of the Cultural Revolution, each year has seen the planting of at least 25 million acres until total forests, both natural and man-made, now cover approximately 500 million acres, a three-fold increase during the past 25 years. The emphasis is less on production forestry than on afforestation, shelterbelts, dune fixation, and dike consolidation. A "great green wall" of forest belts is being established along desert borders, totalling over 2,000 miles of windbreak strips and soil stabilization measures, preventing sheet erosion and crop damage from desert winds, which reach a speed over ten miles per hour for at least two-thirds of the year. Forestry programs also cater to recreation and amenity. In urban forestry, China is among the leaders of the world.

This reafforestation program not only supports general environmental health, but also provides fuel wood and building materials, taking pressure off of virgin forests. Much of China's depleted wildlife, notably deer and pheasant, survive only in relict patches of primary forest. After centuries of depletion, most of these creatures are no longer declining in numbers and range. China conserves its wildlife and genetic resources in part for strictly pragmatic benefits. Gene reservoirs serve increasingly as a support for agriculture, medicine and industrial processes. For example, the Chinese use an extract from the dature flower, a poisonous plant, to anesthetise the body during surgery. The soybean, with origins in China, is now one of the world's most important crops because of its high protein content. The Chinese recognize the potential of their diverse array of soybean germ plasm available in the wild state, and they are collecting as many different strains as possible. Since 1971 they have developed plans for taking general stock inventories of genetic reservoirs, through, for example, a six-month survey in 1973 of one quarter of a million square miles in the south-east sector of the Chinghi-Tibet Plateau, where a research team from the Chinghi-Tibet
Institute of Biology collected more than 30,000 specimens of plants, insects, fishes, amphibians, reptiles, birds and mammals.

B. Conservation of Technological Environments

1. Atmospheric Pollution

In a number of China's urban areas, atmospheric pollution is pronounced. It is, however, different from the pollution which characterises many Western-world cities, since the limited number of vehicles produce no photo-chemical smog and minimal exhaust fumes. In winter, however, the urban populace burns large quantities of coal for heating, resulting in a haze which spreads over Peking, Shanghai, and other large cities.

The level of industrial pollution varies considerably from one locality to another. Many of China’s urban areas contain a relatively low density of factories, due to the moderate degree of overall industrialization and a policy of dispersing light manufacturing and processing plants to communes in the countryside. But in Peking, on more days than not, atmospheric contamination cuts visibility substantially. In the lower Yangtze Valley, the city of Soochow is especially blighted with smoke from scores of exhaust stacks. Steel centers such as Anshan, and other industrial localities such as Wuhan, Tientsin, and Harbin, lie under smoke palls of varying intensities.

A campaign to reduce pollution has developed in the past few years. Smoke-stack scrubbing devices recover sulphur, carbon and other scarce materials, with the result that smoke effluent becomes less thick and black. These anti-pollution measures also serve to help public health. Sulfur dioxide from Peking’s Shih-ching-shan steel and iron factory, for example, has been reckoned a factor in enlargement of the liver among school children.

To term these measures “clean-up activities” is a misnomer, however, since the principal aim is usually to recover scarce resources.

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43 The use of coal for domestic purposes may soon be reduced in the southern half of China. A factory in Shanghai recently turned out 1000 solar-energy stoves. Looking like an inverted umbrella, the stove requires 30 minutes to boil six pints of water, and 15 minutes to cook 2 1/2 pounds of rice—periods much the same as those required with a coal stove. During several months in the middle of the year, the noonday temperature in southern China reaches 24°C or more, which allows the stove reflector to reach 450°C. But a solar-energy stove is dependent on the warm parts of the day, whereas much cooking occurs at evening time. Nevertheless, a stove of this kind could prove especially useful for tropical countries whose principal (though largely unused) energy source is the sun, and whose usual forms of energy to date are derived from oil together with oil-generated sources such as electricity.

The Chinese centuries-long record of scarcities was continued during the 1958-1962 period, when droughts and famines were coupled with economic catastrophes of the Great Leap Forward and the withdrawal of Russian technological aid. Since that traumatic period, the Chinese have opted for a policy of strict self-reliance, even though it means that they must make out with a narrow margin of surplus of many raw materials.

This conceptual approach to atmospheric pollution underpins many specific procedures which the Chinese adopt with regard to environmental contamination. The same approach could apply in other developing countries, whether or not they favor China's political orientation. If anti-pollution initiatives promote extreme economizing in the use of strategic and scarce materials for production processes, and if they cater to public health at the same time, little purpose exists for arguing which should serve as principle originator for the initiative. Until a developing country attains a significant degree of industrialization and a fair level of affluence, it does not need to engage in precise comparison of various benefits in order to determine an appropriate allocation of funds between competing purposes. These two goals are often complementary in a developing country, whereas in a developed country, where the respective contributions are likely to be much more marginal, they sometimes conflict.

