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GLOBAL CHARM OF THE CHANGJIANG RIVER DELTA

CHEN Shu-peng, ZHOU Cheng-hu, CHEN Qiu-xiao
(State Key Laboratory of Resources & Environmental Information System, Chinese Academy of Sciences, Beijing 100101, P. R. China)

ABSTRACT: Based on the theory of geo-economy, under the new situation of global economy, information network and China's entry into WTO, also with the holding of APEC (in 2001) and the International Exposition in the near future, the Changjiang (Yangtze) River Delta is striding toward the spectacular international multi-polar situation and becomes one of core regions with high-speed development. Facing the ocean and world all along, leading the progressive tides of the age and scintillating the splendor of the nation, she does advance with time. Through a long period of irrigation projects construction and intensive operation of lands in previous agricultural society, the artificial wetland ecosystem with a positive cycle had ever been formed in this region. At present, environmental pollution and urban expansion resulted from post-industrialization are being rectified. The delta will be the paradigm of industrial and agricultural modernization along the sustainable development road. With the rapid development of urbanization, she has been one of the regions with the highest density population and high urbanization level. Taking the Changjiang River estuary and the Hangzhou Bay as two parts, she is continuously strengthening and adjusting her interior structure, expanding mothball space and constructing the oriental modern "logistics center" to link the whole world. The butterfly-style urban system of the Changjiang River Delta is flying, probably engendering earthshaking "butterfly effect".
KEY WORDS: delta civilization; artificial wetland ecosystem; butterfly effect; the Changjiang River Delta

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1 SPLENDOR OF HISTORICAL CULTURE

In China, the Changjiang (Yangtze) River Delta① generally means an advanced productivity and culture, which affects deeply not only the whole China but also the Asian-Pacific region, even Europe and Africa.

1.1 Cradle for the Communication and Propagation of Civilization

The development course of the Changjiang River Delta's culture is devious, but the Neolithic *Hemudu* Culture excavated in Yuyao City of Zhejiang Province indicates the advanced paddy rice culture; *Majiabang* Culture 5000a B. P. and East Bridge Ruins in Qingpu County of Shanghai 3300a B. P. represents the culture of the Neolithic Age in the Taihu Lake Basin ranging from the north of the Hangzhou Bay to Changzhou; *Liangzhu* Culture 3300–2200a B. P. excavated in Yuhang also indicates the advanced agricultural culture in the Taihu Lake Basin; *Qiangliangang* in Huai'an 5400–4400a B. P. represents the north region of the Changjiang River and *Beiyinyangying* in the north of Nanjing 4000–3000a B. P. indicates a civilization with exquisite stone tools, fishing and hunting, and animal husbandry at that time (CHEN, 1992). Based on these facts, a truth can therefore be revealed that people could follow quickly the step of the deposition process of the sea near the Changjiang River Delta and then explore the fertile swamp wetland (SUN and SUN, 1999). Advanced productivity and culture of the Changjiang River Delta, transcending that of Center and West China, formed the splendid *Wuye* Culture as a part of the *Huaxia* Culture and becomes one of the origins to communicate with overseas culture and to spread Chinese civilization.

Received date: 2003-05-27
Biography: CHEN Shu-peng (1920–), male, a native of Jiangxi Province, academician of Chinese Academy of Sciences, specialized in cartography, remote sensing and GIS. E-mail: chensp@public.bta.net.cn
① The Changjiang River Delta includes 15 cities at prefectural or above level, namely Shanghai, Nanjing, Suzhou, Wuxi, Changzhou, Nantong, Zhenjiang, Yangzhou, Taizhou, Hangzhou, Jiaxing, Huzhou, Shaoxing, Ningbo and Zhoushan.

Early in the Three Kingdoms period (226–231 AD), SUN Quan—the king of the Wu Kingdom assigned ZHU Ying and KANG Tai to visit Vietnam and Cambodia. They both wrote their monograph when they came back. Luckily, the monograph "The Biography of Foreign Countries during the Wu Kingdom" (*Wu Shi Wai Guo Zhuan* in Chinese) can be read from a masterpiece "River Record Annotation" (*Shui Jing Zhu* in Chinese). However, the work "The Records of Strange Things in Funan" (*Fu Nan Yi Wu Zhi* in Chinese) compiled by ZHU Ying had been lost. In 230, SUN Quan assigned WEI Wen and ZHUGE Zhi to visit Taiwan by leading a hundred people fleet. "Water and Soil in Linhai" (*Lin Hai Shui Tu Zhi* in Chinese) recorded the general situation of Taiwan, such as climate, topography, vegetation, soil, agriculture and fishery. Just as the emigration from Nanjing, Shanghai and Ningbo to Taiwan when Taiwan came back after the Second World War and Taiwan's investment to enterprises in the Changjiang River Delta recently, the history of effectual development of communication between Chinese mainland and Taiwan at that time contributed greatly to the economic and cultural exchange between them.

Located at the hinge of the Changjiang River and the Grand Canal, Yangzhou was ever extremely prosperous as a main harbor city in the Tang and Song dynasties. Jian Zhen (688–763 AD), an eminent monk in the Tang Dynasty, who was born and grew up in Yangzhou, began his monasterial life at 14 years old, then toured Chang'an and Luoyang, researched science and religion theory of the Tiantai Temple and resided at the Daming Temple. Invited by Japanese, he planed to go Japan five times, but all failed. Finally in 753, he went there by the ship of Japanese envoy with 20 monks, nuns and craftsmen, then stayed in the Royal Nara Temple. In Japan, he presided religious fair, constituted the Japanese monastic discipline, established the religious base and introduced Chinese sculpture, architecture, medicine, painting and calligraphy etc. into Japan, which contributed greatly to the culture communication between China and Japan. Till now, Japanese disciples make their pilgrimage to Jian Zhen's golden sculpture in the Royal Nara Temple, and the Tiantai Temple in Zhejiang and the Dayun Temple in Yangzhou have been the Holy Land for pilgrimage of Japanese Buddhist. His great impact on cultural exchanges between China and Japan are long lasting.

