

MAJOR PROBLEMS OF SUSTAINABLE DEVELOPMENT ALONG THE BANK AREA OF THE CHANGJIANG RIVER

YANG Gui-shan

(*Nanjing Institute of Geography and Limnology, the Chinese Academy of Sciences, Nanjing 210008, P. R. China*)

ABSTRACT: Developing the Changjiang(Yangtze) River and building a developed economic zone along the bank area of the Changjiang River is a great strategic decision of the national macroeconomic development distribution. This decision has both given an impetus to fast development of the regional economy and exacerbated the contradiction among economy and resources and environment. In this paper, some major problems existing in economic sustainable development, such as scattered industrial structure, duplicated construction of the great projects, enlarging the development gap of the regional economy and deteriorated environment etc., have been studied. The results show that scattered structure and duplicated distribution of some key industries and projects, especially automobile, electronics and petrochemical industry and communication, power installations, is one of the reasons for low industrial economic benefit; the great development gap among upper, middle and lower reaches areas are enlarging since the 1990's; soil erosion, flood disaster and environmental pollution are still exacerbating due to unreasonable over-development. Based on the above analysis, this paper brings out some countermeasures and proposals for increasing the ability of regional sustainable development, including transregional reorganization of industrial structure linking by assets and speeding the process of regional economy integration; gradually controlling and reducing the development gap among upper, middle and lower reaches areas through regional cooperation on a mutually beneficial basis; as well as strengthening ecological construction and environmental protection and increasing environmental bearing capacity etc.

KEY WORDS: the bank area of the Changjiang River; sustainable development; structure problems; environment deterioration

CLC number: F127 Document code: A Article ID: 1002-0063(2000)02-0097-08

The Changjiang River is rich in fresh water and waterpower resources, the mean runoff and waterpower of the river are about 37% and 52% respectively of total ones of China. In addition, the Changjiang River has the immense navigation potential and valuable shoreline resources, the navigable length reaches 3640 km and the all shoreline length is about 6000 km from Yibin City to the estuary. Moreover, the Changjiang River, with the advantages of suitable location and broad hinterland, crosses East, Middle and West Economic Zone with different economic levels of China, so its unique function can not be substituted in the devel-

opment of the maritime area, the border land and the large rivers. Although the region along the Changjiang River, including Jiangsu, Anhui, Jiangxi, Hunan, Hubei, Sichuan provinces and Shanghai, Chongqing cities accounts for only 1/7 of the whole country in area, many indexes of economic and social development amount to or exceed 1/3 of the total nation, such as population, GDP(Gross Domestic Product), gross output value of industry and agriculture, major farm and industry output (such as grain, cotton, oil-breeding crop, steel, cement and chemical minerals). So this area plays a decisive role in national economic development.

Received date: 1999-11-12

Foundation item: Under the auspices of the Resource and Ecological Environment Key Project of the Chinese Academy of Sciences (KZ951 - A1 - 202).

Biography: YANG Gui-shan(1965 -), male, a native of Xinghua County, Jiangsu Province, professor. His research interest includes regional environment and resources.

© 1994-2010 China Academic Journal Electronic Publishing House. All rights reserved. <http://www.cnki.net>

With implementing the strategy of the Changjiang River exploitation since the 1990s, the economy of the basin has been developing rapidly. The rate of GNP increasing amounts to 13.3% from 1991 to 1995, 4% higher than that in the 1980s and 1.7% than the national rate in the same time. The tendency of development is driving and the status in national economy is enhanced continuously. But we must realize that the economy of this area is developed by highly inputting and paying a high cost in resources and environment. Presently, the conflict of inter-departments and inter-regions and environmental deterioration are the factors limiting the sustainable development of future economy. In this situation, if we don't implement proper adjustment and management as soon as possible, the development of economy will not be sustainable, which will have adverse effect to the national economy. Therefore, this paper made initial analysis to the main problems for reference by the decision-makers.