To promote their approach to pollution problems, Chinese leaders urge factory managers and workers to devise more economical processes for production, and to collect waste of every sort for processing. For example, factories in Canton extract soot from their emission systems for reuse in a variety of ways. A Dairen plant which manufactures sulfuric acid now treats its effluent in order to recover sulfuric acid fumes and ammonia for eventual utilization in fertilizer production, and as a consequence reduces the health hazard attributable to its polluting discharges.45 Both of these practices are in line with a dogma that "[t]here are no wastes, but only things that are left unused; there is nothing that cannot be used. What is waste and what is not waste are relative terms. Waste under one condition may be valuable under different ones. Waste materials can be transformed into useful things, and the harmful into the beneficial."46

45 "Id.
46 Chi Wei, Turning the Harmful into the Beneficial, Peking Review (January 28th, 1972); and Hua Ching-Yuan, In Multipurpose Utilisation of Materials, it is Necessary to Promote What is Beneficial and Eliminate What is Harmful, People's Daily (September 7th, 1971).
2. **Water Pollution**

Since the losses and risks entailed in water pollution are considered more immediate and serious in impact than those in atmospheric pollution, a more intensive rehabilitation program is necessary. The Si Kiang River, which flows through Canton, at one time received untreated waste from dozens of factories. Now the river is clean enough for swimming. By contrast, the Siang Kiang River, which flows through Kweilin, a provincial town with less industry and hence less incentive to check on the river’s health, still receives factory effluence after only marginal treatment. The water looks clean enough, and a local fishing commune reports no fall-off in catches. But municipal authorities declare themselves apprehensive in the face of growing industrialization, and are to start to monitor the river’s levels of contamination.

Until 1970, the Huangpu and Suchow Rivers in the Shanghai area served as sewers for many local industrial activities, such as paper and chemical fibre manufacture, and production of tanned, printed and electric-plated goods—all highly polluting processes. After being adapted to yield thousands of tons of fertilizer as a by-product each year, these industrial activities are less contaminating. Furthermore, the rivers have been rehabilitated through removal of over 400,000 tons of organic mire.\(^{47}\) Waste water is treated until it is clean enough to irrigate nearby farmland. In 1973, Shanghai extracted 120,000 tons of raw materials worth around $12.5 million from its waste.\(^{48}\) For example, a highly effective insecticide, in an amount sufficient to treat 1500 acres of farmland, was produced from 11.5 tons of cigarette butts.

3. **Recycling of Industrial Waste**

Industrial centers feature many diverse forms of waste recovery. Wuhan’s iron and steel works feature a multitude of by-processes,\(^{49}\) converting cinders and slag into house bricks, phosphate fertilizer, road metal, and cement.\(^{50}\) At Kirin, 100,000 tons of calcium-carbide sludge from chemical manufacturers are converted into cement, thus relieving a disposal problem as well as assisting industrial out-


\(^{50}\) As much as 40% of China’s cement is reputedly made from steel slag. Berger, R., *Growing Resources Matched by Modern Skills*, The Times (London), October 2nd, 1974.
At Hangchow, papermill waste—among the worst contaminants of water systems—is converted chemically into liquid fertilizer. In Canton, pesticides are derived from otherwise useless poisonous chemicals. In many areas, pulp and paper mills established during the Great Leap Forward have been abandoned after pollution proved to be too costly to control adequately. In Peking, a large petro-chemical complex degrades acidic effluents through techniques which yield water for irrigation and for fish and duck ponds. In many of Peking’s garbage disposal facilities, a process of fermentation and compostation removes harmful bacteria before the rubbish is transformed into fertilizer. Peking’s chief port and a major city in its own right, Tientsin, has established eleven industrial complexes during the past 20 years, contributing to a fourfold increase in its population. The local sewage facilities were not given sufficient priority to cope with this expansion, until pollution of Po-Hi Bay disastrously reduced prawn, crab and other traditional fisheries. The effluent is now treated until it is fit for irrigation, producing crop yields 30 per cent higher than obtained with river or rainwater irrigation. Tientsin likewise recycles fish waste into ingredients for medicine and health foods, powders fish shells as an additive for chicken and duck fodder, and uses its furnaces to produce blue anti-damp bricks and cement.