In the South Song Dynasty, Hangzhou became the political and cultural center of the country. Extreme prosperity around the West Lake did exist at that time. Afterward, Marco Polo (1254–1324 AD) described in his tour notes, his deep impressions on Zhenjiang, Yangzhou and Hangzhou with a high praise of richness and civilization in the Orient. He is the one who first introduced China to Europe, and his influence is long lasting.

ZHENG He (1371–1435 AD), a famous navigator in the late Ming Dynasty, had navigated from Jinling and other ports for seven times. The fleets led by him traversed the Indian Ocean through the South China Sea, and via 30 or more countries, they ever arrived the farthest destinations—the coast of the Red Sea and the east coast of South Africa. ZHENG He's navigation event was a great contribution to the great discovery of geography and has been acknowledged by the world. In British Thames Ocean Atlas, ZHENG He was ranked first and Columbus the third. Every time, ZHENG He navigated on a very large scale. For example, the 7th navigation included 27 800 persons and 62 large boats, the biggest of which was 148m long and 60m wide and could accommodate 1000 persons. When the 5th navigation was over, there were envoys of 17 countries came to China by ZHENG He's fleets. Furthermore, India once assigned 1200 envoys and attendants to China by ZHENG He's fleets in 1413. All the seven navigations set out from Nanjing. The ship manufacturing industry and logistic guarantee at that time, as regard to both technology and scale, reached the advanced level in the world. Whereas, in 1492, the Spanish fleet leaded by Columbus only consisted of 3 boats and 88 persons; in 1497, the Portuguese fleet leaded by VaSco da GAMA, 4 boats and 170 persons; in 1519–1522, the Spanish fleet leaded by R D MAGALHAES, 5 boats and 265 persons. In each ZHENG He's navigation, a large number of bullions, copper lines, china, cotton, copper vessels, iron pans and agricultural tools were loaded, which indicated high level handicraft and manufacturing techniques of China, and by which, the Chinese civilization was spread to foreign countries. At the same time, alien animal, perfume and invigorator were taken back, thus Chinese people could feel the world and broaden their horizon (SONG and CHEN, 1999). ZHENG He's navigation map had recorded the most splendid history of the Changjiang River Delta as an international navigation base.

1.2 Important Agricultural Base

The Changjiang River Delta was once a base for ex-

ploiting farming and pasturing in the coastal regions. "*Guan Zi*", a famous work compiled during the Warring States Period, pointed out that people should not dry the sea just for catching fish or fire the "sou"① so as to farm on it, people must consider the long-term development when they want to fulfill their goals. This original idea to attach much importance to environmental protection and sustainable development was legislated in a law named "Land law" (*Tian Lü* in Chinese) 2000 years ago.

CHEN Fu mentioned in his agricultural book a kind of land, called living land, which can flexibly move in correspondent with the rising and falling of lake, this land could specially adapt to the environment at estuary where it could be irrigated by salt water in the morning and fresh water in the evening (SUN and SUN, 1999). "*Wu Jun Zhi*" in the South Song Dynasty, "*Zhi Li Taicang Zhi*" in the Qing Dynasty argued that though the Taicang and Chongming reaches of the Changjiang River were called sea, they were actually river, and its fresh water could be used to irrigate, not to make salt.

The Changjiang River Delta was also the initial base of the dyke-pond ecological agriculture. "*Jie An Lao Ren Man Bi*", compiled by LI Yu in the Ming Dynasty, recorded an enrichment history of a farmer—TAN Can through his exploiting the "silk dyke-fish pond" and managing efficiently vertically distributed farming in Taicang. It was TAN Can who initiated the dyke-pond ecological agriculture. From the late Ming Dynasty to the early Qing Dynasty, the "silk dyke-fish pond" developed rapidly in the Changjiang River Delta and the Zhujiang (Pearl) River estuary, the "ecological agriculture" adapted to the local natural feature was then formed. Accordingly, a prosperous situation came into being in these two regions, which were called "Land of Fish and Rice". Compared with general operation, dyke-pond ecological agriculture increased the crop yield by 30% to 50%, the average paddy yield then was 7500kg/ha, while mulberry leaf yield 22 500kg/ha. Thus, these two regions began to supply grain for the Capital then via the Grand Canal, and also silk production for Europe and even the whole world by the Silk Road. From then on, the Changjiang River Delta played a critical role as a political and economic base of the hinterland (MIN, 1999).

With the spread of dyke-pond experience, the landscape and environment in the Changjiang River Delta had been also changed thoroughly. The Changjiang River Delta had consequently become an area with the highest density of drainage networks—the total length of river and ditch per square kilometer exceeding 3km. The Taihu Lake once could connect with the Changjiang River via 127 water channels. Through these channels, water level could be adjusted, boat could run fairly well, the farm land could be irrigated by utilizing wind power and oxcart, and river mud could be taken for cultivation. A good circulation did appear by forming "a very special man-made ecosystem with the interaction of water and soil resources, which was rarely seen in the world". This advanced cultivation system could not only accommodate more people, but also protect environment effectively. Grain and pod yield of Lujiawan Village in Deqing, Zhejiang Province reached 15 120kg/ha and 1665kg/ha respectively even when suffered greatly from the natural disasters. Considered as one effective method to utilize wetland, to exploit water and soil resources, and to promote the development of agriculture, this experience has been spread to Brazil and Denmark. From the facts mentioned above, we can learn an outstanding innovation of the Changjiang River Delta contributing to the world ecological agriculture.

