

PART II E2

REGIONAL LITERATURE REVIEW ON ECOSYSTEM SERVICES AND POVERTY ALLEVIATION – CHINA DESAKOTA ASSESSMENT

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1. A BRIEF INTRODUCTION TO THE REGIONAL CONTEXT

POLITICAL CONTEXT

The political dialogue in China is certainly very interesting as at the moment, since the country is undergoing tremendous changes and challenges to the natural environment, to its socio-economy and administrative system. As agricultural productivity increases, one of the great challenges is how to provide work and education to an increasing number of people released from the primary sector. Another is to provide enough water and food for a huge and still growing population with limited arable land and water resources. The issue of food security ranks high on the priority list in the political dialogue. A third is how to maintain high growth and enhance social justice within the society, not neglecting the poor, minority groups and women interests. While governance depends on top-down decisions, not only in China, the increasing readiness of the Chinese government to enter into dialogue with delegates that people have a right to choose at the local level, is encouraging. Migrant workers are now represented by some of these delegates. Proposals submitted for consultation during the Chinese People's Political Consultative Conference (CPPCC) run into ten thousands.

Finally, another great issue of global concern is how China can stay competitive while modernizing its industry to meet environmental standards, increase the efficiency of resource exploitation and transformation, and uphold the ecosystem functions of its water bodies, wetlands, mountains, grasslands, forests, and agricultural areas, not just by restricting the access of poor ecosystem users to fragile ecosystems, but by allocating a fair value to conservation and management efforts in which poor people, who traditionally built their livelihoods on these resources, are involved as beneficiaries. Deskota areas, neither town nor village, are growing the fastest in contemporary China, less and less so as just satellites of metropolitan agglomerations, but more and more as development zones in their own right, receiving more private and public investment. They largely integrate and condense the issues and conflicts that matter along the geographic scale from rural to urban settings. As they are spaces where much of the future growth will take place, discovering their peculiarities at a regional scale and finding solutions on how to deal with problems related to ecology and the economy of natural and human resources in these areas will be key issues for a sustainable future development of China.

SOCIAL CONTEXT IN DEMOGRAPHY

After nearly 30 years of efforts, China has found a successful way of dealing with the population issue in a comprehensive manner. The excessive population growth has been brought under effective control. The annual population growth rate decreased from 2.88% in 1970 to 0.55% in 2007. China has accomplished a historic transition in population reproduction pattern from one featuring high birth rate, low death rate and high growth rate to one featuring low birth rate, low death rate and low growth rate in a relatively short period of time, a change that took decades or even up to a hundred years for developed countries to realize in the past. Since the implementation of the family planning program, over 300 million births have been averted nationally, thus saving a great amount of payment for the upbringing of children for the society. This has

alleviated the pressure of excessive population growth on the natural resources and environment, thus contributing to the economic development and the improvement of the people's living standards. Yet, there are occasional worries that population growth might rebound (China Daily 2007) and if it does not, how to deal with issues of social security among her aging people.

ECONOMIC CONTEXT IN URBANISATION

China has total population of 0.83 billion in 1970 and 1.32 billion in 2007. It is expected that the total population will be 1.40 billion by 2020, and 1.47 billion by 2050. Urbanisation in China went along with political change in the country. Until the political reforms in the late seventies, the pace of urbanisation in China was somewhat slower than in neighboring countries like India despite its relatively higher per caput GDP (Deng 1993). The definitions of urban versus rural as described in the China Statistical Yearbook depend on (1.) the size of the settlements and (2.) the share of the 'non-agricultural' population, which in turn is subject to scrutiny by the local residence committees in towns and by village committees in townships. That such decisions are not consistent is explained by the fact, that the status of a non-agricultural resident can imply significant privileges (apartment, job, etc.).

Heilig (1999) remarked that Chinese urbanisation statistics were biased by the specific residence registration procedure, which was a relic from the pre-reform economic control system, i.e. urban residents are significantly less than urban inhabitants. If both India and China were to change their definition of urban centres to one based on a relatively low population threshold - as used by many Latin American and European nations - a large proportion of their population would change from rural to urban, which could totally change the urbanisation statistics of Asia (Tacoli, 1998). China's urbanisation has experienced three phases. The pace of urban growth during the first period, from 1952 to 1965, was fast. During the Cultural Revolution the urban population share stagnated at about 18 per cent from 1965 to 1978. Rapid urbanisation started with the economic reform in 1978 and has continued since then. In 1975, China's urbanisation rate was 17.8%, and non-agricultural population rate was only 15.4%. In 2007, the urbanisation rate had risen to 45.4%, and non-agricultural population rate to 33.8%. By medium expectation, the urbanisation rate will increase to 59.8% by 2020, and 74.2% by 2050, and the non-agricultural population rate will increase to 47.9% by 2020, and 64.8% by 2050. China will be a developed and urbanised nation by then.

Table 1 Urbanisation process in China 1965-2050

Year	Total population, 10,000	Urban population, 10,000	Urbanisation rate
1965	72538	13010	0.179
1985	105851	25097	0.237
2005	130791	56245	0.430
2007	132168	60042	0.454
2020	139583	83470	0.598
2050	146903	109067	0.742

It is expected that peri-urbanisation will account for at least 40 percent of future urban population growth in service-oriented extended urban regions (EURs) such as Beijing, Shanghai, and Hangzhou, and over 60 percent of future urban population growth in more industrial cities such as Chongqing, Chengdu, and Ningbo (Webster 2002). “The actual importance of the process in East Asia, in terms of local, national, and global impacts, is even more significant than implied by the demographics. Because most large manufacturing enterprises now locate in peri-urban areas, these regions will continue to attract much, if not most, of the FDI flowing to the East Asian region, along with considerable complementary domestic investment. Peri-urban development almost always involves wrenching social adjustment as small agricultural communities are forced into an industrial way of life in a short time.” (Webster 2002). The high rate of urbanisation, correlated with GDP growth in China, exerts a high demand on energy and resources like timber, cement, steel, aluminum, coal, etc. Shen et al. (2005) predict that China might face shortage of crucial resources and not be able to meet the targets of the urbanisation strategies, while continuing current energy and resource consumption for its industrialisation and modernisation.

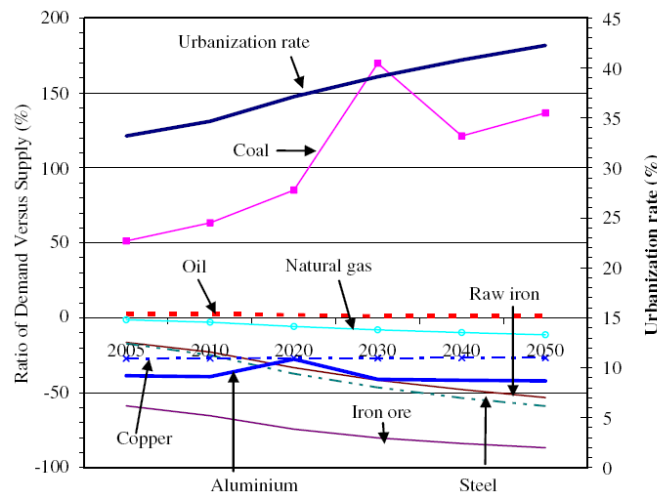


Figure 1 The change curve of resources shortage rates in China under the restrictions of both modernisation and urbanisation (Shen et al. 2005)

GEOGRAPHIC CONTEXT OF LAND USE

In a geographic context, the land-use characteristics of China are many people in less farmland, lack of resources, and large demand for construction land. This land situation is one of the main constraints to steady growth of grain production in China, and sustained, rapid and healthy development of the national economy:

1. Less land per capita share of resources, poor quality, and uneven distribution of land resources. China's per capita arable land is 0.106 hectares, per capita forest is 0.186 hectares, per capita grassland is 0.217 hectares; these are equivalent to only 44%, 18% and 35% of the global average, respectively. China's overall quality of land resources is not high. National farmland irrigation rate was 39.8 percent; forest occupies 70.5% of the

total woodland; grassland of poor quality accounts for around 50 percent of the grassland. China's geographical distribution of land resources is uneven, particularly does not match the regional distribution of water resources, which seriously affects land productivity. The area south of the Yangtze River Basin encompasses more than 80 per cent of the total water resources of the country, but has only takes 38 per cent of the total cultivated land area, while the area north of the Huai River owns less than 20 percent of the country's water, but 62% of country's arable land.