The efficient use of scarce resources is demonstrated through many other industrial processes. The Chinese now achieve electroplating without the use of cyanide, dehair hides with enzymes, convert fluorine into cryolite, produce pharmaceuticals from pig guts, transform fungus materials into medicines, convert metallurgical tail gas into sulfuric acid, make yeast out of wine residue, and recover carbon bisulfide from chemical fibre production. Instances

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52 Westoby, J. (formerly Director, Office of Forest Resources, Food and Agriculture Organisation of United Nations), personal communication (1975). See also Westoby, supra note 38.
53 According to Sebastian, supra note 51, the process of bio-chemical purification occurs in several stages. Hydrogen sulfide is removed and made available for recycling through steam stripping. Then processes of sedimentation, flotation, and chemical-induced coagulation cause materials to collect at the bottom of containers and oils to collect on the surface. A laboratory culture of organisms assimilates phenol compounds. These processes leave the water clean enough to raise fish and ducks, and to irrigate cropland, while skimmings from the flotation process are used by farmers for soil conditioning.
abound of recycling seemingly trifling resources. For example, at a crane factory in Peking, iron filings are carefully collected for recycling; at a fruit processing plant on a commune near Sheoshan, husks and even fruit stones are crushed for fertilizer; and at a building materials unit in Changsha various forms of waste are used for road construction materials. In many areas, a new factory cannot commence operations until it satisfies local officials that it will seek productive uses for its by-products, and will make adequate efforts to eliminate the four wastes—waste liquid, waste gas, waste slag and other solids, and waste heat. This restriction contrasts with the situation in industrialized nations, where the institutional milieu encourages factories to be established with implicit indifference to the social costs of their industrial processes. In general terms, the Western-world framework of marketplace mechanisms, legal codes and political systems, has for centuries tended to favor the rights of private property, in disregard of “community property” such as the atmosphere and water bodies. There has been, perhaps, little need to safeguard these natural resources as long as they were unlikely to suffer gross degradation. This situation has engendered an institutional environment where private interests flourish, often at the expense of society’s more general interests. In China, a proposal for a new factory encounters a set of constraints whereby the asymmetry of institutional safeguards tilts the balance in favor of community concerns.

III. Conservation Rationale

These illustrations indicate how China is developing a strategy of its own for environmental conservation. In conceptual analysis, in policy formulation, and in application, China’s approach differs markedly from that of the industrialized West, from that of centrally-planned economies such as the Soviet Union’s, and from that of most other developing countries. Since China’s needs and opportunities differ from those of other countries, certain of China’s principles and practices prove of limited validity elsewhere. To large degree, however, China’s unique approach is due to the institutional innovations of contemporary Chinese society—not all of which are part and parcel of the Chinese version of Communism and development.

56 For a discussion of institutional asymmetry which tends to favor environmental degradation, see Mishan, E.J., Technology and Growth: The Price We Pay (Pelican Books, 1969).
A. Contrast with the West

Insofar as the Chinese have developed a conservation strategy which reflects their experience of scarcity of raw materials, their approach is fundamentally different from that of the West. In the developed countries, major pollution started to occur roughly from the beginning of the "throw-away economy." This phase has featured expanding exploitation of extensive stocks of natural resources, a trend aggravated by built-in obsolescence of products. This experience is altogether alien to China, so its scope and need for conservation diverge significantly from the West's.

At the same time, the West is now finding that certain goods and services of the natural environment are coming into acutely short supply. One major example is the shrinking capacity of the atmosphere and water bodies to absorb effluence. Community resources such as these are degraded or depleted in the West primarily because of institutional deficiencies. Pollution does not generally arise through wantonly irresponsible exploitation of the natural environment. All too often the responsibility has been difficult for an individual to discern, considering the lack of economic, legal, and social constraints to help a polluter perceive the impact of his activities on natural resources. Natural resources have essentially been viewed as "free goods." Theoretically, these natural resources, such as the atmosphere and water systems, belong to everyone. In practice, however, the public has possessed no identifiable property rights in such resources: no one has owned them, no one has been vested with institutional capacity to protect them. Everyone's business has been treated as no one's business. Thus natural environments in the West have been misused not as much through design on the part of ill-intentioned individuals, as through default of institutional provisions to safeguard them.

Of course, this analysis over-simplifies the situation. It overlooks, for example, the public trust doctrine. By invoking the community's interest, many Western nations have achieved some success in reducing pollution on the part of individual entrepreneurs. Nevertheless, this brief review of pollution in the West points up the institutional framework in industrialized countries, which tends to

encourage environmental degradation by individuals, and offers limited capacity for the community to act qua community to safeguard resources of common heritage.

These shortcomings of institutional capability in the West could be further corrected if the Chinese approach to common property were to be adopted. The community's responsibility for social goods such as clean air should be made more explicit. It should be institutionalized through some form of property rights and protection capabilities for common property resources of the natural environment. Obviously this approach, with its emphasis on community welfare rather than on individualist values, is readily available in a country with China's political orientation. But the approach is far from impossible in "free democratic" societies, were the increasing necessity for it to be recognized.

A question arises as to how far the Chinese strategy can be maintained as China pushes ahead with economic development. Hitherto the country is little industrialized—a situation at variance with that in Western nations which have a long history of industrial advancement and consequently have experienced severe pollution prior to the formulation of corrective measures.