2 ADJUSTMENT AND OPTIMIZATION OF ECONOMIC STRUCTURE AND ITS MODERNIZATION

2.1 Overall Structure of Industry

The land area of the Changjiang River Delta only amounts to 1% of the total area of China, its population amounts to 6.25% of the total population in China, however its gross output value of industry occupies more than 21% of that of the whole nation. From the spatial spectrums of economy diffusion, Shanghai has been the kernel of economic development in this region even in the whole nation, whose radiation range has been expanding. In its inner, the Changjiang River Delta can generally be divided into four spheres: Shanghai itself comprises the first one; the second sphere includes Suzhou, Wuxi, Hangzhou and Ningbo, where the tertiary industry such as finance, insurance, communication and so on occupies a great portion of the whole industry, and village and township enterprises are highly developed; the third sphere includes Nanjing, Zhenjiang, Changzhou, Shaoxing and so on, which are the bases of mechanical and electrical, textile and chemical fiber industry; the fourth sphere includes Yangzhou, Nantong, Huzhou and Zhoushan,

① A shallow lake overgrown with wild plants

whose industrial structure is slightly lagged, and village and town industries there develop relatively slowly.

2.2 Vital Ecological Agriculture

In the Changjiang River Delta area, governments at all levels and many villagers have attached great importance to ecological agriculture which has been developing and strengthening increasingly, there exist some demonstration counties as regard to the construction and development of ecological agriculture in this area. Haining in Zhejiang Province, for instance, as a national demonstration city, has built at least 350 marsh gas ponds with a total volume of 7460m^3 in thirteen towns (SHEN, 2000). Crops are fertilized based on the characteristics of soil nutrient, and non-pollution vegetable base is being built in Yanguan, "reassured vegetables" terra of 6.67ha in Xiashi, and other 18 non-pollution agricultural production bases. In some towns such as Changqiao Town, Xiashi Town etc., a demonstration zone has been set up so as to spread environment-protection type chemical pesticide with high effectiveness and little poisonousness. So far, four agricultural bases in ecological virtuous cycle like Dongchang orchard in Xiashi Town, bases of aquiculture in Maqiao Town, orchard of agrotechnical station in Xieqiao Town and Meida seedling base in Yuanhua Town have been built sequentially.

2.3 Upgraded Agricultural Processing Industry

Under the reform and open-door policy for more than twenty years, the yield of grain, fruits, meat, domestic bird eggs, aquatic production and so on take the first position in the world respectively. However, in 2001 industrial food production was only 25% of the total food production, food industry value amounted to only one third of agricultural industry value and the processing degree was only about 45%, while the same indexes in developed countries were 90%, 1.5 to 2 times and 80% respectively. Generally speaking, 80% of our technical facilities for agricultural processing are just at the world level of the 1980s. At present, only 5% of the total can be in synch with the international level.

Being an obvious contrast with the whole country, agricultural processing industry has become one of the most vigorous industries in the Changjiang River Delta area, which involves food, drink, textile, clothing and other 12 industries. These industries in this area show us clearly their multi-levels, multi-characteristics and diversity, and the products of which are favored both in the domestic and overseas markets due to their unique flavor, exquisite craftwork and excellent quality such as high quality aquatic production, fine soft feather, silky clothes, tea and other traditional products. Drinks, health-care goods etc., are becoming more competitive in the international market by adopting the new technology such as super high temperature sterilization, freezing storage, molecular distillation and so on in the corresponding industries. At present, a considerable proportion of agricultural processing industries are in a favorable manufacturing scale in this area, their logistic circulating scale has also been expanded increasingly, and the refinery of standard is ongoing. Meanwhile, a few regional and scattered standards has been establishing in the market although there are not in a uniform architecture.

After the entry into WTO, competition that the agriculture industry faced is shifted from primary and singular agriculture product competition into that of the whole industrial system including every process of agricultural production, circulation, processing. The development of agricultural processing industry in the Changjiang River Delta can not only increase employment, but also affect the utility of agricultural resources, which will speed the construction of small town, induce the service industry, and in turn bring an unprecedented chance of "starting a new undertaking" for township enterprises.

2.4 Increased Foreign Investment

Recently, lots of foreign enterprises have invested in the Changjiang River Delta area and improved their economical internationalization highly (WEI and ZHONG, 2002). Despite the increasing of foreign investment in the Zhujiang River Delta and the southern Fujian Province, the Changjiang River Delta centered with Shanghai is accumulating foreign capital rapidly and forms a powerful new magnetic field.

Since the China′s entry into WTO, some transnational groups are increasing their investments in the Changjiang River Delta to build their development and manufacturing center in the center city of this area. Investigations reveal that the first eleven cities in the inner China with good investment environment are all situated in the Changjiang River Delta, according to the normalizing analysis of national environment, basic constructions, public utilities, social environment and law and political environment. WANG

Neng, the president of Chinese Sales Department of Carrefour Cooperation, which is the biggest shopkeeper in Europe, said that the Changjiang River Delta is the first selection of the transnational groups' strategy in the 21st century because it has special advantage to connect the foreign and national markets and is full of capital and human resources there.