1 ACUTE CONFLICTS OF REGIONAL ECONOMIC DEVELOPMENT BETWEEN INTER-DEPARTMENTS AND INTER-REGIONS

1.1 The Scattered Trade Structure and the Severe Problems of Duplicated Low-level Constructions Existing in Key Industries

In the bank area of the Changjiang River, as a production base of major industrial products, the outputs of industrial products account for the large proportion of the whole country. For the purpose of short-term and local benefit, among some major industrial trades (machinery, electronic, textile and chemical industries), lots of problems such as small production scale, low specialization and low technique, "large-complete", "small-complete" and self-support duplicated production, are more severe. Taking automobile industry as an example, there are 50 manufacture enterprises with all trades in this region, 200 enterprises of special vehicle reequipment, and 600 enterprises of engine and fittings by the end of 1993, of which small enterprises of which amount to 3/4 (XIE, 1995). As for some great national enterprises, like the Dongfeng Automobile Company and the Shanghai - VW Company, the automobile outputs were only about 15×10^4 and 16×10^4 in 1995. The outputs of other enterprises are about some tens and some hundreds. For example, the output of automobile in Hunan Province is less than 1×10^4 , the outputs of

Anhui and Jiangxi are only about 3×10^4 and 5×10^4 . But the outputs of most of the automobile company abroad are more than one million. The companies whose outputs are less than 50×10^4 belong to uneconomical enterprises there.

The electronic industry is like that. Due to importing foreign equipment and constructing product-line repeatedly, all regions appear self-close patterns. For some home electrical appliance such as color TV, refrigerator, air conditioning, washing machine and recorder, every province and city in this area are in some scale. Color TV is an example, among more than 10 brands, outputs more than millions is only one "Changhong". The others are less than 10×10^4 or 20×10^4 . The whole output of Hubei and Hunan is less than 9×10^4 and 1.5×10^4 respectively in 1995. Output of Jiangxi and Anhui provinces are also less than 30×10^4 . But in South Korea which has about the same scale in color TV product, there are only six companies and each of them products about 300×10^4 TV sets annually. The gap of scale economy at home and abroad is very great.

Owing to decentralization and small scale, enterprises have no scale economy, which lead to high cost and low competition ability. In this situation, enterprises contest raw materials, energy resources and market, which lead to price contest and unreasonable resources assignment. The limited capital are often occupied by some low-level enterprises unreasonably, which interferes renovation and technology progress of high-level enterprises, results in some equipment leaved unused or used inefficiently, and consequently causes both a great loss in enterprises and low benefits of investment. In recent years, the economy of the bank area of the Changjiang River is developed rapidly, but the benefit of enterprises is low. From 1990 to 1995, the mean revenue by every 100 yuan (RMB) fixed assets decreased from 15.02 yuan in 1990 to 11.28 yuan in 1995, the rate of decreasing is 4.7%. The profit rate of capital reduced from 13.02% in 1990 to 8.12% in 1995, the yearly rate of decreasing is 7.6%. The revenue of production value reduced from 10.24% in 1990 to 8.40% in 1995, the yearly rate of decreasing is 3.2%.

More severely, automobile, electric and petroleum chemical industries are all taken as the mainstay industries in the most provinces and cities of this area. They make use of the opportunity of opening and development, actively attract businessman and investment

and use these capitals to construct and enlarge enterprise unreasonably. These make the conflict of industrial structure more severe.