2. Land that can be developed to compensate the lack of resources. At present, China's unused land area which can be developed into farmland is only about 6.6667 million hectares. Wasteland that can be developed into farmland is located mainly in the northwest and northeast regions, which has more constraints for development and utilisation.

3. Land utilisation rate and productivity are low. Over the years, construction land mainly expanded outward, causing rapid expansion of construction land, while actually the use is less efficient. Urban land growth is far more dynamic than urban population growth. According to official statistics, in 1986-1996 the non-agricultural population in Chinese cities increased by 59.7 percent, while over the same period, urban land grew 106.8 percent. Rural areas have dispersed rural settlements, empty villages, and a lot of idle lands. The rural per capita land occupancy is 182 square meters, 32 square meters higher than the national standard. Urban regions blindly set up development zones, occupy large stretches of land, and thus increase large areas of idle farmland which is uncultivated. In 1996-2007, the trend of population density decrease in the buildup area continued. Agricultural land utilisation level and productivity were lower. The ratio of canals, irrigation ditches, and roads net to arable land area are 1:25, 1: 10 and 1:20, respectively, which is more than 1.5, 1, and 2 times the average of intensive land use nations. In 1996, national farmland grain yield was 4.89 t / ha (5.32 t / ha in 2006), orchards yield is 5.95 t / ha (2006 yield of 17.0 tons / ha), woodland yield is 1.39 cubic m / ha (less in 2006), which is below the average level of developed countries.

4. Land is degraded and serious damaged, and the ecological environment has been deteriorated. At present, 1/5 of the arable land was polluted by the industrial waste water, solid waste, emissions, and pesticide; 135 million hectares of grassland was degraded, desertified or alkalinised, at an annual increment of 2 million ha. Soil erosion covers 367 million hectares or about 38% of the land area, at an annual increment of 1 million hectares. The desert area has now reached 262 million hectares, and expands 246,000 hectares annually. Because of the serious imbalance in the ecosystem, there are frequent drought and flood disasters every year, natural disasters damage about 100,000 hectares of arable land each year. In 1996, due to mining, 2.8 million hectares of land area was destroyed, while land reclamation rate to compensate mining activities was only 12%, far below the level of economically developed countries.

THEORETICAL DEFINITION OF DESAKOTA IN CHINA.

It is clear that over time, as the cities expand, desakota phenomena are often transitory in their own locations and gradually spread out into the surrounding countryside. The changes have affected not only the total urban population, but also the distribution of

sizes of cities, which are more evenly distributed in populous countries like China, evidenced by indicators like the Pareto exponent (Song and Zhang 2002). City size distribution and extent of urbanisation have both given rise to the *desakota* phenomenon and the growth of *desakota* areas in China. Not all authors use the term *desakota* to describe similar appearances. Webster for example subsumes under ‘peri-urbanisation’, what happens as far as 300 km away from the core city in China (Webster 2002). For simplicity, he further delineates regions as peri-urban, where (1) employment in manufacturing is more than 20 percent of the region’s labour force and rising, and (2) employment in the primary sector (agriculture, fisheries) is more than 20 percent of the labour force but declining. However, Webster (2002) concedes that these phenomena are better described as ‘a process under way’ than in terms of strictly delineating criteria.

In this section, we will draw an urban gravitational field distribution map for China through designing gravitational units and calculating the gravitational field. We divided the country into cells striding 0.02 degree of both latitude and longitude (equivalent to 2.2 km along meridians). Supposing a friction coefficient of distance decay of 2, we calculate the influence force, or gravitational field, to each cell from each of the 670 cities by using ARCGIS, and then define the city influence domain for each cell in accordance with the largest gravitational force principles. The total urban influence force field was charted by summing up the influence force fields of 670 cities, and finally drawing the distribution maps of influence domains for 670 cities dissolving the city influence attribute for each cell in GIS. Underlying parameters for the calculation of urban gravity fields are the population size of urban centers and their relative proximities. Where to draw the limits of such defined *desakota* phenomena is a matter of deciding which urban gravity field grade to take as the boundary. In our case it was based on empirical observations.

The results are that for the national distribution of urban gravitational force, the urban gravitational force grades are between -3 and 39. Grades for low value areas are less than or equal to 5, grades for high value area are equal to or more than 16, and grades for mid value area are between 6 and 15. Normally the urban gravitational force is higher at regions with higher city density in China, and the grade is more than 6. Whereas regions with the grade greater than 16 have the highest urban gravitational force, they are generally located around large cities which fail to form contiguous high-value zones. Therefore, the internal structure and spatial distribution of urban gravitational fields can be analysed by studying the distribution of the regions with gravitational force grades between 6 and 15.

By reading the distribution map of the gravitational field in China, we can find that China's urban gravitational field distribution characteristics are: 1, high-value regions are concentrated in the southeast half of China, while the grades for the north-western half are relatively low; 2, the concentrated distribution of city groups is combined with the scattered distribution, and large city groups always form contiguous regions with high gravitational force value; 3, regions with harsh natural conditions, such as the Gobi desert, plateau and mountain, and cold regions in the north, that have low gravitational force value for their cities are scarce; 4, regions with favourable natural conditions, such as coastal areas, the great plains and large basins, have high gravitational force value for the city density is high, the regions near the mega-cities have the strongest gravitational

field; 5, the difference between the low and high value areas is larger (about 24) according to the grading by natural logarithm.

At present, this approach does not take into account differences of population density within municipalities. China significantly lowered the criteria for qualifying localities as urban in the early 1980s. In 1987, for example, the newly created city of Zibo in Shandong Province contained 2.4 million residents within its (generous) city boundaries. But 66% of the urban population was principally engaged in agriculture (Goldstein, 1990). Cohen (2004) believes that any estimate of the size of a particular city needs to be clarified in terms of whether it is an estimate of the central city, the greater metropolitan area, or a wider planning region that may include other subsidiary settlements.