By the end of 2001, 70 000 enterprises with foreign investment had been authorized according to statistics in Shanghai, Zhejiang and Jiangsu, of which more than 400 are the top 500 enterprises in the world, and the sum of contracted foreign capital was US$150×10^9. In the next ten years, there will be more than 100 000 foreign investment projects being settled down here and the total in actual use amounts to about US$200×10^9. In 2001, foreign direct investment (FDI) in the Changjiang River Delta reached US$16.1×10^9, which for the first time exceeded that of the Zhujiang River Delta, occupied 34% of the total FDI in China in 2001, and this proportion will probably go up continuously in the coming years (WU and XU, 2002).

The abundance of inflowing of foreign investments brings not only the capital but also the advanced technology and management ideas. The Changjiang River Delta's economy is being strengthened and its industry structure is being optimized gradually with the infusing of foreign capital.

2.5 Fast Developing Urbanization

Along with the quick promotion of industrialization, urbanization is developing rapidly. In the current development stage in the Changjiang River Delta, they promote each other greatly.

In regard to promoting urbanization, North China began much earlier than other areas, but they have a little perspective because of their weak industrial base. With a characteristic of coarse-opening, endogenesis and extroversion, mainly depending on the reform and opening policy and the regional advantage, the urbanization of the Zhujiang River Delta has been promoted in a bottom-up way by towns' marketization when developing the light industry. The urbanization of this area has developed rapidly since the Chinese reform and opening policy. However, township enterprises are relatively much dispersedly allocated in Guangdong Province, and there are too many development zones with their overlarge scales and less industrial relation among them. The rural industrialization restricts the development of service industry, and leads to the following problem: unsuitable usage of land resources, relatively ragged infrastructure, low quality labor force and large scale immigration of surplus rural labor force to cities and towns, which indicates a low quality of urbanization (NI, 2002).

The development of urbanization in the Changjiang River Delta is also extroverted, endogenesis, however, it takes an intensive strategy—to use effectively the country's surplus such as grain, to absorb more rural labor forces and generate export production with Chinese characteristics to exchange with the intensive land production and decrease the rate of cultivated land, to develop service industries so as to accommodate more surplus labor forces, to make concentration and radiation effect of the tertiary industry. Urbanization is becoming the main tune of modernization and the driving force and headspring of regional economic development in the Changjiang River Delta.

Urbanization in the Changjiang River Delta is fast developing. By the end of 2001, 53 cities and 1390 towns had been in this area, among which, there had been two super metropolises—Shanghai and Nanjing with a non-agricultural population larger than 2 million, three metropolises—Suzhou, Hangzhou and Wuxi with a non-agricultural population larger than 1 million (Fig.1, Table 1). In this area, there existed one city per 1800km^2, which was seven times denser than that of the whole country (Urban Economic Investiga-

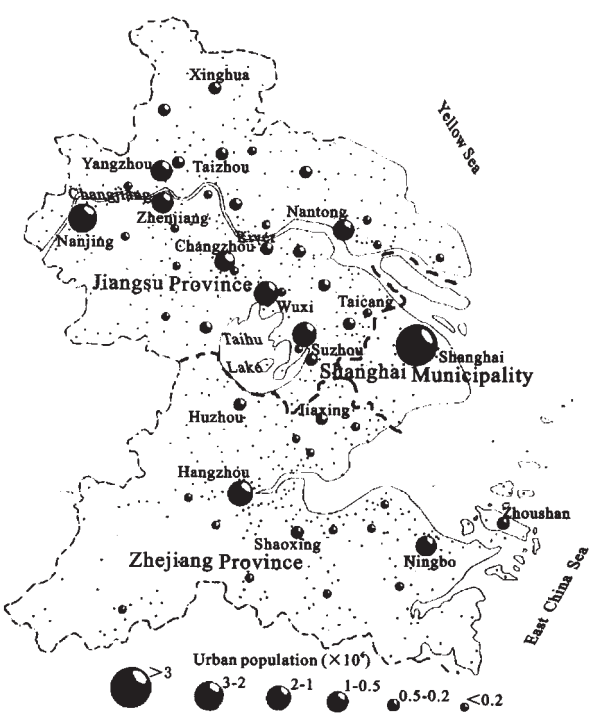


Fig.1 Urban population distribution in the Changjiang River Delta in 2001

Table 1 The scale of urban population and built-up area of 15 cities

City	2001		1997	
	Non-agricultural population ($\times 10^6$)	Built-up area (km^2)	Non-agricultural population ($\times 10^6$)	Built-up area (km^2)
Shanghai	9.8384	550	8.6879	412
Suzhou	1.1706	109	0.8280	77
Wuxi	1.2657	164	0.9273	90
Changzhou	0.8271	71	0.7614	67
Nanjing	2.8221	212	2.3477	177
Nantong	0.8384	73	0.4582	59
Zhenjiang	0.5383	63	0.4546	55
Yangzhou	0.5264	53	0.3839	45
Taizhou	0.3037	40	0.2108	29
Hangzhou	1.9326	227	1.3176	105
Ningbo	0.8069	74	0.6753	64
Jiaxing	0.3001	46	0.2528	37
Huzhou	0.3439	55	0.2682	46
Shaoxing	0.3110	35	0.2282	26
Zhoushan	0.2320	55	0.1856	45

Source: Urban Economic Investigation Group, 2002

tion Group, 2002). Also by the end of 2001, the average urbanization level here had been at 43%, up nearly 5% when compared with that of the whole nation (National Bureau of Statistics of China, 2002) .

With the rapid increase of urban population, built-up area is expanding quickly. Taking 15 cities at prefectural or above level as examples (cities at county level is excluded), by the end of 2001, the total built-up area of 15 cities in the Changjiang River Delta had been 1827km^2, up 37% compared with that of 1997. The urban expanding rate in this area during 1997–2001 was 124% faster than that of the whole country.