1.2 The Serious Problems of Duplicated Planning and Construction of Main Projects

With the reforming of national investment management and formation of all-round opening pattern, the proportions of local self-financing and foreign investment are unceasingly increasing. Because the authority of examining and approving is transferred to local government and the control mechanism haven't formed, the ability of macro-control was weaken. For the purpose of short-term and local interest, some regions develop "large-complete" and "small-complete" planning and construct some large-scale projects in a hubbub, which lead to self-support pattern. In fact, some large-scale projects exceed the demand and feasibility of local. These constructions might result in waste of manpower, material and capital resources. Taking port and bridge crossing the Changjiang River as examples, the hinterland scope, the coordination of waterway and landway, the depth of water and stability of the bank have not be considered in planning and construction. On the 400 km bank from Nanjing to the estuary, the slogan of "prospering the city by ports" has been put forward in most of counties and cities along the bank area. Presently, except first-class constructed opening ports(including Shanghai, Nanjing, Nantong, Zhenjiang, Taicang, Changshu, Zhangjiagang, Jiangyin and Yangzhou) where some large berths are being constructed or enlarged, there are 6 trade ports which are being constructed and planed to construct. Although some forecasts such as the hinterland and traffic have been done, the construction scale is obviously too large due to repeat calculations. In some ports, the problems

of cargo insufficient and equipment leaving unused have happened. In addition, for the upper reaches area with shortage cargo and bad condition (Yibin and Luzhou), they are raising funds to construct the trade ports which are unsuitable for the local condition, some even construct container ports.

The plan of bridge crossing the Changjiang River are like that. There are 7 bridges constructed or planned to construct only on the 400 km of the Changjiang River from Nanjing to the estuary. The mean distance between bridges is less than 60 km. Especially, the distance between-Nantong-Changsu Bridge planed by Jiangsu Province and passageway of Changjiang Estuary planed by Shanghai is only about 30 km. The dense bridges constructed not only make great investment fixed, but also threaten the safety of water transport and flood division.

1.3 Enlarged Regional Economic Gaps among the Upper, Middle and Lower Reaches

The Changjiang River passes through the East, Middle and West Economic Zones of China. The levels of economic development obviously change from the east to the west, there are developed Changjiang River Delta which is stepping into modernization and developing mountain areas including Three Gorge Reservoir Area and The Eastern Sichuan which have not adequate food and clothing yet. Based on the statistics, if GDP per person, local financial revenue per person, value of foreign capital actually used per person, ratio of export value to GDP, investment in fixed assets per person are considered, the ratios of those in the upper reaches area to those in lower reaches areas are 1: 2.88, 1: 3.14, 1: 17.96, 1: 5.27 and 1: 4.98 respectively. The proportion of two areas in living level is 1: 2.89 (Table 1).

Table 1 Gap of economic development along the bank area of the Changjiang River (1995)

Indexes	Upper-reaches	Middle-reaches	Lower-reaches	Upper : Middle: Lower
	area	area	Area	
GDP per person (yuanRMB/person)	3120	3505	8982	1: 1.12: 2.88
Local financial revenue per person(yuanRMB/person)	147.5	160.0	462.5	1: 1.08: 3.14
Foreign capital actually used per person(USD/person)	5.47	10.38	98.24	1: 1.90: 17.96
Ratio of export value to GDP(%)	4.8	5.7	25.3	1: 1.19: 5.27
Investment in fixed assets per person (yuanRMB/person)	796	929	3965	1: 1.17: 4.98
Living level (yuanRMB/person)	1261	1343	3635	1: 1.07: 2.89

Affected by obvious difference in development jump-off point, conditions for opening, investment environment and incomes and industry structure, the gaps of economic development among the upper, middle and lower reaches areas are being enlarged, and more striking from the 1990s (Fig. 1). This has been a noticeable problem to the sustainable development of the bank area of the Changjiang River. Some people even think that these problems might affect the stability of society.

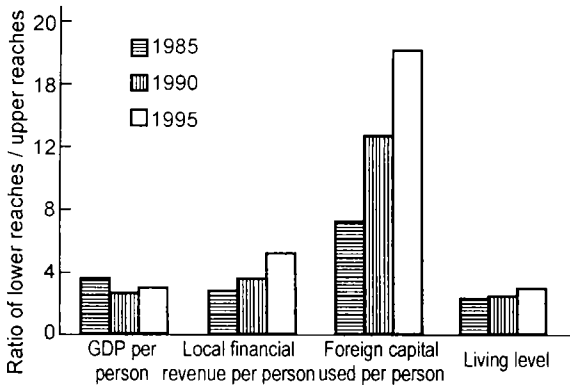


Fig. 1 Enlarging trend existing in the gap of economic development along the bank area of the Changjiang River

2 THE UNCEASING ECOLOGICAL AND ENVIRONMENTAL DETERIORATION

2.1 The Decrease in Quality of Eco-Environment

The natural environment of the bank area of the Changjiang River, especially the upper reaches area, is very vulnerable. The extensive utilization of resources and the way of economic development place additional pressure to them and result in the intensification of soil erosion and hazards, which adversely affect the sustainable development.