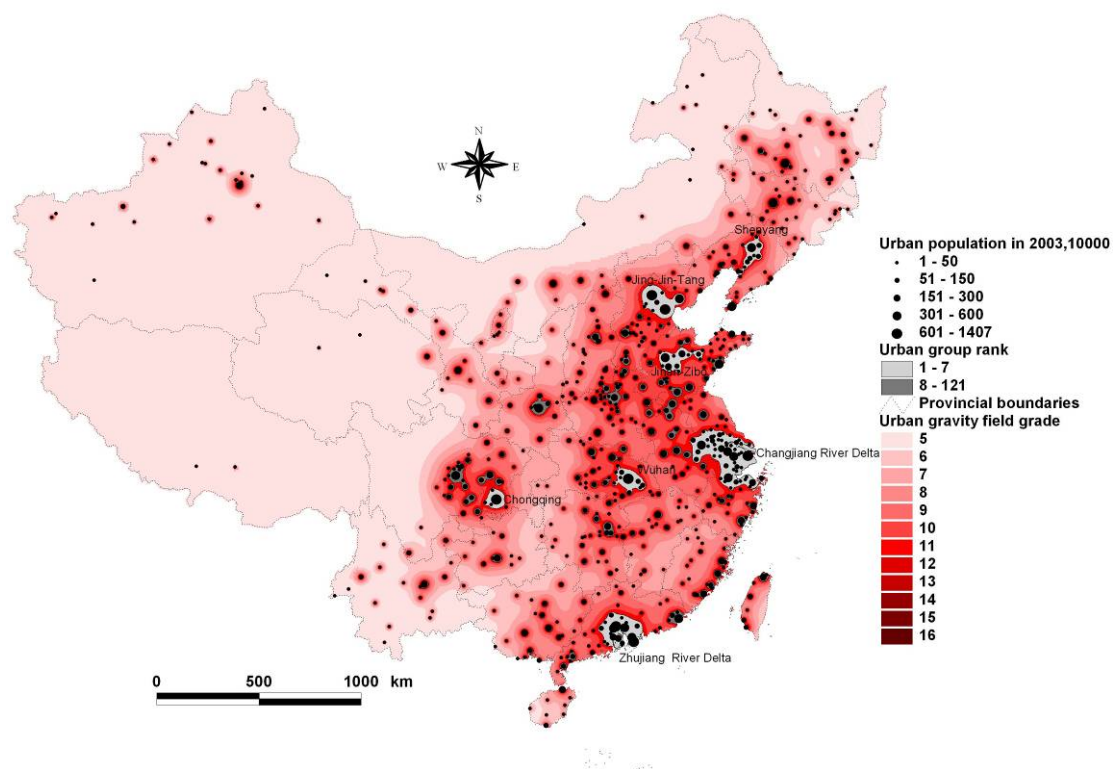


Figure 2 Distribution map of DESAKOTA zones in China

Keeping the above mentioned restrictions in mind, let's have a look at the results of the city gravitation analysis: According to the total urban population in the contiguous regions, the result of sorting for China's megalopolis clusters are: the Yangtze River Delta (population 51.21 million), the Pearl River Delta (population 42.17 million) and the Beijing-Tianjin-Tangshan region (population 26.96 million) are the top three largest (Fig. 2); Wuhan (population 13.64), Jinan - Zibo (population 12.80 million), Shenyang (population 11.98 million), Chongqing (population 11.27 million) are the 4th-7th largest; Xi'an, Shantou, Zhengzhou, Xuzhou, Qingdao, Changsha, and Harbin are the 8th-15th largest; Nanchong, Dalian, Changchun, Taiyuan, Wenzhou, Taipei, Guiyang, Shijiazhuang are the 16th to 23rd; Haikou is the 50th, Yinchuan is 121st. (Figure 2, Table 2)

Table 2 The largest 15 megalopolis clusters in China sorted by population

Rank	Population, 10000	City number	Head city	Other major cities
1	5121.0	50	Shanghai	Nanjing, Hangzhou, Suzhou, Wuxi, Ningbo
2	4216.7	19	Guangzhou	Hong Kong, Dongguan, Shenzhen, Foshan
3	2695.8	8	Beijing	Tianjin, Tangshan
4	1364.1	11	Wuhan	
5	1279.8	13	Jinan	Zibo
6	1197.9	12	Shenyang	
7	1127.4	4	Chongqing	
8	839.9	5	Xi'an	
9	752.6	9	Chengdu	
10	655.5	4	Shantou	
11	511.9	12	Zhengzhou	
12	424.4	3	Xuzhou	
13	416.3	5	Qingdao	
14	392.2	3	Changsha	
15	337.7	2	Harbin	

Source: China City Statistical Yearbook 2004

A comparative analysis of land use data and Landsat images revealed two concurrent processes of urbanisation and non agricultural land use change (Lin 2007): Rapid urban sprawl of large cities, driven by the expansion of ring-roads and setting up of 'development zones', has contributed to the conversion of farmland into nonagricultural uses. At the same time, rural industrialisation and a housing boom have given rise to a dispersed pattern of non-agricultural land development all over the country.

Since environmental patterns may strongly influence ecological processes Long et al. (2008) analysed the changes of LULC (land use and land cover) patches between 1995 and 2006 to assess the structure and function of urban-rural ecosystem. The authors used number of patches, patch density, aggregation index and average patch area to measure the fragmentation and aggregation of LULC in Chongqing. The aggregation index of urban settlements and rural settlements showed that local urban-rural development experienced a process of changing from aggregation to decentralisation. The continuously augmented patch density of construction land indicated that the expansion of construction land has been keeping a zooming trend (Long et al. 2008).

Chongqing's rural settlements increased by 39.66% from 1995 to 2006 however, its rural population decreased by 3.64%. A field investigation showed that there was more idle rural housing land, vacant rural housing, and often one household owned two or more houses, either because the owners are rural-urban migrants, or live permanently in urban areas, which resulted in some waste of land resources. As elsewhere, land use changes in China, while restricted by physical conditions, are mainly driven by socio-economic factors. In the case of Chongqing, drivers of land use change were (1) The establishment

of the municipality directly under the Central Government, (2) the Three Gorges Dam Project, (3) the Western China Development Program, and (4) the the Grain-for-Green Programme. Implications for the new policy of ‘Urban-rural Integrated Reform’ are the transformation of Chongqing into a metropolis with an urbanisation level of 70% by 2020 while at present approximately 73.6% of the over 31 million registered population in Chongqing are rural people with an average income of 2 874 RMB in 2006 (urban income: 11 570 RMB).

As informal urban communities are not so apparent in Chinese cities, the question is where the urban poor are living under conditions of rising house prices and rents in sprawling cities. No information was found about whether such people travel long distances to commute to the cities from peri-urban or desakota areas, but some form of informal housing at the periphery of large cities might still exist. Not much was found on such informal communities apart from some general aspects of the phenomenon described by Davies (2004), but observations on China did not include this aspect.

In many Chinese cities heavily polluting industries are being relocated outside the established urban fabric to the peri-urban areas. This shift is to areas where large numbers of the poor live, especially migrants. They bear the consequences in terms of water and air pollution and the implications for health (DFID 2004). Around the built-up urban areas within municipalities there is also typically substantial agricultural land, which can be used to provide food. In the case of Beijing, the peri-urban agricultural land is farmed mainly by rural migrants who rent land and greenhouses. Migrant farmers can earn a net annual income of RMB 8000-9000 per person, five times higher than the average income in their home villages. A key issue identified in the analysis of agriculture in peri-urban areas is that farmers have a strong need for assistance in accessing markets (World Bank 2003).

Given the continuous fast economic growth of China, the question whether migration is excessive or insufficient is debatable. Although the rate of urbanisation (1995-2000: 2.64%) lagged behind economic growth (1990-2003: 9.6%), a high rate of increase in level of urbanisation brings its own costs, and even if the level of urbanisation is less than optimal for China’s economy, the costs of having an even higher rate of urbanisation might already exceed the benefits (McGranahan & Tacoli, 2006).