There even appears suburbanization phenomenon in Shanghai, Nanjing and Hangzhou. Nine cities along the Shanghai–Nanjing, Shanghai–Hangzhou railways and the Grant Canal are almost joined together. The urban agglomeration in the delta has gathered great advantages in manufacturing industry, finance, trade, education, science and technology, information and culture which is critical to promote the economic development of this area, the linkage of national and foreign market, the attraction of foreign investments and the upgrade of industries and technology.

Definitely, for example, Suzhou is developing its both sides while protecting its central ancient city, its design scheme for the industry zone to span Jinji Lake has not only protected the ancient city with a 2500- year history but also promoted the modern economy greatly. "Ancient city is yesterday's Suzhou, new high-tech zone on its both sides is today's Suzhou and the eastern industry area is tomorrow's Suzhou". With Xiaoshan as its strategic developing base, Hangzhou is now expanding to the south bank of the Qiantang River, which means her stepping from 'West Lake period' into 'Qiantang River period'. Nanjing merges itself with Pujiang Town and makes it as the front base to accelerate the economy of the northern Jiangsu Province. Changzhou expands toward north and incorporates Wujin near the Changjiang River into its urban district to make itself an inland city to a port city facing river and sea ((MA and GUO, 2002).

Shanghai is becoming the international center of finance, trade, shipping and information with a very high speed, and will drive the economical development of the Changjiang River Delta even the industry zone of the Changjiang River. Shanghai's successful hosting of APEC and successful application of World Exposition in 2010 will obviously promote the development of the economy of the Asian-Pacific region and world trade. Meanwhile, the urbanization of Shanghai is changing day by day. As a focus in the world, the city is becoming more famous. Now, Shanghai is carrying out a uniform planning for 100 towns in its suburban area. The suburban population of its outside sphere will be 8×10^6, among which 6×10^6 will be urban population, and the land for construction will be 900km^2 by 2020. As to the secondary industry, present administration limits will be broke down, industry zone will be arranged properly in order to realize the concentration and internationalization of industry. In new-built residential districts, high building is prohibited and parking lots is provided for every home. High efficient and convenient public transporta-

tion can be switched to the urban expressway network easily and the broad-band connection network and mobile communication network cover everywhere. Every new city will possess one or two big comprehensive supermarket. The forest coverage of suburban will be more than 30%, green land per person will be up to 10m^2. Influenced by the idea that "the city exists in nature", the total green land is increasing every year in Shanghai. In 2001, green land amounted to 16262.17ha, its coverage rate reached 23.82%, and green land per person was 5.56m^2. The afforestation project along the main roads is ongoing. So far, the afforestation of 25 main roads has been completed. Pudong New District, Yuandong Avenue and Longhua Avenue first put the maintenance and supervision of street afforestation in practice. Green land along the main streets will amount to 2430ha by 2010. The urban-rural combined and uniform integrated urban green lands will be established finally. The spatial expansion of Shanghai is not the simple quantitative accumulation of its area but the improvement of embodying strategic intention and the new function. Such spatial expansion is to seek win-win outcome between overall urban development request and local region's profit, and is also impersonal demand to improve the spatial efficiency for concentrated developments.

With the development and opening of Pudong and the advancement of building modern international city, and also influenced by APEC and World Exposition, Shanghai will be the world class city ultimately, which will bring far-reaching meaning to the Changjiang River Delta, to China and even to the Asian-Pacific region.

3 RADIATION SPACE AND "BUTTERFLY EFFECT"

3.1 Free Inner and Outer Traffic Access

In the south of the Changjiang River Delta, an approval was made by Chinese government to build a highway bridge spanning the Hangzhou Bay in 2002, which will be 40km long. Once finished, the land traffic distance between Shanghai and Ningbo will be sharply shortened for about 130km to 200km. In Shanghai, Yangshan deepwater port has been arranged to develop, which has a total construction period of 20 years, and the first-term of which will cost 12×10^9 yuan (RMB) and be completed by 2005. A connection channel between Zhoushan City and the mainland will be available all day long with a distance of 32km, 6 bridges, and a construction budget of 5.8×10^9 yuan. These constructions will give birth to many large scale port-oriented enterprises involving the chemical, steel and motor industries in Shanghai, Hangzhou and Ningbo, which will in turn promote urban comprehensive constructions in the south of the Changjiang River Delta. In 2000, the throughput of Shanghai port and the ports located in the Hangzhou Bay reached 378.91×10^6 t, which amounted to 30.2% of the total in China.Thereto, the throughput of Ningbo port reached 115×10^6t, and the container throughput 902 000 TEUs.

The Hangzhou Bay, 70km long,100km wide for the maximum width of its cross section, possesses a water surface of 5000km^2, and therefore provides a best environmental clarifier for the cities along it. The main transportation infrastructure to connect Shanghai, Hangzhou, Ningbo, etc. comprises double railway lines, expressway and 7 air ports. Through the under planning magnetic suspend way between Shanghai and Hangzhou, a trip between these two cities will cost only half an hour.

On the other hand, 60% of Shanghai's coastline is located in the north of the Hangzhou Bay, along which comprehensive industry zones and chemical industry zones have been drawn on the blueprint in the towns of Huinan, Nanqiao and Jinshanwei. Via Luyang Bridge, they can access Yangshan port easily. The coastline inside Jiaxing expands as long as 121km, and Zapu port in this region can also co-work with the Shanghai International Navigation Center while Jiaxing City can be constructed as a modern port city focusing on manufacturing and trading industry.