According to the statistic data (ECWCYC, 1991 – 1995), the area of soil erosion is $36.3 \times 10^4 \text{ km}^2$ in the Changjiang River Basin. Although people have made a great progress in controlling soil erosion in recent 40 years, and have control about $12 \times 10^4 \text{ km}^2$ in area, the area of soil erosion still amounts to $57.9 \times 10^4 \text{ km}^2$ at the beginning of the 1990s due to more rapid rate of destruction. If the areas controlled are considered, the accumulated area of soil erosion in recent 40 years is two times of that in the 1950s, the 2/5 area of which is

distributed on the bank area of Changjiang River. With developing rapidly in bank area since the 1990s, the problem of soil erosion is more severe. For example, in Three Gorges Reservoir Area, the rate of decrease in forest cover reduced from 22% in the 1950s to 12% in the 1980s because of unreasoning economic activities including reclaiming wasteland on steep slope and excessive logging, which result in 65% area of soil erosion and 160 million tons soil eroded (YU *et al.*, 1995). In recent five years, the area of soil erosion increase by $1 \times 10^4 \text{ km}^2$ per year, which equals to the area controlled. Severe erosion have brought 480 million tons sediments to the sea by the Changjiang River, which result in not only the degradation of soil fertility and productivity, but also blocking middle and lower reaches of river and lake, increasing the water level of floods and placing additional demand for protecting this area. For instance, the water level of flood in Jingjiang section of the Changjiang River have amounted to 10 m higher than the elevation of land, which threaten the Jiangnan Plain and Wuhan City.

Due to frequent extensive hazards and extreme damage, the bank area of the Changjiang River is significant risk area. According to the statistical data from 1986 to 1995, the area affected by hazards amounts to 15.8 million ha, being about 64% of farmland of this area and 36% of total area affected by hazards of the whole country. In them, the area affected by the flood is 6.16 million ha, being about 45% of total area affected by flood of China. In addition, the flood and other hazards are intensified in recent years (Fig. 2).

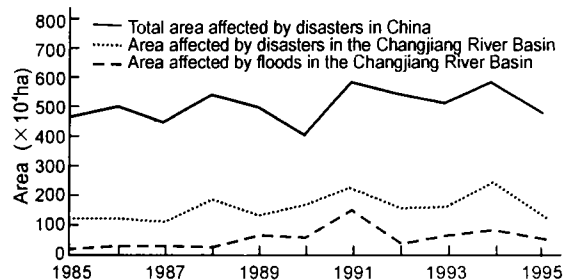


Fig. 2 Areas affected by natural disasters in China and the bank area of the Changjiang River

Especially, the areas of middle and lower reaches of the river are more adversely affected by flood, it has a threat to the economic development and living. Presently the standard of flood-defense is low. For example, the flood-defense projects of Taihu Lake can not

protect this area against once-in-20-year flood and once-in-5-year storms (LIANG, 1993), which can not meet the demand of economic development. By 1995, there are an area of 8.52 million ha vulnerable to floods, being about a half of the area of cultivated land. In severe flood season, the situation controlling the flood and dividing logging water is very urgent.

In recent years, the channels of river are silted continuously and the areas of river and lake were unreasonably enclosed for breed aquatics, which decrease the capacity of storing and draining flood water and exacerbate the hazard. For example, in 1991's serious flood, 9.96 million ha cultivation lands were adversely affected, 1299×10^4 people were besieged and 1163 people died. The total economic losses amounted to 4.84×10^{10} yuan(RMB) (CHEN, 1992). This disaster insignificantly has adverse impacts to the local economic development and stability of living. This is a bitter lesson.