B. Contrast with the Soviet Union

China's approach to conservation likewise diverges from that of other centrally-planned or socialist economies. The Soviet Union might be expected to avoid the pollution problems which afflict the West, since its economic system is not based on private enterprise and the individual profit motive—both factors which tend to act with implicit indifference to society's welfare. Yet in certain sectors of the Soviet Union, environmental contamination is virtually as severe as in the West. Lake Baikal, like Lake Erie, is critically polluted by industrial effluence. "A study of pollution in the Soviet Union suggests that abolishing private property will not necessarily mean an end to environmental disruption. In some ways, state ownership of the country's productive resources may actually exacerbate rather than ameliorate the situation."

This phenomenon arises because Russian planners use the individual production unit as the measure of economic efficiency. The factory manager's responsibility is to meet production quotas, not to protect environmental quality. The Russians find it hard to include social costs in their factory-pricing arithmetic. If the manager

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is required to implement pollution controls which prove expensive, he will accord them minimal attention insofar as they upset his productivity norms. So profit and loss is perceived through perspectives far narrower than society-wide considerations.

The problem arises because of inadequate terms of reference for factory management and production processes. In turn, this deficiency derives from the present Soviet economic system, which in certain respects resembles state capitalism as much as socialism. Although the proximate cause of industrial pollution lies with excess emphasis on a limited sphere of activity, the fulfillment of production quotas, the principal cause lies with the constricted concept of production's benefits. When production tends to be pursued for production's sake, without clear regard for its impact on human welfare, its consequences may not always be beneficial. Moreover, it is easy to measure a manager's achievements through productivity criteria, since the material outcome of his efforts is immediate, visible and quantifiable. If he devotes attention to safeguarding environmental values, the results will often be delayed, dispersed, and less commensurable. To overcome this problem, the manager needs to be given incentives to pursue community objectives apart from material goods, even though these further purposes may not so readily lend themselves to evaluation through economic criteria. To Soviet planners, with their penchant for apparent precision in economic calculation of gains and losses, the challenge of incorporating imponderable factors such as clean air and water seems a "fuzzy" field indeed.

The Chinese meet the issue by concluding there is no acceptable economic answer. They transfer the question to the one area which they believe is capable of resolving the problem: the political sphere. They weigh the pros and cons of factory productivity in accord with what might be termed "social utility value" since a factory's ultimate output is supposedly an increase in human welfare, how far is this objective served by what decrease in pollution, at what cost to material production? Of course this assessment is possible only in a highly politicized system that sets a premium on all-round living levels, both material and non-material. The assessment also depends on a sufficient cadre of officials who are impelled

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55 Id.


57 KAPP, supra note 60.
by ideals of "serving the people." As a visitor to China quickly discovers while talking to managers of factories and communes, a cardinal quality among officials is "political attitude," i.e., a commitment to socialist precepts. Without this key attribute, all professional expertise is considered to be of no avail.

Thus the problem of a centrally-planned economy can be readily tackled by the Chinese. They determine that technological advancement shall be answerable to social welfare. In other words, they reverse the dependency relationship.

C. Contrast with Other Developing Countries

With the possible exception of Cuba, developing countries are inclined to define social welfare in terms of expanding GNP and other economic parameters of national advancement. The Chinese not only see these modes of development as too gross to reflect citizen welfare, a criticism frequently heard in the West, they also see them as generally irrelevant for basic determinants of development policy. Instead the Chinese identify aspects of human welfare which they wish to promote. Then, and only then, they examine options for economic mechanisms to achieve these goals. Of course, there is a certain amount of feedback guidance from economic constraints. The Chinese recognize that they cannot aim for perfectly clean skies and streams, since the cost would be prohibitively high in relation to benefits. This analytic procedure enables the Chinese to build into their strategy whatever environmental measures they believe are consistent with the objective of net social utility.

D. Eco-development

Overall the Chinese now appear so attentive to environmental factors that their development policies express a new concept: eco-development. Briefly defined, this is a form of development which fosters economic advancement in accord with ecological determinants. It is predicated on the thesis that there can be no long-term economic development without attention to ecological imperatives. Conversely, ecological factors are not the only absolutes at issue, since environmental conservation for an emergent community must derive a large measure of its validity within a context of development aspirations: "economic development and social progress are the indispensable prerequisites for the protection and improvement

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62 See Henle, supra note 3, at introduction.
63 See Kapp, supra note 60.
of the human environment.”

To this degree, the Chinese view development and conservation as two sides of one coin. This orientation for China's development program is a reflection once again of the key factor in the country's environmental strategy: the institutional framework that facilitates, rather than impedes, environmental conservation. In fact, China's political and social milieu is of such significance to an understanding of the Chinese approach to environmental problems that it merits consideration in more detail.

**E. The Politico-Social Framework for Conservation and Development**

In the Chinese view, development aims at the satisfaction of basic needs for individuals and society. In certain aspects, this goal can be attained through the provision of material goods and the Chinese do not disregard the value of material progress. In fact, much of their success has been achieved in this area. They continue to place great stress on production of factory and farm.