Possessing more than 1500 islands, Zhoushan owns very rich resources for building large deep-water ports including 40 places with a sea water depth more than 10m and a coastline of 183km, 22 places with a more than 20m depth and a coastline of 83km. So far, the nine 10 000-ton-grade berths have been completed, one of which is a 250 000-ton-grade berth. In the recent years, by cooperating with Ningbo in developing modern deep-water port, Zhoushan port developed quickly as regard to its throughput capability.

The Hangzhou Bay Bridge under planning with its connection line of 84.8km starts from Jiaxing in the north, and ends in Ningbo in the south. On the bridge, there will be a 6-lane divided expressway whose designed speed will be 100km/h. Once built five years later, the distance between Shanghai and Ningbo will be greatly cut off, which will be a great chance to Ningbo, Zhoushan and other neighbor areas (HU and

YAO, 2002).

In the north of the Changjiang River Delta, it differs a lot between both banks of the Changjiang River. By the Grand Canal, Ning–Hu(Nangjiang–Shanghai) railway and expressways, the spatial-temporal distance between any two cities or towns in Su-Xi-Chang region (including Suzhou, Wuxi and Changzhou cities) is reduced to 1.5 to 2.0 hours, and door-to-door logistics have been easily established there. Radiated directly by Shanghai, the earliest Hi-tech zone in China has been formed. The development and construction of Zhangjiagang, Zhenjiang, Changzhou and Xiaguan will promote further the flourish in the south bank of the Changjiang River. However, on the north bank, the Changjiang River obstructed the contact with Shanghai greatly. For Yangzhou, Taizhou and Nantong (though as the historical and culture cities), the only on-land route available to Shanghai was a bypass via Nanjing. In the past 20 years of carrying out the reform and open-up policy, new bridges in Zhenjiang, Jiangyin and Nanjing have been built and put into use. The bridge and tube across the Changjiang River from Taicang to Nantong passing by Chongming is under planning. Lüsi and Yangkou ports have been linked to the Ning–Tong(Nanjing–Nantong) expressway. Under such a situation, the development of the cities in the north of the Changjiang River will be highly prompted.

In the west of the Changjiang River Delta, with Hangzhou and Nanjing as the vertex and along the east side of the Tianmu Mountains, current railway and expressway under construction passing Huzhou, Changxing and Yixing will be linked together. Therefore, a butterfly-shape traffic system in the Changjiang River Delta is shaped (Fig. 2).

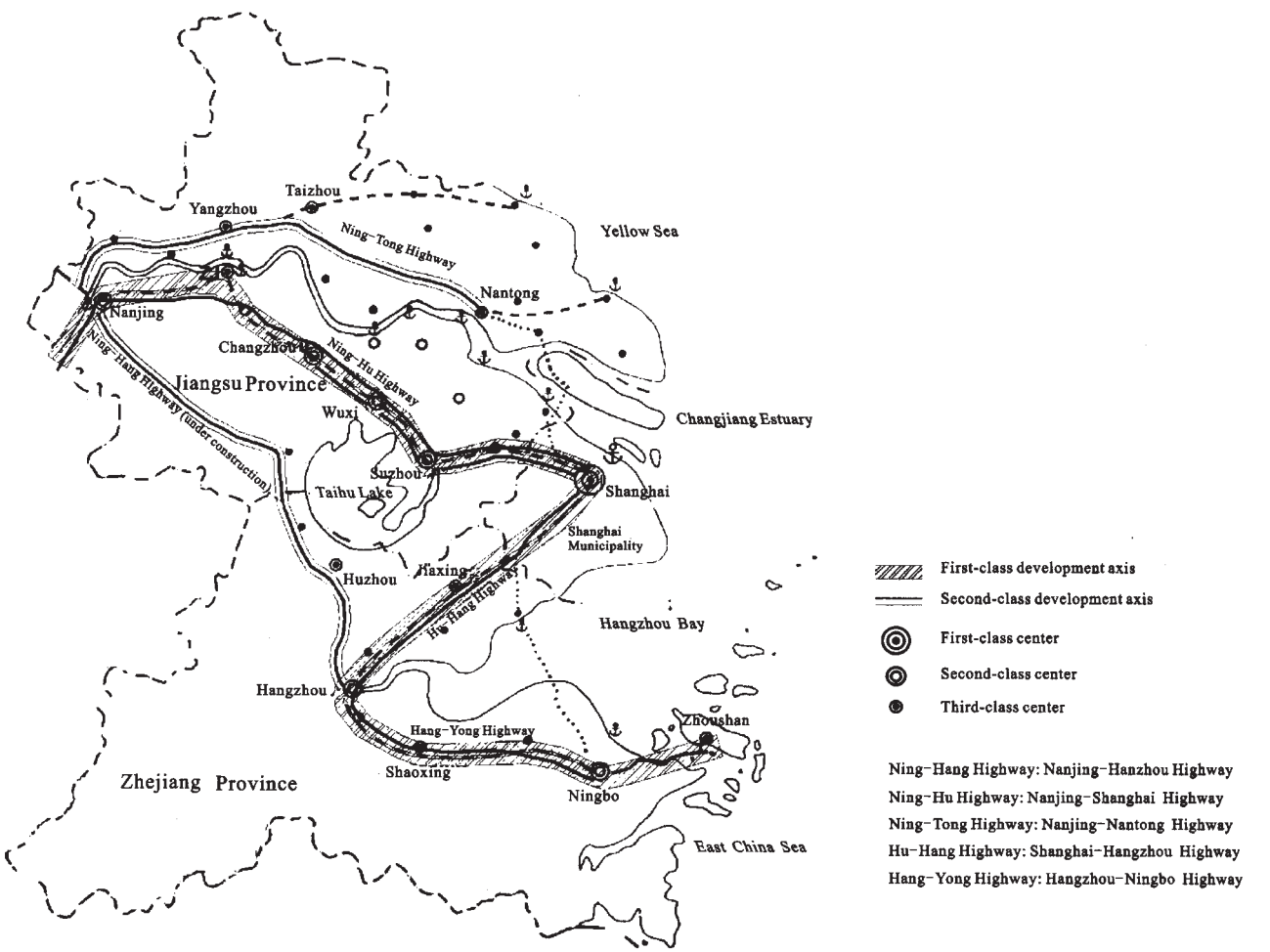


Fig. 2 Sketch of butterfly-shape traffic system structure in the Changjiang River Delta