In addition, there are other problems including avalanche, landslide and mud-rock flow in the areas of upper and middle reaches and land subsidence in the lower reaches area. In the bank of 690 km along the Changjiang River from Chongqing to Yichang, there are 283 unstable locations affected by landslide and mud-rock flow, being about 1.5×10^9 m³ in size and the largest risk rock and landslide over 1×10^7 m³ are distributed in 25 locations (LI, 1995). These events severely threaten to the safety of human life, property and navigation. In the lower reaches area near Shanghai, Suzhou, Wuxi, Changzhou and Nantong cities, the problems of subsidence are severe due to long-term

groundwater over-pumping. Presently, the accumulative subsidence of Shanghai amounts to 3 m in the center of subsidence zone, that of Suzhou, Wuxi and Changzhou 1m. These result in many environmental and geological problems.

2.2 The Exacerbating Environmental Pollution

The bank area of the Changjiang River is one of the area heavily burdening contaminants. According to statistic data, in 1995, waste water, exhaust gas and solid wastes amount to about 1.5×10^{10} t, 335×10^{10} m³ and 1.9×10^8 t respectively, being about 39%, 27% and 29% of total ones of China. The amounts of them per unit area are 1.07×10^4 t/km², 2.46×10^6 m³/km² and 138.8 t/km² respectively, being over 2.74, 1.92 and 2.07 times of the mean level of the whole country. Especially in the lower reaches area, the amounts of them are 4.13×10^4 t/km², 10.3×10^6 m³/km² and 393.6 t/km², being about 10.6, 8.1 and 5.9 times of the mean level of the whole country (Table 2). Moreover, the problems of environmental pollution are gradually exacerbating. The yearly increasing rates of them respectively account for 0.4%, 4.9% and 1.5%.

Presently, Chongqing and Sichuan in upper reaches area have been the center affected by acid rain in the whole country. At the same time, the cities (including Shanghai, Suzhou, Wuxi, Changzhou, Wuhan, Huangshi) along the areas of middle and lower reaches of the river are also frequently affected by acid rain. Since the 1990s, 1×10^{10} t waste water was directly drained to the Changjiang River per year. In flood

Table 2 Status of environmental pollution in whole China and the bank area of the Changjiang River

Region	The amounts of waste water, gas and solid			The amounts of waste water, gas, solid per unit area			
	Waste water ($\times 10^8$ t)	Exhaust gas ($\times 10^8$ m ³)	Waste solid ($\times 10^8$ t)	Waste water ($\times 10^4$ t/km ²)	Exhaust gas ($\times 10^4$ m ³ /km ²)	Waste solid (t/km ²)	
The bank area of the Changjiang River	Lower area	44.6	11160	4251	4.13	1033.3	393.6
	Middle area	71.5	15012	10334	1.04	217.7	149.8
	Upper area	29.7	7320	4290	0.53	130.2	76.3
	Total	145.8	33492	18875	1.07	246.3	138.8
The whole China	372.9	123407	64474	0.39	128.5	67.2	
Percent of the bank area in whole China (%)	39.1	27.1	29.3	274	192	207	

season, only 28.7% water in the river belong to the 2nd grade and 58.9% water belong to the 3rd grade of national water standard. In Luzhou City and Yibin City the level of water quality of river have decreased to the 4th – 5th grade. The water pollution of the Changjiang has been exacerbating since the 1980s from point pollution near location of sewage drainage to surface pollution. If we ignore that, it will lead to unthinkable result. The more severe problem is that exacerbating pollution directly threaten to economic development and human life in some local area. For example, in Taihu basin, water quality of river and lake is lower than the 3rd grade of national water standard. About 97% Taihu Lake surface area reaches to mid-eutrophication to eutrophication degree, which have adverse impacts to water for production and living around lake areas and the situation that no water to use even if near to water appeared.