On the other hand, the Chinese economy derives no impetus from advertising, and the social milieu often inhibits as much as stimulates consumer demand for material goods. Much personal well-being stems from non-material sources such as a sense of community. A Chinese peasant or factory worker may not regard a full belly, adequate housing or better education and health as the main attributes of life in contemporary China. He may well stress his sense of belonging, of playing a recognized part in society. This may seem incongruous to a citizen of a consumer-oriented country, where individualistic inclinations tend to be emphasized. There is little doubt, however, that many Chinese derive satisfaction from their country's social cohesion. This support from the social environment induces less demand for material goods, whose production often leads to degradation of the natural environment.

Nonetheless, increasing affluence, albeit of modest degree, may soon cause some stratification of society. Already there are “haves” and “have-nots.” On the streets of Peking and at the Great Wall, a few people sport cameras. Only some can afford to wear watches. A watch, like a radio, is considered a perquisite of improved living standards, and desired as such. Perhaps the demonstration effect by

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the more fortunate or ambitious members of society will eventually stimulate envy among those who feel they are somehow left behind. In the meantime, however, the extreme spirit of egalitarianism protects the community from feelings of relative deprivation among individuals.

These broad perspectives help the Chinese to recognize where material progress conflicts with human welfare. Living standards depend in part on welfare amenities such as a healthy and agreeable environment. China’s ultimate objective, loosely described as “socialism,” appears to be a community where individuals and society at large attain a high quality of living. In achieving this goal, material advancement has a definite but limited function. Thus economic development is but a single facet of social development.

This conceptual framework is important for Chinese evaluation of economic activities, especially where such activities run counter to other considerations such as environmental safeguards. When the Chinese wish to assess the value of an economic enterprise—a factory, a reafforestation program, an anti-pollution measure—they do not measure it merely in terms of economic benefits and costs. Rather they invoke social performance criteria which they consider a better reflection of their society’s aspirations. What does the enterprise contribute to the entire socioeconomic environment? Does it detract from the physiobiotic environment? Considerations of profit and growth are viewed not as a starting point but as a consequence of planning policy. After all, the economy serves to allow people to earn a living and thereby their daily bread, while profits are a separate and subordinate aspect. In the process known as “building socialism,” the Chinese seek to advance the overall welfare of society in both economic and non-economic terms. At the same time, they seek to establish an equitable equilibrium among society’s structural components, a process which, they believe, will automatically generate economic expansion. This strategy is the reverse of the development path as derived from Western-world principles, which appear to rest on the assumption that profits are the best medium for economic advancement. The strategy also diverges from Soviet-system models, where the emphasis is on production as the principal means for development.

66 The Chinese are assisted here through their cultural and philosophical background. Taoism has taught that human satisfaction depends on a spectrum of factors, among which material prosperity constitutes a single limited means for the attainment of individual well-being. See also infra note 82.
67 See also Henle supra note 3, at introduction; Kapp, supra note 60.
F. Welfare Criteria for Social Goals

Within this frame of reference, the Chinese cannot accept the marketplace as a reliable guide to people's desires. Market mechanisms demonstrate only "revealed preferences" which reflect the ability of people to pay. People do not all earn alike, cannot pay alike, so the marketplace presents a distorted picture of people's "real desires."\(^{68}\) Free markets cannot evaluate social goods and collective needs, such as clean air, forest cover, gene stocks, and ecological equilibrium in general. Nor do free markets foster sustainable exploitation of "society resources" such as raw materials. To cite Chinese dogma: "Socialist production must serve proletarian politics, and the function of all socialist enterprises must be geared to the entire revolutionary situation, to the requirements of people throughout the country and the welfare of future generations."\(^{69}\) In other words, to evaluate economic activity, do not use the measure of supply and demand in market terms, but of supply and need in human terms.\(^{70}\) The Chinese do not seek corrections for imperfections of the marketplace, since "fine tuning" of its economic mechanisms can lead only to marginal improvements of a system that is often basically out of kilter with society's goals. The marketplace is subject not so much to minor deficiencies as to outright failures. Consequently the Chinese seek institutional alternatives to serve as primary vehicles for policy. In their view, there is a straightforward solution: "Put politics in command."

This is not to say the Chinese ignore economic factors. They apply criteria of market mechanisms, while not allowing them to dominate decisions. They watch for consumer evaluation of products as signalled through competitive markets. They constantly seek to adapt the design and price of goods large and small: clothes, radios, bicycles, machinery and heavy equipment, crockery, food supplies. They introduce changes in response to information from the marketplace, which is recognized as a sensitive milieu. But analysis of consumer preference is confined to a restricted sphere of evaluation. A marketplace proposal for change may not accord with criteria derived from a broader appraisal context based on social and political values. For example, demand for expanding supplies of cheap paper may not be consistent with the need to husband forest resources or to tighten anti-pollution measures in pulp mills. The

\(^{68}\) For further treatment of this topic, see KAPP, supra note 60.

