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River water chemistry in India–An overview

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Based on extensive analyses of a very large number of samples, the average river water in India is more alkaline than the world average river water. The dominance of Na and Cl in Indian river shows their monsoon control. There are spatial and seasonal variations. The northern river are less saline than the southern rivers. The sediments covered by the Ganges–Brahmaputra System is about a billion tons/a. Among the southern rivers, Godarari carried nearly 200 million tons/a sediments.

Studies on nutrient transport show the nature of their fractionation. Heavy metals are preferentially transported in their mobile fractions. Southern rivers carry large heavy metals relative to the Himalayan rivers. The particulates are enriched in metal relative to the bed sediments.

On the all–round use of the Daedong River and its water resource protecting measure

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The Daedong river is one of the important rivers which flows through Pyongyang, South Pyongyang province and North, South Hwanghe provinces.

The physiographic character of the Daedong river are: length is about 450 km, basin area is about 20247 km^2 and average year precipitate is 1050–1100 mm/a, the average outflow of Daedong river is about 14900 million m^3/a.

The characteristics of precipitate in this area are: every year in July–August of rainy season is 70–80 of annual precipate falls down but spring has very drought.

West sea barrage, Sunchon barrage, Ponghwa barrage and Mirim barrage were built on the Daedong river. Daedonggang hydroelectric power station has been built and Namgang and Nyongwon hyro–electric power station are now under construction. With the construction of many barrages in the Daedong river basin, the Dawdong river has turned into great artificial lake which has a storage capacity of 6 billion m^3 and effectiveness in using the water resources. By the west sea barrage the lower basin area of the Daedong river turned into fresh water region from brackish water region. Therefore Daedong river must be protected from industrial waste water and living waste water.

Speçially, in May–July of dry season, degree of pollution of Daedong river is highest and general pollution is high at big cities.

Value of BOD

Mirm	1957year.....1.16 mg/L
Daedong brige	1988year.....2.49 mg/L
Kangson	1988year.....2.3 mg/L
West sea barrage	1988year.....3.48 mg/L

For the purification of contamination of water, various methods are studied.

Pollution monitoring of the Bagmati River

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Chemical and biological analyses were carried out for the samples collected at different sites of Bagmati and its tributaries. The river maintains good water quality until it enters the urban areas. As it enters the urban area there is an ecological break down. The main causes responsible for the destruction of the aquatic ecosystem are the untreated sewage of Kathmandu and Patan, and the industrial wastewarers discharged directly or indirectly (through the tributaries) into the Bagmati river. The analysis of the data shows that the Bagmati river can be divided into 4 sections according to the different water qualities and biological features: (a) Zone of good ecological condition from the source to Guheshwari (b) Zone of slightly polluted conditions from Guheshwari to the mixing place of Dhobi Khola (c) Zone of severe pollution from Thapathali to Chovar, and (d) Zone of pollution from Chovar to Khokana.

Effects of acid rain on forest in Southwestern China

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Acid rain is one of the most serious environmental problems facing industrial country today. A natural question to ask is whether acid rain is also an environmental problems in China. Since 1979 an increasing number of institute for environmental sciences and meteorology in cities such as Beijing, Shanghai, Chongqing and Guiyang have been monitoring acid rain. Several years data clearly indicate that acid rain in China occurs mainly in the south of Yangtze River. In the north, apart from a small number of cities where the rainfall is slightly acid, most area have neutral or slightly alkaline rain water. In the south, acid rain is most serious in the southwestern area. Heavy acid rain in this area is centered around Chongqing, the mean value of rainwater

was 4.27, 4.18 and 4.12 in 1981, 1982 and 1983 respectively. The frequency of acid rain was very highly with a value of 79.8, 93.1 and 94.8 percent in 1981, 1982 and 1983 respectively.

In 1982 an area of *Masson pine (pinus massoniana* Lamb.) in Nanshan hill of Chongqing have exhibited decline, which caused leaders to take notice and some foreign and Chinese scientists to make on investigation.