Table 3 Annual percentage change in population, urban population and urbanisation level – China 1990-2000, by Millennium Ecosystem Assessment zone

Zone	Population (%/annum)		Urbanisation (%/annum)
	Total	Urban	
Coastal zone	2.01	3.48	1.48
Cultivated	0.96	2.13	1.22
Dryland	1.05	1.55	0.48
Forest	0.61	2.17	1.59
Inland water vicinities	1.42	2.69	1.29
Mountain	0.81	2.41	1.53
Overall	1.06	2.25	1.27

Source: CIESIN Global Rural-Urban Mapping Project 2005 (estimates)

Socio-economic changes taking place in extended metropolitan areas (EMR's) were analysed by Wang (1997) comparing the income levels and life-styles of the three villages of varying distances from urban areas in the Shenyang-Dalian EMR in north-east China. Wang (1997) suggests the EMR settlements are simultaneously rural and urban and concludes that the perception of a rigid rural-urban division needs to be challenged.

Praendl-Zika (2002) advocated a poly-centric network of settlements (Fig. 3) which should be structurally organised according to the logistic needs of farming activities. These comprise internal logistic needs; e.g. farms and their appending fields are located in a way that internal distances from the farm to the fields are as short as possible, and external logistic needs, e.g. short distances and supply chains in a poly-centric network of settlements with its different markets and consumers facilitate direct marketing for farmers and therefore allow higher profits without intermediaries, leading to sustainable rural-urban partnerships.

Xie et al. (2005) think that the longstanding migration of the population to large cities which has historically marked third world urbanisation is less significant than the transformations that are taking place as the rural population becomes urban without substantial movement to the cities. This phenomenon is what the authors call “desakota”. They developed a logic (Fig. 4) for modeling spontaneous urban change in China integrating ‘global’ or policy influences and ‘local’ influences based on household decisions.

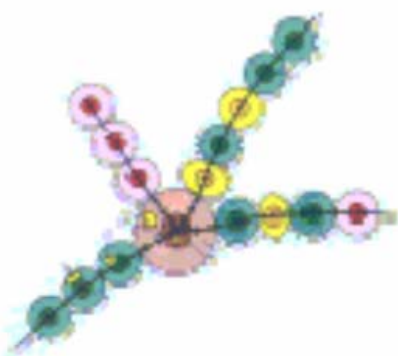


Figure 3 Poly-centric network of settlements (Praendl-Zika 2002)

Xie et al. (2005) called this “two-front growth” which combines two different policy-making levels which both contribute to the simultaneous development of urban and rural areas by fusing “city-leading-county” initiatives in the cities with the “household responsibility system” that has been introduced in the countryside. City-leading-county initiatives are geared to transforming decaying state-owned enterprises into private but often State sponsored investments. These new developments are initiated by local enterprises adjacent to large cities with foreign investment, often appearing in what was once farming land like “flying intruders” (Wei 2002).



Figure 4 The logic of desakota (from Xie et al. 2005)

In contrast, the introduction of a “household responsibility system” (HRS) has dramatically changed rural areas through the decollectivisation of agriculture and a return to family-centered crop production. HRS has provided strong incentives for rural towns and villages to diversify and grow their economies by developing non-agricultural enterprises. In general, this kind of rural urbanisation often involves small-scale, individual, private owned non-agricultural land use, which is termed “rural construction” in official Chinese statistical yearbooks with most construction registered as housing. But the functional uses of such rural construction are diverse; many individual houses are in mixed use, based on small factories, craft and other retail shops, restaurants, and related privately-owned and operated businesses. According to Marton (2000) this bottom-up impetus is core to China’s economic vitality and is a primary factor sustaining China’s continued economic miracle.

Compared with state-owned enterprises (SOEs), township and village enterprises (TVEs) are found to be more efficient in terms of relative productive efficiency. TVEs can and should continue to develop in order to both pursue urbanisation and absorb the abundant surplus labour in rural areas (Chen 1998). However, SOE’s also have the capacity to adjust to changing markets, integrate and stimulate the emergence of related enterprises in their surroundings and improve their environmental performance (Zhang 2007), yet balancing economic growth with environmental protection remains an arduous task. As political decision making is taking heed of local experience, it is interesting to find out more about the perception of stakeholders regarding this balance. In a Zhengzhou SOE, 50 per cent of farmers and 60 per cent of current employees ranked environmental protection higher than economic growth, 76 per cent of laid-offs did so and just 22 per cent of senior managers, not surprisingly as their income depends on productivity and profit rather than environmental performance (Zhang 2007).

Chinese ‘peri-urbanisation’ differs from the Southeast Asian in a variety of fundamental ways. First, the developer of the major industrial estates is usually an agent

of local government, normally the municipality. A second difference, “is that regional development planning, and to a lesser but considerable extent a conceptualization of urban constellations as regional systems, does not exist in China.” (Webster 2002). Peri-urban development is driven both by large industrial projects, such as coastal economic and technological development zones (ETDZs), and bottom-up economic processes that result in the start-up of SMEs (small and medium-sized enterprises). Existing SMEs in peri-urban areas include former TVEs that have survived the rigors of an emerging market economy. A high proportion of former TVEs in peri-urban areas, and an even higher percentage in rural areas, have not been able to survive the transition from a scarcity economy, which guaranteed markets for virtually all products, to a surplus economy.

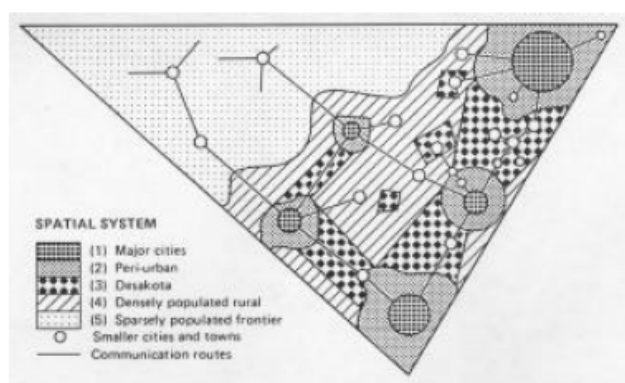


Figure 5 Spatial delineated zones in the urban-rural continuum (McGee 1991)

A conceptual framework and implementation methodology for measuring urbanisation has been proposed by Heikkila (2003). If such ‘fuzzy urban set’ methodology is developed further and integrated as a component of GIS software, it could also be used to delineate desakota zones spatially (Fig. 4), a prerequisite for more intensive spatially-based research for example on trade-offs between economic development and loss of ecosystem services including their respective effects on poverty alleviation in these areas. The gravitational pull model introduced above could serve the same purpose, provided it can be validated against empirical data or remotely sensed evidence.

SIMPLIFIED DESCRIPTION OF THE DESAKOTA PHENOMENON IN CHINA

Who: floaters, or peasant workers.

Where: suburbs of large cities, or villages in cities.

What happens: the floaters is working hard to make money, and service the urban needs, including restaurant, food processing, vegetable production, construction work, house decoration task, baby-sitter and house keeper, gardener, transportation, and all other tasks the urban labour does not like to do.