\(^{69}\) Hua Ching-Yuan, supra note 46.

\(^{70}\) See KAPP, supra note 60.
appraisal is shifted from the micro-context of individual customer evaluation, to the macro-level of societal welfare.

In certain respects, the Chinese employ methods of economic appraisal akin to those used in the West when assessing pros and cons of a development project. They engage in a form of input-output analysis and cost-benefit or cost-effectiveness analysis in order to maximize gains while minimizing expenditures. They evaluate economic tradeoffs of environmental safeguards through, for example, a comparison of labor opportunity costs of one course of action with costs of another. If a commune wishes to consider building a new dam for water conservation, the local community tries to put a “price tag” on the project’s environmental benefits and costs, by asking what the commune will have to forego in terms of man-days otherwise devoted to agricultural production or to planting additional forests. In this manner, the Chinese use labor as a measuring rod for assessing the comparative merits of different opportunities. Within the ethos of their society, this method constitutes a more accurate reflection of costs and benefits than could be derived from market prices. A similar assessment is available through analysis of related resources such as capital equipment as a standard by which to compare different courses of action. To be sure, managers of factories and commune enterprises do not yet have anything like a specific code to guide them. They are still developing a technique to serve their eventual aim of a systematized strategy, to determine environment/economic trade-offs in specific instances. Meantime, they apply the strong pragmatic streak which they have developed through centuries-long experience of organization and administration.

It is hardly possible to over-emphasize the grass-roots contribution to the analytic process. Factory-bench workers and commune peasants regularly engage in discussion about “political” aspects of their community’s activities, notably welfare dimensions of economic decisions. This is important in ensuring that the “real needs” of local citizens are met when a development project—a new crop or a medical facility, an intensified production method, or a conservation measure—is under consideration. To this extent, the institutional unit of factory and commune supports the principle of local responsibility for production processes—which includes factors such

71 See Kapp, supra note 60.
72 This analytic technique was demonstrated to the author by officials at a commune near Peking, August 1974.
73 See Kapp, supra note 60.
as pollution by-products. Local authorities are inclined to care for the health and general welfare of the immediate community, whereas central planners may be overly preoccupied with production for its own sake. The same applies to concern for environmental amenity. As a specific precept of China’s organizational system, the authority of the “line,” i.e., the vertical dimension of the planning hierarchy, is counter-balanced by the horizontal authority of on-the-ground representatives. Of course, a drawback to this process is that proletarian discussion groups may not have the information and expertise to offer adequate opinions upon, for example, conflicts between ecological welfare and economic needs.

G. Eco-Development and Non-Economic Values

The Chinese strategy thus permits opportunity for non-economic values to be considered in conjunction with strictly economic factors, facilitating eco-development, with its capacity to promote rather than deny environmental values. Far from viewing a forest tract merely as a resource to be “mined” for the short-term contribution which its timber products make to the economy, the Chinese procedure enables policy-makers to see it as a resource available for a variety of uses on sustained-yield basis. Although many Western planners try to view forest resources in the same way, they are thwarted by the immense pressure of marketplace forces which seek to profit from the forest within short-run time horizons. Whereas Western planners tend to invoke political constraints and broad social determinants towards the end of the evaluatory process (often through a fine-grain form of cost-benefit analysis), the Chinese stress the importance of socio-political input from the start.

In the West, private advantage tends to operate within a time scale of a decade at most, given present discount rates for investment. Society’s interest, by contrast, extends into the indefinite future. The Chinese know nothing of private profit within telescoped time-frames, since their system denies the concept’s validity.

Nor do their environmental planners find they have to swim ever harder merely in order to keep abreast of a tide of purely economic development with its environmental disruptions. On the contrary, the Chinese pursue a form of development with built-in scope to safeguard and enhance environment values.

If, then, the Chinese wish to consider a forest tract for exploitation, planners use political authority to appraise the prospect in terms of environmental, economic, social, and even cultural gains
and losses. If they subsequently elect to give total protection to a forest because of its watershed or recreation values, political levers of decision are used to implement the policy without having to consider an outcry from frustrated private entrepreneurs. The system entails the risk that sometimes excessive emphasis is given to non-economic factors. This is not a significant defect, compared to the excessive exploitation caused by marketplace forces in private-profit economies.