3.2 Radiation Space and "Butterfly Effect"

Twenty years ago or even much earlier, the week end recreation of Shanghai citizen was limited to the gardens and villas in Suzhou, or West Lake and the Lingyin Temple in Hangzhou. The fresh vegetable and

fruits, goods for people's daily life (like Dongting Early Orange, Biluochun Tea, Dragon Well Tea, Lotus Powder and Water Shield of West Lake, Tangxi Loquat and Yangchenghu Crab), or the arts and crafts (like Hangzhou brocade, Huzhou Brush Pen (*Hu Bi*), Yixing Pottery) were all provided by "the Heaven" (Suzhou and Hangzhou), "Land of Fish and Rice" (Taihu Lake basin), or other surrounding area of the Changjiang River Delta. In these years, hastened by the newly developed expressway, and the speed-raised railway and air service, citizens in the Changjiang River Delta can easily travel to the Huangshan Mountain, Thousand-islet Lake, Sanqing Maintain and Wuyi Maintain during the two-day weekend. Even the travel industry and agricultural processing industry in Jiangxi Province are targeting at serving the big cities in the Changjiang River Delta.

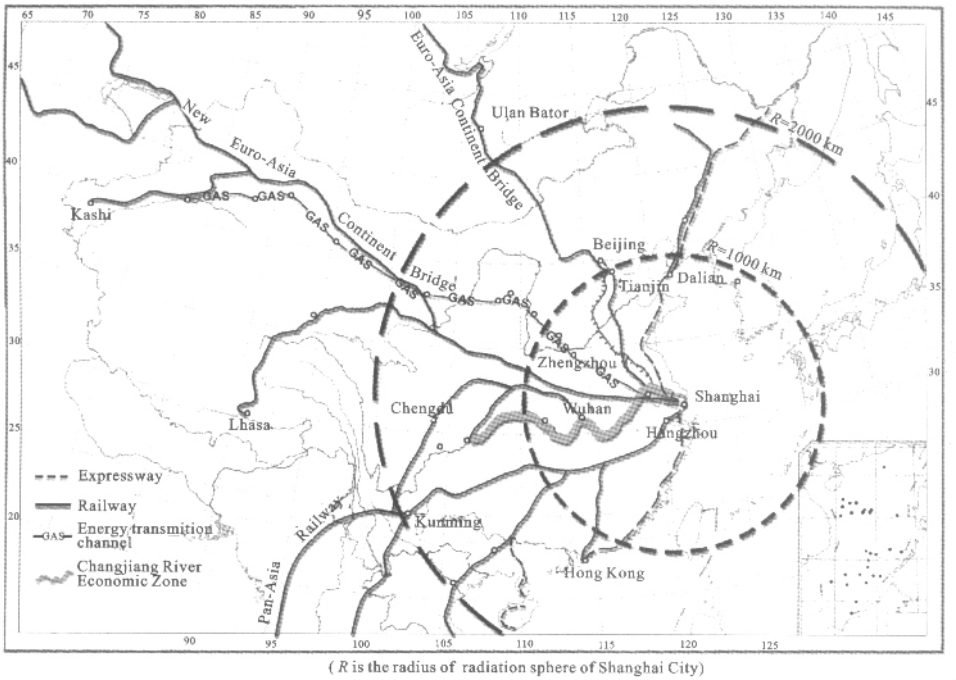
As is well known to all, the industry zone of the Changjiang River is the main economic hinterland of the Changjiang River Delta. The main basin area of the Changjiang River covers an area less than 20% of the whole China. However, more than 39% of total investment and GDP in China is aggregated here with its economic density of 1.5 times higher than the average level of the whole nation. Local consumption dependence on outside regions remained 34.2% in 1998, at the same time with a consumption level 8% higher than the average level of the whole country(57.5%) (ZHANG, 2001). After solving the basic living problem, the main task of development should be shifted from solving the basic living problem to enlarge industries' marginal utility, to increase the income of producer, and to ensure the increase of farmers' earning and their employments. By fulfilling the dynamic balance of basic farmland, planting areas and productions can be arranged according to market demands.

With the accomplishment of the Three Gorges Project and the construction of Pudong Development Zone, as the source of domestic modern economy and the first level axis for territorial development, the Changjiang River becomes more important in China. With the construction of Hu–Yu (Shanghai–Chengdu) railway and expressway, and the speed-raised Xi'an–Shanghai and Zhe–Gan (Zhejiang–Jiangxi) railway line, the relation between the Changjiang River Basin and the Changjiang River Delta will be closer than ever. "+++" like network in the middle reaches of the Changjiang River Delta, and "I" like network with Chongqing and Chengdu as its cores in the west reaches of the river form the new pattern for re-construction of regional resources and adjustment of industrial spatial structure (CHEN, 2000; YAN and REN, 2000). However, the environmental problems caused by industrialization such as shortage of land resources, acid rain and the deterioration of water source and ecology must be paid more attention to during the future years (HARDOY *et al.*, 2001; YU, 1997; ZHONG, 2003) .