In 1985 the researchers of the Academia Sinica made an investigation into the effects of acid rain on the growth of *Masson pine* in two districts (Nanan and Natong) and three counties (Baxian, Jijiang and Jiangjin) of Chongqing City. The results are summarized as follows:

In many environmental factors the acidity of rainwater was most closely related to the growth and productivity of trees.

Acid rain primarily damages needles of *Masson pine*. The chlorophyll content of needles in region with rainwater pH < 4.5, was higher than in region with rainwater pH > 4.5.

Total biomass and net production of *Masson pine* forest were respectively 40.81 ton. ha, 2.23 ton. ha.a for 18 years old in region with rainwater pH < 4.5, and 103.74 ton. ha, 8.72 ton. ha.a for 19 years old in region with rainwater pH > 4.5.

According to data by stem analysis method, it was found that the effects of acid rain on the periodic increment began about twenty years ago.

Damage of acid rain (rainwater pH < 4.5) on the biological productivity was estimated as 52–59%.

From the results mentioned above, it can be concluded that acid rain has caused forest decline in southwestern China. In the process of China's socialist modernization and reconstruction, acid rain research got under way relatively late, and the impact of acid rain is not yet fully explored. So the acidification of the environment and the ecological effects should be given close attention.

Problems of forest management and its improvement in China

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There are more and more people but less and less forest resource in China over past centuries. Forest cover is only 125 mill.ha. now, taking 12.98% of total land. The capitation forest area is 1/10 ha, which is about 1/10 of the average level of the world, and takes about 130th place in the world.

Almost all of the Chinese forest is located in the mountainous areas in Northeastern, Southeastern and Southwestern regions. The total growing stock is about 9100 mill.m^3. Because there is 344 mill.m^3 being cut each year, the decaying rate of forest resource has almost reached to 200 mill.m^3/a. It was reported that forest resource in 2/3 of all national forest units would be cut and used up in 11 years on the basis keeping forest management in the current level. Forestry in China is critical. It has already caused that forest resource, finance of forestry and

environment in China have all been brought to a crisis.

Due to large demands to wood and irrational management of forest, caused by many reasons, forest resource has been destroyed much more seriously than ever before, and more and more eclological catastrophes have taken place throughout China in last decades. For example, soil erosion area has enlarged to 150 mill. ha. from 110 mill. ha. in 1950s, and desert area has expanded to 127 mill. ha. from 107 mill. ha. in 1950s.

The fast growing of population is one of the most serious factors consuming wood. If Chinese population exceeds 1.2 billion in the end of this century, more than 400 mill.m^3 of growing stock will be cut per year, based on today's level of consumption. But it is not possible to increase wood production in near future, according to the current status of forest resource and management level in China. So the matter of extreme urgency now is to improve forest management with the aim of filling the gap between growth and consumption of forest resource.

The government should solve the most serious problems dealing with forestry development, such as administative system and economic policy. The key point is that forestry unit should be treated as a special economic department but not like mining industry, which should actively be supported by the government.

Both governors and people should accept the modern-forestry idea, by which forest is regarded as a natural product with ecological, social and economic benefits, and its economic benefit is much less important than others. As to forest management, we should pay attention to all of them. At same time, man-made forest should be largely developed and existing virgin forest should be reasonably managed to meet the need of wood and conservation as soon as possible.

Forest resource should be intensively managed. The current forest management level in China is far away from this goal. For example, growth rate is less than 1.6 m^3/ha. a, which is only 1/3 of that in F. R. Germany. Forest growth would compensate need of wood only if the growth were increased by 1 m^3/ha. a. Such increase is possible when it is intensively managed.

Retaining rate of reforestation should be increased. Annual Chinese afforestation area is the biggest in the world. It was about 3 mill . ha. a in last 35 years. But only 27 mill. ha. of man-made forest has been retained to date, which means that 0.77 mill. ha. of reforestation has survived each year. Hence the retaining rate is only 1/4 or so, and there is a tremendous potential possibility to double it. Once this goal is achieved, another 0.7-0.8 mill. ha. of man-made forest will be obtained each year.