Why: surplus rural labour force in the countryside, wants to pursue more income, have better living conditions in city than in rural area

2. REGIONAL PATTERNS AND DRIVERS OF CHANGE IN DESAKOTA REGIONS

THE ECONOMIC DEVELOPMENT CHARACTERISTICS IN CHINA SINCE 1978

- Maintaining rapid growth rate for a long period. China's economy maintained fast growth for 30 years, the average real GDP growth rate was 9.75% in 1979-2006. China's real GDP in 2006 was 13.34 times higher than real GDP in 1978.
- Stable economy with low inflation rate. The overall inflation rate in the last 3 decades was low. The average inflation rate in 1978-2006 was 6.08%, and the average inflation rate in 1997-2006 is 2.09%.
- Rapid growth in real GDP per capita recently. The real GDP per capita growth rate in 1979-2006 was 8.5%. Real GDP per capita in 2006 was 9.72 times as much as in 1978. According current exchange rate, China's real GDP per capita is 16084 Yuan or \$2217.
- The expectation for China's economic growth is optimistic. According to data from the IMF, China's GDP per capita based on purchasing-power-parity (PPP) valuation of country GDP was \$1692 in 1992, 3913 in 2000, and 6771 in 2005. It is expected to be 12187 in 2010, reaching the expected level of Brazil and Mexico at that time; to be 21092 in 2015, reaching the level of Russia and Malaysia at that time; and to be 36503 in 2020, reaching the level of Argentina and Portugal. China's GDP per capita based on PPP was 1/11 of USA's in 1995, 1/6 of USA's in 2005, and is expect to be 1/2 of USA's in 2020.

Table 4 Economic growth in China 1978-2006, current price Yuan

Year	GDP, 100 million	GDP, 100 million index	GDP Per capita	GDP Per capita, index
1978	3645.2	100.0	381.2	100.0
1980	4545.6	116.0	463.3	113.0
1990	18667.8	281.7	1644.0	237.3
2000	99214.6	759.9	7857.7	575.5
2005	183867.9	1200.8	14103.3	880.7
2006	210871.0	1334.0	16084.0	972.9

Economic development forecast

Table 5 Economic growth in China and major nations 1992-2020 by IMF, GDP, PPP, per capita

Country	USA	UK	Japan	Germany	France	Argentina	Russia	China
1992	24233	18505	20942	19580	19249	9357	7293	1692
1995	27258	21503	22878	21424	21005	10474	5947	2495
2000	34139	26950	25793	25466	25656	12210	7067	3913
2005	41124	33623	30858	29525	30427	14513	11010	6771
2010	49798	42491	37561	36780	36682	20343	15954	12187
2015	60828	53528	44179	43819	43878	25241	19830	21092
2020	74301	67431	51962	52206	52485	31318	24647	36503

Zhang et al. (2007) have looked at economic growth from a sectoral point of view. The results are listed in Table 6. The share of the primary sector has been in constant decline. However, it is possible that this decline might ease a bit in the distant future considering that the value of agricultural produce is rising in response to population growth and comparative scarcity induced by global environmental change.

Table 6 GDP growth and composition of China GDP by sectors (from Zhang et al. 2007)

Year	GDP (100 million Yuan)	GDP growth rate/annum (%)	Percentage of GDP			Ratio of secondary to primary industry
			Primary industry	Secondary industry	Tertiary industry	
1978	3624	11.7	28.1	48.2	23.7	1.72
1985	8964	13.5	28.4	43.1	28.5	1.52
1990	18 548	3.8	27.1	41.6	31.3	1.54
1995	58 478	10.9	20.5	48.8	30.7	2.38
1996	67 885	10.0	20.4	49.5	30.1	2.43
1997	74 463	7.8	19.1	50.0	30.9	2.62
1998	78 345	7.6	18.6	49.3	32.1	2.65
1999	82 068	7.6	17.6	49.4	33.0	2.81
2000	89 468.	8.4	16.4	50.2	33.4	3.06
2001	97 315	8.3	15.8	50.1	34.1	3.17
2002	105 172	9.1	15.3	50.4	34.3	3.29
2003	117 252	10.1	14.6	52.2	33.2	3.58

COSTAL CONCENTRATION TREND OF ECONOMIC GROWTH

According to resources and environmental carrying capacity, the existing development density and potential for development, and considering the future of China's population distribution, economic layout, land use and urbanisation patterns, land space will be divided into four main functional zones: optimised development, key development, restricting development and prohibiting development. The aim is to adjust and improve regional policies in accordance with the main function of the respective region, conduct performance evaluation, and standardize the spatial development order to form a reasonable space development structure. DESAKOTA corresponds to the optimized development zone and key development zone.

Regional development directions for optimizing the development zone are: the optimizing development zone is the region which already has higher development density, and its resources and environment carrying capacity of the region started to diminish. The growth model of relying on massive land occupation, consumption of a lot of resources and substantial pollution emissions to achieve faster economic growth must change. Improving the quality and efficiency of growth must be the first target. This zone must enhance participation in the global division of labour and the level of competition to continue to lead the country into economic and social development, lead China's participation in economic globalisation, and become the mainstay region of China.

Regional development direction for the key development zone: the key development zone is the region with higher resources and environment carrying capacity, has better

economic and demographic concentration conditions. The development policy on this zone is to enhance infrastructure, improve the investment and entrepreneurial environment, promote industrial cluster development, and strengthen economic scale, speed up industrialisation and urbanisation, accommodate industrial transfers from the optimizing development zone, accept population transfers from the restricting development and prohibiting development zones, and gradually become the major carrier for national economic development and population concentration.

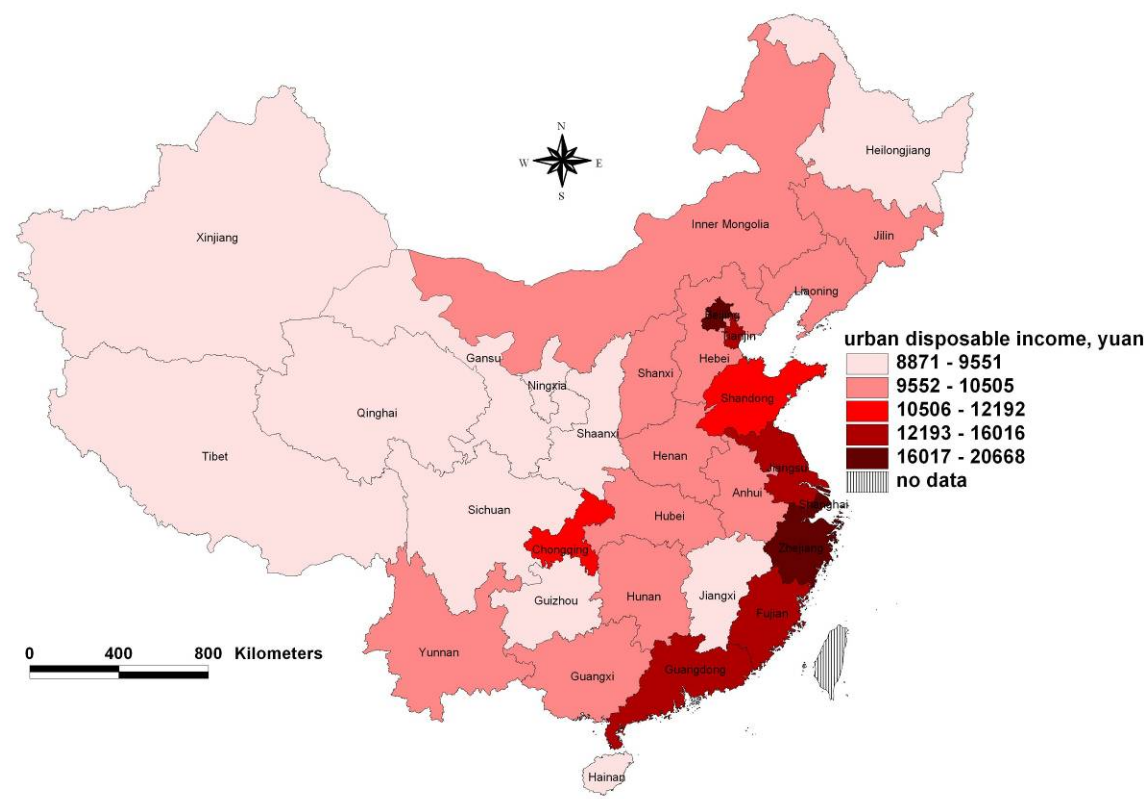


Figure 6 Urban per capita disposable incomes in China, 2006

TREND OF PRODUCTION AND TRADE FOR AGRICULTURAL PRODUCTS IN CHINA

Table 7 Trend of production and trade for agricultural products in China

Labor intensity	demand	low land -intensity	high land -intensity
high	strong	vegetables, fruits; Increase production, exports	Herb medicines, tea; Increase production, exports
	weak	tobacco decrease production, exports	sugar cane decrease production, imports
low	strong	corn, green feed, potato; Increase production, exports	cotton, oilseeds, pulses ; Increase production, imports
	weak	rice, wheat, hemp; decrease production, exports	other grains and other crops, sugar beet; decrease production, imports