3 COUNTERMEASURES AND SUGGESTIONS FOR STRENGTHENING THE ABILITY OF ECONOMIC SUSTAINABLE DEVELOPMENT

It is the precondition for implementing sustainable strategy in the Changjiang bank area to strength the ability of sustainable development, which related to ability of social security, economic support and resource and environment support. As a focal point of national economic construction, this area is at the beginning of rapid development. Therefore, stress and principal task of this area in the future is to strengthen the ability of economic sustainable development. To solve these problems above-mentioned, some measures as follow:

3.1 To Implement Trans-regions Reorganization of Industry Structure Linking by Assets and Speed Regional Economic Integration

The different sections of the Changjiang bank area have special socio-economic features and resource and environment conditions. This area, with potential ability of cooperative development and inter-connected through the Changjiang River “golden channel”, has better basements and conditions to solve duplicated construction and realize regional economic integration compared with other regions in China. Therefore, submitting to demands of the market and internationalization, industry system making the areas of upper, middle and lower reaches cooperation should been constructed.

The delta area should mainly develop internationalized mechanical and electrical products, chemical products, light industry, high-tech industry, banking, trade, tourism and the rising tertiary industry. Middle reaches area should mainly develop metallurgy, machinery manufacturing and light textile industries. Upper reaches area should mainly develop energy, machinery manufacturing, chemical industry, metallurgy and food processing based on the condition of resources. The government should restrict severely the new investments in those major industries and work out favorable policies, so as to encourage backbone companies of the industries to combine, annex, refit, and hold other middle and small scale companies in trade inner, by famous-brand products. This will enlarge the companies scales, and make regional industry constructions reorganized to a great extend. For example, automobile industries should form two large automobile industry groups: One consists of cars, light-autos and passenger-cars leaded by Shanghai-VW Ltd. Company, and the other consist of cars (mini-cars), middle and large camions leaded by Dongfeng Automobile Company. Around 2000, they can become multi-regional large automobile groups with outputs more than 50×10^4 each year, and be characterized with higher first-step, specialization, and volume-producing to provide respectively full or part automobile products. Another example is the production of color TV in the electronic industry. In the leading of companies whose yearly output is near or more than millions such as Shanghai Radio-TV, Nanjing Panda and Sichuan Changhong, other TV and relating accessories product companies in the district should be reorganized strategically. The capital should be activized and the waste of existing equipment should be avoided. As to the other newly built or planned important construction objects, consummate restriction in investment should be established as soon as possible. According to the national industry policies, the integrated national project department should supervise strictly in order to try to avoid the repeating construction which caused by the narrow consideration of local and short-term benefit.

3.2 To Follow Complementary Advantage and Co-development Policy and Control and Decrease the Development Gap

Due to the accumulative gap in history and the

different capacity and driving of development, the gap of regional development in the Changjiang basin will extend further in a long period(YU *et al.*, 1995) . However, the unlimited enlarging and existence of development gap does not accord with the basic principal of sustainable development and will become significant restriction. So we should follow complement advantage and co-development policy and control and decrease the gap of the development in upper, middle and lower reaches areas.

Firstly, the investment in the transport and other basic establishment construction should be increased to limit the gap of development capacity in this region and improve the investment environment. Secondly, the government should draft special industry leaning and favorable policy. On the one hand, we should encourage the developed lower reaches and maritime regions to invest in middle and upper reaches area in energy and resources base to stimulate the development of middle and upper reaches area, especially upper area. On the other hand, we should support the development of villages and towns enterprise and improve the development of village economy in developing area. In addition, it is the effective measures for speeding the development and decreasing the gap of economy to implement cadres and talents intercourse among middle, upper area and lower area, and to put the counter-grade development strategy leaded by famous-brand products in practice.