The only tropical forest tracts of worthwhile extent in Southeast Asia to survive beyond another two decades could well be those of southern China. In most other parts of the region, forests are being cut at a rate which will mean their virtual demise by the end of the century.74 Already most forests of lowland Malaysia and the Philippines have disappeared, while those of Indonesia will be severely reduced within another ten years. Under long-term exploitation programs, these forests could be managed as renewable resources. The present pace of exploitation, however, causes them to be treated as non-renewable resources, since hardwood communities are unlikely to be left with sufficient time to replenish themselves before they are reduced to remnants beyond capacity for restoration. Forests are felled by private entrepreneurs seeking to meet worldwide need for forest products such as veneer, plywood, and pulp and paper. Thus both demand and supply are determined by free market systems which reflect the perceived needs of private persons. By contrast, society's long-term needs are disregarded by default. The forests in question rank among the richest on earth in terms of species diversity. Plant and insect species are especially numerous. Given experience to date, it is a statistical certainty that they contain many sources for new foods, beverages, medicines, fibres, resins, and other products of peculiar use to Southeast Asia. The marketplace, however, does not recognize potential uses, only actual needs. It does not reflect society’s varied requirements, only economic demand on the part of individuals (whether entrepreneurs or consumers). Western individualism combines with developing world insistence on immediate economic advancement to produce a situation where society’s

74 Author’s own experience in S.E. Asia. See also ASIA/PACIFIC FORESTRY COMMISSION OF FOOD AND AGRICULTURE ORGANISATION, FORESTRY TRENDS IN THE ASIA-FAR EAST REGION (FO:APFC/73/5, 1973); Proceedings of a Symposium on Biological Resources and National Development, 5-7 May 1972, MALAYAN NATURE JOURNAL, Special Issue (Soepadmo and Singh, eds. 1972); PAPERS OF INTERNATIONAL MEETING ON THE USE OF ECOLICAL GUIDELINES FOR DEVELOPMENT IN TROPICAL FOREST AREAS OF S.E. ASIA (International Union for Conservation of Nature and Natural Resources, Morges, Switzerland, Poore, ed. 1975).
heritage in common property resources such as forest gene pools is subject to irreversible injury. The institutional milieu in both developed and developing countries serves to promote rather than impede destruction of these unique resources.

H. Priceless Assets such as Endangered Species

The Chinese system thus includes capacity to take account of those economic values which are difficult if not impossible to quantify in economic terms: the intangibles and incommensurables which are a bugbear of Western environmental planning. Although recycling of waste products—a major conservation activity in China—is easily amenable to economic quantification, some other benefits of social welfare significant to the Chinese, such as health, are not so easily measured. What dollar value is to be placed on a cleaner sky? Or on the survival in a hundred years time of a landscape of unique interest, such as a spectacular river gorge—which might meantime be developed for hydropower? The Chinese cannot pin down the value of safeguarding these environmental resources in sufficiently precise economic terms to allow them to be compared with competitive activities of development. Unlike Western practice, however, the Chinese give explicit attention to these factors throughout the planning process. Of course, certain countries of the West have recently taken steps to correct this imbalance. For example, the U.S. National Environmental Policy Act of 1969 mandates early consideration of environmental values in federal projects. But this measure extends only to governmental activities, and to private-enterprise activities in certain states. Not all Western countries have taken such extensive steps as yet. Developing countries in the main see this approach as antithetical to economic advancement, and international development bodies, such as the United Nations agencies and the U.S. Agency For International Development (AID), have not taken significant initiatives in this direction.

In particular the Chinese place much emphasis on avoiding damage to unique resources, even when that choice entails appreciable...
economic costs. For example, preservation of an endangered subspecies of tiger in Manchuria\(^{77}\) means passing up opportunities to exploit parts of the primary forests which form its habitat. In what the Chinese do not hesitate to call "human" terms, they believe the gains of tiger preservation outweigh the economic losses, so the community at large supposedly comes out in front overall.

American citizens can assert that they would like to see their black-footed ferret similarly preserved. The ferret is among the most endangered creatures in the world, due to competitive agricultural activities in its shrunken habitat in South Dakota farmlands. Were the ferret to be accorded adequate protection through extension of its habitat, the total economic cost to the United States of foregoing a few extra tons of agricultural produce would be trifling. Conversely—and this is the crux of the matter—the financial loss to the farmers in question would be far from marginal, in that they would forego opportunity to exploit their farmlands to the full. Within the American system, with its emphasis on private profit to be derived from private property, common property of society's heritage gets short shrift: the South Dakota farmers' interests are allowed precedence over the nation's needs. Millions of American citizens may be willing to pay an additional one hundredth part of a cent for their beef or bread to offset agricultural losses arising from protection for the ferret. But the American system gives them next to no opportunity to express their preference on a scale to withstand market forces, since they lack collective mechanisms through which to safeguard collective goods.\(^{78}\)

The problem of declining species illustrates the threats facing many unique resources of the natural environment: not only the

\(^{77}\) See Myers, supra note 42. The Manchurian tiger population has been depleted in part because of a policy until the late 1960's of deliberately reducing its numbers to counteract its depredations on livestock and occasionally on people. But the principal pressure, which has served as a contributory factor to the first point, stems from habitat loss. At the start of this century, Manchuria had only 3 million people. By 1953, the total had shot up to 51 million. Considering continuing trends of population growth in this region, and China's wish to industrialize the northeast, the population could soon reach 100 million. This process means that primary forests and other wildland habitats of the tiger have been progressively depleted as long as economic imperatives have been allowed to predominate over other considerations. The tiger's future now seems secure after China has established a series of reserves for its populations. Given China's readiness to ensure that non-economic factors such as tiger protection shall figure prominently in development planning, these reserves seem to face a better future than those in Southern Asia which have been set up to protect the Bengal race of tiger.