MIGRATION PATTERN IN CHINA

On November 1, 2005, the total population of China was 1.306 billion people, and the country's floating population ("liudong renkou") was 147.35 million, of which inter-provincial movement accounted for 47,790,000 people. Comparing to the fifth national census in 2000, the mobile population grew by 2.96 million, and inter-provincial movement increased by 5.37 million. Liang (2004) remarked that the growth in the floating population benefited from less stringent control of the household registration status ("hukou") and less dependence of floating migrants upon food and other essential goods from the household administration as in the 60ies and 70ies. In 2001, the State Council eased residency requirements in more than 20,000 small and medium-sized cities as part of a plan to absorb 40 million surplus rural labourers. Chen and Parish (1996) remarked that one of the reasons for the relaxation of the household registration controls was that they were found incompatible with rapidly changing demand for labour, especially in and around major foreign trade centres in the coastal regions.

According to a survey in Guanzhou by Fan (2001), permanent migrants who possess urban residence have higher incomes and better chances of moving up to more profitable occupations than temporary migrants. Yet it could have been higher social and educational status that was of help to get permanent urban residence in the first place. In China, a third of the 300 million migrant population are adolescents, representing a growing challenge for the provision of quality educational options (DeJaeghere 2004). Beijing became the first large city to open its public schools to the children of migrants. From the academic year that started in September 2002, Beijing public schools must accept these children, and at reduced school fees.

As regards the floating population, the size of inter-provincial migration might shrink in the future. In the context of the new countryside building, and national economic policies on the development in central and western regions, local cities and towns can resolve the local population employment problem better. Therefore, the inter-provincial flow will be reduced. Beijing also faces growing pressure from its floating population. But if Beijing will further promote economic development in surrounding areas it may be possible to partially alleviate the population pressure and reduce the impact of commuting on urban infrastructure.

Comparing urban and rural development components, urbanisation clearly incorporates the biggest change potential in the future China. The urban population share of the total population is growing very fast, and this will be a major trend in the coming years. China's urbanisation rate in 2050 is expected to reach 60%. In the nearly three decades since the inception of reforms, the structure of China's labour force has been fundamentally transformed. In 1978, an overwhelming majority of the labour force was either employed as agricultural workers in rural communes or as employees in urban state owned enterprises (SOE), with virtually no labour flows between the rural and urban sectors. By 2004, however, over a third of the rural labour force had moved into non-farm activities, and about three-quarters of the urban labour force had found employment outside of the state sector, in urban collectives, joint ventures and private enterprises (Fleisher and Yang 2003). Today, there are more than 100 million rural migrants working

temporarily in cities, establishing a direct connection between the rural and urban labour markets. Generally, there are three types of rural migrants: The first are those who are officially permitted to move to cities. The second involves peasants who engage in industrial, commercial and service activities in cities (the floating population). The third are the daily commuters who live in villages and go to nearby cities to work on a daily basis (the pendulum population).

Table 8 Estimation of floating population in China

Year	the total population , 10000	The floating population, 10000	floating population rate
1982	101654	3000	0.0295
1985	105851	4000	0.0378
1988	111026	7000	0.0630
1994	119850	8000	0.0668
1997	123626	10000	0.0809
2003	129227	14000	0.1083
2005	130756	14735	0.1127

Table 9 Floating population in Beijing (10 thousands), 2000-2007

Year	Total population	Floating population	Floating ratio
2000	1382	304	0.220
2004	1525	430	0.282
2007	1700	510	0.300

CHINA'S CURRENT SITUATION OF THE FLOATING POPULATION

Unlike during the time before the reforms, peasant households today are more self-reliant. Migrant work is a suitable and often the only option to make ends meet. Currently China is characterised by its large number of floating population, a wider distribution, and more stable flows. Floating population flows occur in each province, municipal and autonomous region, from big cities to small and medium-sized cities, from the inland to border regions, from the Han ethnic group region to the autonomous areas, the footprint exists everywhere. It can be said that in a market economy, where ever the conditions are suitable to make money, a floating population shores up. In China, the floating population is mostly introduced by relatives and friends or local workers, forming relatively stable flows. The stability of flows is also represented by relatively concentrated inflow and outflow routes. Most of the flow is from the rural areas to large and medium-sized cities and from the central and western regions to eastern coastal areas.

Part of the temporary floating population enters cities and towns to join the non-agricultural industries sector. This can be divided into two types: self-employment in the urban informal sector, such as construction workers, cleaning workers, and other temporary vendors. Another type of population flow to cities and towns as official migrant workers, employed to do the dirty, hard, and bitter jobs which urban formal worker do not want to do.

Of all China's floating population, the desire of workers to do business, undertake study or training, and marriage migration with family are the main reasons for the population flows. The fact that mobile business workers occupy a large proportion of the floating population is caused by the macro background of a large number of surplus agricultural labour drifting to cities and towns to seek employment opportunities.

With the existence of a dual economic structure in China, the urban-rural gap is still large, low economic efficiency of agriculture stimulates surplus agricultural labour movements. Urban employment opportunities, a higher income level and better living conditions also exert a pull on the surplus agricultural labour force. Uneven economic development and reform also contributed to let surplus agricultural labour flow from the relatively backward central and western regions to the more developed eastern coastal areas. These are important economic driving forces for China's agricultural surplus labour flows.

The continuous deepening of reform and opening up, and breaking of a series of institutional barriers for the movement of the population provide a realistic possibility for population flow. Reform and opening up also change the mindsets of the people, the majority of farmers gradually get rid of native concepts and the shackles of small-peasant mentality, and intensify their sense of market economy, competition and mobile awareness. The migrants need to be very flexible and adapt to changing situations, as their lives are threatened by insecurities with respect to employment agreements, social security, and according to Tao and Xu (2007) also rural land tenure. Yet at the overall scale, the benefits for the migrants (compared to non-migration) and the national economy prevail. Rural non-agricultural labour in TVE's etc. has a 3.5 times higher marginal productivity than agricultural labour, whereas the marginal productivity of urban labour is 14 times higher (Tian et al. 2004). The relationships between rural, urban, agricultural, and non-agricultural populations are captured in Figure 7 (Tian et al., 2004).