3.3 To Strengthen the Ecological Construction and Environment Protection, Enhance the Carrying Ecological and Environmental Capacity

The problems of ecology and environment in the Changjiang basin result from unreasonable economic activity and the different sections of bank have close relation and special feature. For example, the blocking of river and lake, rising of water level in flood and exacerbated flood disaster are mainly related to intensification of soil erosion, avalanche, landslide and mud-rock flow. Therefore, it demands the overall and systematic viewpoint to mitigate these problems. From this viewpoint, we should regard the whole basin as a whole system and consider the ecological construction, hazard defense and mitigation, and environment protection in working out social and economic programs. The environment problems including soil erosion, avalanche, landslide and mud-rock flow significantly

result from the unreasoning mining and opening up wasteland by destroying the forest. To solve these problems, the developed lower area should cooperate with and support the developing area by initiating the resources processing industry and labor-intensive industry and liberate the peasants from the agriculture. Only by solving the survival problem of peasants, we can prevent the trend of environment exacerbating and solidify the result of harness. The key of solving problem of the floods disaster in middle and lower area is increasing investment, strengthening ecological construction and fortifying the dike engineering. Therefore, we should regard the flood defense works as an important basic establishment construction to plan, alter the situation faced in defending and mitigating flood that engineering construction lag behind the socio-economic constructions and improve the ability of preventing and mitigating the hazards.

The bank area of the Changjiang River is one of the areas heavily burdening contaminants and also a element industry base continuously affected by severe pollution in whole country. It is necessary for improving the environment quality to integrate standard with essence. On the base of defining obligation of pollution control, enhancing pollution control and implementing policy of "the pollution should be harnessed by who do it", adjusting the industry structure and reasonable distribution are effective means. The great projects with severe pollution should be restricted in the delta area and around the big and middle cities which have been heavily polluted now. In addition, integrating the intensity and internationalization of industry structure in delta area, traditional industry and enterprises with severe pollution should be modified and transferred which is easy to process them in a whole. The new great projects emitting lots of contaminant should be distributed in the middle reaches area with advantageous resources condition and more environment capacity, which is convenient for fully utilizing the resource and environment capacity and stimulating the regional economic development^①.

REFERENCES

CHEN Guo-jie. 1995. Provincial difference and future change trend of economic development in Yangtze River Basin[J]. *Resources and En-*

① The data used in this paper are adapted from "The Yearly Book of China" except some data pointed out

- vironment of Yangtze River Basin, 4(1):11 - 17. (in Chinese)
- CHEN Hong-lin, 1992. The information of natural disasters from July to September, 1991[J]. *Disaster Mitigation in China*, 2(1): 53 - 60. (in Chinese)
- ECWCYC(Editorial Committee for Water Conservancy Yearbook of China), 1991, 1992, 1993, 1994, 1995. *Water Conservancy Yearbook of China*[M]. Beijing:China Water Conservancy Press. (in Chinese)
- ECYRY(Editorial Committee for Yangtze River Yearbook), 1995. *Yangtze River Yearbook*. Wuhan: Yangtze River Yearbook Press, 217 - 219. (in Chinese)
- LI Xing-yu, 1995. The problems of ecological environment in the construction of industrial zone along the bank area of Yangtze River[J]. *Resources and Environment of Yangtze River Basin*, 4(2):137 - 141. (in Chinese)
- LIANG Rui-ju(ed.), 1993. *91' Serious Floods Study of Taihu Basin*[M]. Nanjing: Hohai University Press, 31 - 37. (in Chinese)
- XIE Yong, 1995. Study on development and distribution of automobile industry[A]. In: Chinese Science and Technology Association (ed.). *Development of Yangtze River in the 21st Century*[C]. Beijing: China Mapping Press, 290 - 294. (in Chinese)
- YU Xing-yan, CHEN Li-hua, 1995. Effect of forest and plant on water and soil conservation in the area of the upper reaches of the Yangtze River [A]. In: Chinese Science and Technology Association (ed.). *Development of Yangtze River in the 21st Century*[C]. Beijing: China Mapping Press, 388 - 393. (in Chinese)