With the great chance of Pudong development in Shanghai and China's West Development strategy, as an organic urban agglomeration, the Changjiang River Delta will probably become an international center of finance and trade, and also a logistic port and an information port covering the Asian-Pacific region in the near future. In the surrounding area within 1000km far from the delta, a national expressway is under construction to connect many cities in the coastal region, with Dalian in the north as its start, and Sanya in the very south as the end. Jing–Hu (Beijing–Shanghai) magnetic suspension train and new Xi'an–Shanghai railway will appear in the near future while Hu–Yu expressway and Hu–Gang (Shanghai–Hong Kong) high-speed railway is already in use. Outside this sphere (with a 1000km radius), there exists New Eurasia Continent Bridge to connect ports of Rotterdam; along the ancient Silk Road, expressway and double-track railway are laid as well as oil and gas pipeline and the main optical fiber line to connect Xiangjiang and Middle Asia area; Qing–Zang (Qinghai–Xizang) railway, crude oil pipeline and communication optical fiber line are also under construction or being laid; by lengthening Zhe–Gan railway, extending Xiang–Dian (Hunan–Yunnan) railway and constructing the Pan-Asia railway, a direct reach to Rangoon and Singapore will be fulfilled, the contact with the Atlantic Ocean and the India Ocean can be established (Fig. 3). At the bottom of the seas or oceans, the network of optical fiber line to link Japan, Korea, Singapore, even San Francisco and Los Angeles has already been formed.

World-class manufacturing industry of navigation ship and container, and shipping business with its furthest access to Alaska and the west coast of Africa will be based on the Changjiang River Delta to build Oriental Center of Logistics and Information Flow these industries needed. Being such an Oriental Center, the Changjiang River Delta will become a vigorous industrial junction and one of core areas in the world economy to reconstruct regional economies and to reallocate resources.

In the stage of the world civilization in the new century, starting from the apex of "T' like structure comprised of the Changjiang River Basin area and



(*R* is the radius of radiation sphere of Shanghai City)

Fig. 3 Main logistic channels of the Changjiang River Delta

coastal areas of China, the Changjiang River Delta, with a butterfly-like shape, will exert great influence on the whole world. That is just the inside information of the Changjiang River Delta's historical culture, and also her great charm in modern economic development.

4 SHOULDERING HEAVY RESPONSIBILITIES

The Changjiang River Delta is now in a critical stage to update and upgrade its industry structure, which means that labor-intensive industry should be shifted to fund and technology-intensive industry with a high level processing. We should know that the exterior environment for updating and upgrading the industrial structure is not very good. On the one hand it must face the high-tech pressure and monopoly of developed countries and regions, on the other point it has to compete with the cheap labor force and low cost from the less developed countries or regions.

Since the entry into the middle and late stage of industrialization, the Changjiang River Delta's population increase, and her industrialization and urbanization have been expedited. So far, the average cultivated land per capita in Shanghai is about 226m^2, Jiangsu 627m^2, Zhejiang 367m^2, which are all below the average level of China. The carrying capacity of environment is increasingly reduced. The original advantage of the market in this area tends to be forfeited with the quick speed of industrialization and internationalization of other regions. Some industries such as metallurgy, chemical engineering, architecture and urban gas industry still consume over 100×10^6t of coal. Some gases, such as SO_2, CO_2 and NO, are discharged into the air, and the environment is polluted. And the pollution belt of the Changjiang River has been extending. In China, the energy conversion ratio of coal is only 30%, while in U.S. it reaches 80% or so. The technical equipments of Jiangsu's chemical engineering industry are only at the world level of the 1980s. The joint ventures, lagged enterprises' reconstruction and the technology introducing of new corporations usually depend on foreign countries, and the ratio of research and development (R&D) in the whole economy is less than that of India and Korea. All these will result in such consequences that current environment is polluted, the corporation vigor loses gradually, and the sustainable development of Changjiang River Delta is threatened. After China's entry into WTO, some traditional industries, high-tech industry and service industry will also be affected greatly.

According to the list of global economy in 2000 by U.N., China ranked the 6th (after USA, Japan, Germany, the U.K. and France) as regard to the economic strength, the volume of trade ranked the 4th. As a developing country, we are proud of high-speed econo-

my development, but we must soberly know that we are still far away from some developed countries. According to ANDERSON, Chinese GDP has increased 6 times and reached US$1.2×10^12 since its economic reform in the late 1970s (ZHONG, 2003). However, we should keep in our minds that economic aggregate is still rather small when compared with some developed countries. In 2001, China's GDP only accounted for 3.7% of the total in the world, the volume of trade amounted to 4.3% of the total, the sum of our country's service industry only amounted to about 1/4 of that of Japan or 1/10 of that of USA (ZHONG, 2003). Our finance market is still far from being mature, and its scale is far behind Japan and less than the sum of other Asian countries. It will take a few decades for RMB to become an international currency. From the 1970s to 2001, China has risen the proportion of her volume of trade to the total in the world from 1% to 4%, while some Asian countries from 2% to 8%; the gross domestic product from 2% to 3.7%, while ASEAN (Association of Southeast Asian Nations) from 1% to 5%, and Japan from 1% to 10%. Even after 20-year development, Chinese economy scale will still be less than Japan, accounting for about 1/4 of USA or EU (European Union) scale.

Therefore, as the highland of domestic industrial development, also as the flagship for the flourish of Chinese economy, the Changjiang River Delta with Shanghai as its center is shouldering heavy responsibilities.

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