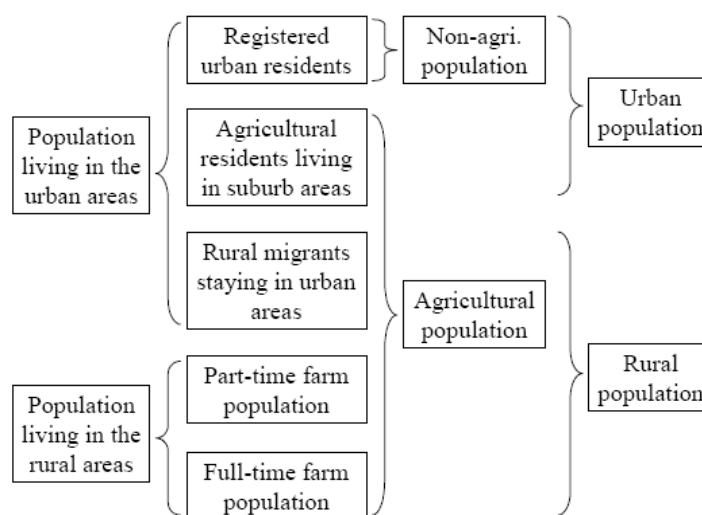


Figure 7 Relations between different population sets (Tian et al. 2004)

Based on the floating population data in 1996 from the Ministry of Public Security of China, the spatial floating population in Chinese cities is analysed. Major conclusions are

that the floating population in Chinese cities is distributed over the region following coastal line and focusing on three circles: a) The Beijing-Tianjin-Dalian floating population circle. It is the third biggest floating population circle which has a sex proportion of 1.94. The floating population from other provinces accounts for 74 percent of the total. The floating population in Beijing resides together by kinship and the area of provenience. b) The Shanghai- Nanjing-Hangzhou floating population circle. It is the second biggest floating population circle whose proportion of floating population from other provinces accounts for 49 percent. The floating population's stay time in this circle is more various. c) The Guangzhou-Shenzhen-Xiamen floating population circle. It is the biggest floating population circle. Its sex proportion is 1.22. The floating population from other provinces is 56 percent of the total.

Reconversion from agrarian to industrial activities, specially low-skill, labour-intensive manufacturing in this region has led to a "large-scale, rural-urban population immigration of largely unskilled female workers, and the expansion of the builtup area for industrial and urban uses at the expense of agricultural uses." (Sit and Young 1997). The summer flood of 1994 clearly illustrated the problems arising from rapid urban development in the Pearl River Delta with inadequate attention been paid to soil conservation and maintenance and improvement of the drainage systems (Chan 1996). The perceived need for better planning was constantly challenged by the immense development pressures arising from economic reforms (Xu and Ng, 1998). The challenge for sustainable regional planning is picked up by Liu and Huang (2007), who apply landscape ecological metrics to assess the present situation of desakota towns and dynamics and present suggestions for ecological planning focusing on small towns.

RESETTLEMENT INFLUENCES

Resettlement can be looked upon as a form of involuntary migration that amplifies desakota phenomena in the resettlement areas. Heggelund (2006) evaluated an 'impoverishment risks and reconstruction' model (IRR; Cernea 1997, 1998) used to identify risks in the reconstruction of livelihoods for resettled people in the Yangtze River (Fig. 8) Three Gorges Project (TGP). Aspects of environmental capacity (YVWRPB et al., 1999) and natural resources in the reservoir area were addressed by decision makers and lead to changes in the resettlement strategy, but social costs of resettlement, like the loss of social networks, deserve more attention (Heggelund 2006). 87.3% of the active working population of an estimative 1.2 million people originally living in the Three Gorges area belong to the category 'peasants'. Lack of available farmland is therefore one of the biggest challenges for successful rural resettlement (Zhu and Zhao, 1996), which was already a problem in the area before resettlement. Due to risks of erosion and water pollution the population resettled with priority in 'near resettlement' (NR) zones, preferably positioned beyond the borders of the watershed, is several times larger than the population that lived in the inundated area of about 1000 km². Pollution hazards and lack of competitiveness caused initial failures of absorbing part of the labour force of relocatees in small to medium size enterprises inside the reservoir area. Such failures were later mitigated in part by industrial restructuring, which was complemented by

Government-Organized Distant Resettlement (GODR) to economically developed areas on the eastern coast, in the middle and downstream areas of the Yangtze River Basin, and other non-flooded counties in the reservoir area (Zhu, 1999), i.e. regions that benefit from the flood prevention, electricity generation and improved navigation services provided by the project (Tan et al., 2005).

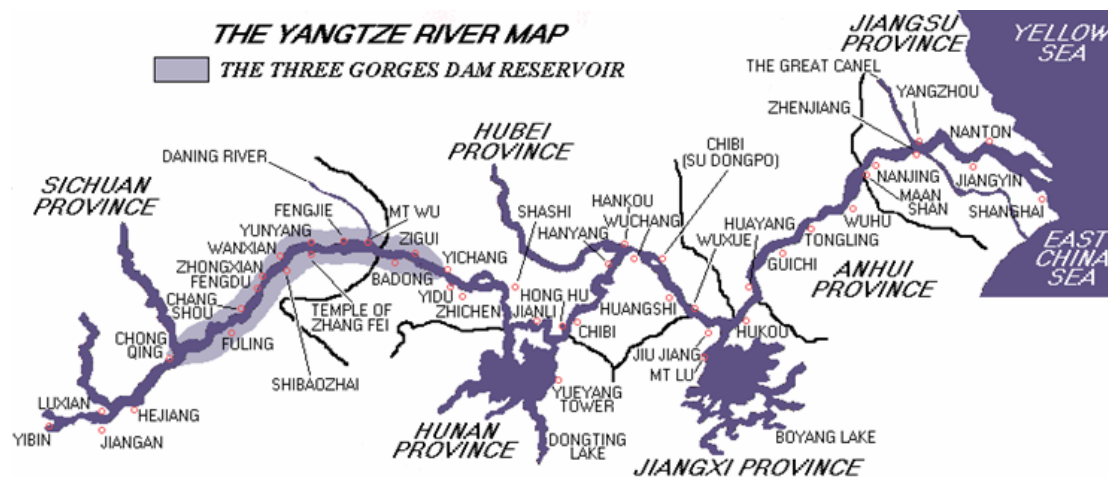


Figure 8 River Basin of the Yangtze (the dam is located in Yichang)

‘Secondary migrants’ (erci yimin), i.e. those who have to give up their land to town construction in the relocation areas are facing problems as they must subsist on an agricultural income or equivalent compensation in an urbanizing environment (Gu and Huang 1999). Some land in the host communities has been subdivided between the former users and the resettled farmers. Combined with preferential treatment of the relocatees in the form of lower income tax and living subsidies for the first year after resettlement, this has nurtured resentment among the host population and conflicts (Qiu et al., 2000). In the Three Gorges Project (TGP), the Chinese government carried out many of the measures suggested in the IRR model reconstruction aspect, like trial settlement, training of peasants and setting up a later stage support fund, financed by a proportion of the revenue derived from electricity sales. The State Council (2001) has also decided to transfer a certain amount of tax revenue paid by the TGP after its completion to Hubei province and Chongqing municipality for assisting the development of the region and environment protection.