\(^{78}\) For further discussion of the common property status of wildlife and the problem this poses for conservation, see Myers, N., *Wildlife of Savannahs and Grasslands*, paper presented at Earthcare Conference, New York, June 4-8, 1975.
atmosphere, large water bodies, forests, and wildlife, but major ecological systems, soils, and biotic productivity of many important forms. As significant components of society's heritage, these resources deserve exceptional measures for their protection in order to serve community needs. Instead, they are treated, for reasons of institutional deficiency, as common property, and thus become subject to exceptional degrees of destructive use in order to serve individual needs (in the West) or limited-focus needs (in the Soviet Union). Few dilemmas are likely to press so hard on institutional systems in the future as those of common property resources, yet few problems are so poorly understood or have received such little investigation to date.79 Furthermore, the problem of common property resources illuminates a range of conflicting situations in societies with multiple interdependent relationships, and with capacity as well as need to exploit resources of many kinds at ever-more rapid rates. Problems of this sort arise wherever there is divergence between personal advantage and community loss, between what benefits a group within its own sphere of reference and what serves the needs of the social system at a higher level of organization.

The Chinese believe that environmental impoverishment in capitalist countries is due to the institutional setting.80 "The main social cause for (environmental contamination and degradation) is that . . . monopoly capitalist groups, which seek superprofits under conditions of serious anarchy in production, discharge, at will and in disregard of the fate of the people, harmful substances that pollute and poison the environment."81 Although this statement applies principally to capitalist societies of the West, the Chinese consider it only little less relevant to the way the Soviet Union manages its economy. Environmental conservation thus becomes a socio-institutional affair; in other words, it is basically a political problem.82 The Chinese approach derives support from the country's cultural traditions which affirm the recognition of relationships between man and nature.83 It has integrated this perception with

79 For further analysis of this point, see supra note 57.
80 See statement by the Chinese spokesman on Draft Resolutions for the Stockholm Conference on the Human Environment, Peking Review (June 7th, 1972). The point has been reiterated by Chinese delegates to Government Council sessions of the United Nations Environmental Programme in Nairobi in March 1974 and April 1975.
81 Hua Ching-Yuan, supra note 46.
82 See KAPP, supra note 60.
83 The ancient Taoist concept of Chinese culture emphasizes that man and society are integrated parts of nature. This relationship is characterized by many interdependencies. See also supra note 66.
socialism's view of relationships between ideology and socioeconomic advancement. This combination allows China to pursue development without precipitating unacceptable environmental degradation.

CONCLUSION

China has gone a long way toward achieving a trade-off equilibrium between economic development and environmental conservation. The experience has a number of insights to offer to other countries.

Despite their recent progress, the Chinese themselves insist they have a long way to go before they can claim success. Fortunately, their policy-making framework suggests that the achievements of the past few years may well be continued while the country engages in industrialization and economic expansion.

China's success to date reflects its response to a particular set of cultural traditions and environmental circumstances. Even more intrinsic to its own situation is the institutional framework within which its conservation policies operate. China possesses a political system, an egalitarian ethos, and socioeconomic aspirations which enable it to develop its unique approach to environmental problems. Without its commitment to politicization of its decision-making systems, China could not have accomplished as much as it has. Other countries may not be prepared to adopt this fundamental transformation of their institutions. In any case, the Chinese stress that each country must work its own salvation—for economic development and environmental conservation alike—in accord with its social, economic, cultural and political resources. The Chinese model is not for export in its entirety.

This is not to say that the outside world cannot learn a lot from China's experience. The developed world might recognize greater need to pay explicit attention to environmental values encompassed in common property resources of society's heritage. This would help to offset the effect of marketplace forces, which tend to stack the deck in favor of over-exploitation of these natural resources with implicit indifference to environmental values at stake.

China rejects economic criteria, especially those of the marketplace to evaluate environmental activities, except within a larger framework of socio-political values. Resources which are degraded through default in the West and the Soviet Union are conserved through design in China by virtue of direct political initiative. Without adopting China's ideological stance, developed nations could
institute collective measures to safeguard collective resources. But even this minor excursion into political economy may require more collective recognition of common goals than many Western societies seem capable of at present.

The developing world might consider that environmental conservation and economic advancement are not so much competitive as complementary components of development. Except within a development context, environmental conservation has little worthwhile to say in view of the extreme impoverishment of many human communities in emergent regions. Conversely, without conservation there can be no sustainable development. Planners might give less emphasis to economic expansion measured solely by absolutist economic criteria such as GNP. They might substitute a variation of development which equally serves human welfare: eco-development.