Short-rotation forest with fast growing trees should be developed in the selected regions. For this purpose, we should apply some advanced technology in various aspects of it, such as, seed collection and treatment, site preparation, irrigation, fertilizer applying, prevention and curing of insect and pest attacking, fire protection, thinning and felling and so on.

Finally, more attention should be paid to the training of young scientists and managers with the knowledge of modern forestry. They will play an important role for the improvement

of forest management in China in the future.

On ecological construction

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The contradiction among heavy pressure of population, limited resource, fragile eco-environment and imperative needs for economic development is the common dilemma that faces developing countries. Having learned from the natural eco-strategies of recycling, symbiosis and self-regulation and considering the Chinese eco-cultural tradition, a sustainable development way of ecological construction is put forward which has following three contents:

Eco-engineering design: to raise the productivities by searching alternative resources and promoting the recycling of materials in different walks of production.

Eco-institutional planning: to build a harmonious production network by adjusting the management institution and production structure, and promoting the symbiosis mechanism.

Eco-behavioral regulation: to help the local people helping themselves by raising the eco-awareness and self optimizing ability of decision makers and peoples.

After discussion of the means of eco-construction, two case studies, Niuqiao Village, Dafong County in Jiangsu Province as an agricultural eco-construction case, and Ermei Transistor Factory as an industrial eco-construction case, are presented, which have showed high social, economic and ecological benefits. It has approved that ecological construction is a feasible way to realize sustainable development for developing countries.

Water shortage and wastewater reuse

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China is not abundantly supplied with freshwater resources. The annual water resource is about 2800×10^9 m^3, with ranks sixth in the world. The water resource per capita is only 2630 m^3/a, which is a quarter of the world average, 88th in the world. The distribution of water resources differs between regions and seasons. More than 45% of the area of China has annual rainfall < 400 mm/a. Only 9% of the total water resources is available to 40% of the total cultivated area in the northern China. Water shortage has become an important problem for industries, agriculture and people living condition in China.

Wastewater discharge is increasing year by year, 3.68×10^{10} m^3 in 1988. Among this about 80% of the wastewater has not been treated and discharged into environment directly. As the result surface water and groundwater have been polluted, it makes the limited water resources

even the less. Water pollution aggravated the water shortage problem. Water shortage problem has become a inhibiting factor to economic development in some areas.

Among the many measures for solving water shortage problems, wastewater reuse is a promising method. Reclaimed wastewater as the water resource has the specialities of stable water quantity and water quality, no change with seasons and available in local area. Feasibility study on industrial wastewater reuse as cooling water and pilot scheme for domestic wastewater reclamation and reuse indicate that wastewater reuse is a practical and economical way of solving water shortage problems.

Analysis and assessment of Chinese eco–environmental situation–The rapid spread of environmental pollution and on–going deterioration of ecosystems in China

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Chinese ecological and environmental issue has already become one of the most fundamental factors to hamper the growth of production and sustainable development. In such a country with a large population and shortage of resources, the eco–environmental problems seem to be more crucial over the world. In order to give out the correct conclusion for evaluating Chinese eco–environmental situation, in this paper, a special assessmental procedure has been used to analyse following 7 basic environmental problems:

1. Natural hazards

An obvious trend is that the more recent years, the more frequent are the disasters, and the interval or span between two disasters becomes shorter and shorter.

2. Soil erosion

Now, the farmland which is damaged due to soil erosion with different intensity is one–third of the total arable land.

3. Forest shrinkage and grassland degradation

The forest coverage had decreased from 12.7%(1971) to 12% (1980). The deterioration of Chinese prairie is about 1.3 million hectare every year from 1949 to 1988.

4. Water resources shortage

By 1984, more than 188 cities had met the water crisis.

5. Desertification

Its area had been enlarged at the rate of 1500 km per year from 1950s to 1980s.

6. Environmental

Air pollution, water pollution and soil pollution in China have been evaluated in detail.

7. Farmland decrease

Due to the urbanization and economic development, farmland was used for non-agricultural purpose.

Additionally, the basic strategies for improving Chinese environmental situation have been suggested.