The 300 km² Shuikou dam in Fujian Province (1987-1996) was cited as a further example of a generally successful resettlement scheme due to fair compensation procedures including compensations for lost production, self-responsible management of compensation funds by recipients, and an economic rehabilitation plan aimed at creating new production systems for affected people (UNEP, 2007). China, the country with the longest running national policy on resettlement in the developing world has resettled a total of 45 million people since its foundation until the end of the 1990s (Frugge et al. 2000). The principle of “Resettlement with Development (RwD) is enshrined in Chapter 1 - Article 3 of Regulations on the Compensation for Land Acquisition and Resettlement of the Construction of Large and Medium-sized Water Conservancy and Hydroelectric

Projects: “The State encourages and supports exploitative resettlement, adopting a method of providing compensation and allowances in the pre-resettlement period and assistance for resettlers’ production in the post-resettlement period” (State Council, 1991, p 3). The concept of RwD is that the resettlement of those forcibly displaced should be treated as an opportunity for development so as to improve their livelihoods after relocation. In the short-term, it focuses on solving the daily difficulties facing the resettlers. In the long term, RwD is used to raise the living standards and the economic conditions of the entire project region. Despite very good progress at the policy level, Duan & McDonald (2004) concluded, that there was still a strong distinction between the ideal and the practice.

Tan et al. (2005) looked at TGP resettlement from a gender perspective. Despite an improved policy framework, which manifested itself for example in the 1992 Women’s Interest Protection Law, gender inequality aspects were not sufficiently included in a resettlement context. The authoress interviewed several groups of people resettled within the NR and the GODR schemes, and some expecting displacement. One common perception among interviewees was the belief that those who are not displaced until the very last moment would receive more advantages, benefits or compensation. Hence, many people deliberately delayed moving. 90% of both gender groups would like to be resettled in a concentrated resettlement manner, in which households from the same area build their houses in either a large or small centralised cluster. The TGP supported one representative of a family awaiting resettlement to visit the receiving locations in remote provinces and if necessary make decisions on the spot. After preliminary discussion within the family, this task was mainly assumed by men. Hence, Tan (2005) concluded that women were less likely than men to participate in migration decisions. In Kaixian County of Sechuan, the productivity ratio of agriculture, i.e. the proportion of the output of a productive sector (percentage in income) divided by its employment percentage was found to be higher in typical agrarian areas than in peri-urban areas, indicating, that in the latter the intensity of land care may get reduced, possibly due to (temporary) alternative occupational options. Yet the interviews revealed that even in the rural areas the main income source of resettler households was not from agricultural production, which only accounted for around 35 per cent of the total revenue, but from non-agricultural activities, making up some 60 per cent of the total. Women in resettler households were the main labour force in the agricultural sectors of both livestock and crop farming. Due to this situation and a comparatively lower exposure to formal education women were found to have less adaptability and diversity in their choices than men in transferring from traditional agricultural sectors to non-agricultural ones (Tan, 2005).

IMPACT OF CLIMATE CHANGE

The observed harmful affects on agricultural activities in China by climate change are: Increased instability of agricultural production, regional drought and high temperature harm intensified, spring frost harm increasing as the warming climate shifts the growing season to an earlier date, agricultural and husbandry industry losses by weather disasters increase. But warming weather shifts the border of the winter wheat cultivation area further north, and increases the corn planting area.

The rivers Songhua, Liao, Hai-Luan, and Huai are sensitive to runoff changes caused by climate change. In 50-100 years, the river runoff in Northern China will decrease by 2%-10%; the river runoff in Southern China will increase by 24%. By 2050, glacier in western China will decrease 27.2%. The water resource distribution patterns will harm agricultural production in China.

Kirshen et al. (2005) investigated how climate change might impact on water supply yields and supply costs. Average reservoir storage capital costs were calculated for 14 basins, with a range of 108,321 USD for the Yarlung Zangbo and 778,833 USD for the Hai River. Total water resources development costs including groundwater were also calculated. Finally the cost estimates were reassessed with projected climate change data from the UK Hadley Center, the Canadian Center for Climate (CCC) and Generalized Circulation Models (GCMs) to find how annualised costs of water resources development increased or decreased in the basins, incorporating the changes of the hydrological model parameters expected from climate change. The effect of sulphate aerosols on global warming is not consistent between different climate models and can be negative or positive. With lower annual flows (Table 10), the total future development costs were found to decrease for most climate change scenarios in the basins negatively affected by climate change, but the development costs per unit of developed water were found to increase, as can be expected.

Table 10 Climate model-related scenarios of river runoff (from Kirschen et al. 2005)

Summary of mean annual flows under various GCMs (with sulphate aerosols)						
ID	Basin	Mean annual flow (billion m ³)				
		Current climate	HadCM2, 2040–69	HadCM2, 2070–99	CGCM1, 2040–69	CGCM1, 2070–99
A	Heilong Jiang	151.3	135.0	149.7	115.5	133.4
B	Lao He	49.1	43.6	53.4	36.2	40.3
C	Luan He	5.6	5.6	7.2	5.8	6.4
D	Hai He	30.3	24.5	31.5	32.6	35.8
E	Chaoba	2.0	2.0	2.2	2.3	3.1
F	Huai He	98.5	119.4	103.1	100.3	133.7
G	Huang He	53.6	35.8	34.6	48.7	56.5
H	Chang Jiang	828.4	809.1	713.5	667.7	677.5
I	Dong Jiang	30.8	35.6	36.9	25.9	28.0
J	Xi Jiang	379.1	414.7	414.9	319.8	314.5
K	SE Coastal	244.8	282.1	273.6	178.8	183.1
L	Langcan Jiang, Yuan Jiang	317.3	254.7	219.0	275.7	302.7
M	Yarlung, Zangbo	85.6	68.4	79.8	74.4	63.1
N	Inner basins	14.5	16.0	17.5	11.2	9.0

Liu & Xia (2004) attributed the reduction and temporary disappearance of river flow in the Yellow River in part to the increase in annual temperature since the 1970s and the decrease in precipitation. More dominant drivers of change were human activities: “During the 1990s, water consumption by industry and agriculture increased dramatically and the contrast between upstream and downstream reaches became increasingly apparent. Each water consumption area expanded their projects, so that the water-withdrawing capability of the projects along the river totaled 6000 m³/s, which amounts to 3-4 times that of the average annual runoff (1830 m³/s). This amount of water-withdrawing capacity has exceeded the available amount of the natural runoff.” (Liu and Xia, 2004).

INDICATORS OF RURAL AND URBAN POVERTY IN CHINA

Table 11 Per Capita Annual Income of Urban Households and Per Capita Annual Net Income of Rural Households by Region in 2006

Region, Yuan	urban Disposable income	rural net Income	urban-rural income gap
Shanghai	20668	9139	2.26
Beijing	19978	8275	2.41
Zhejiang	18265	7335	2.49
Tianjin	14283	6228	2.29
Jiangsu	14084	5813	2.42
Guangdong	16016	5080	3.15
Fujian	13753	4835	2.84
Shandong	12192	4368	2.79
Liaoning	10370	4090	2.54
Hebei	10305	3802	2.71
Jilin	9775	3641	2.68
National Average	11759	3587	3.28
Heilongjiang	9182	3552	2.58
Jiangxi	9551	3460	2.76
Hubei	9803	3419	2.87
Hunan	10505	3390	3.10
Inner Mongolia	10358	3342	3.10
Henan	9810	3261	3.01
Hainan	9395	3256	2.89
Shanxi	10028	3181	3.15
Sichuan	9350	3002	3.11
Anhui	9771	2969	3.29
Chongqing	11570	2874	4.03
Guangxi	9899	2770	3.57
Ningxia	9177	2760	3.32

Xinjiang	8871	2737	3.24
Tibet	8941	2435	3.67
Qinghai	9000	2358	3.82
Shaanxi	9268	2260	4.10
Yunnan	10070	2250	4.47
Gansu	8921	2134	4.18
Guizhou	9117	1985	4.59

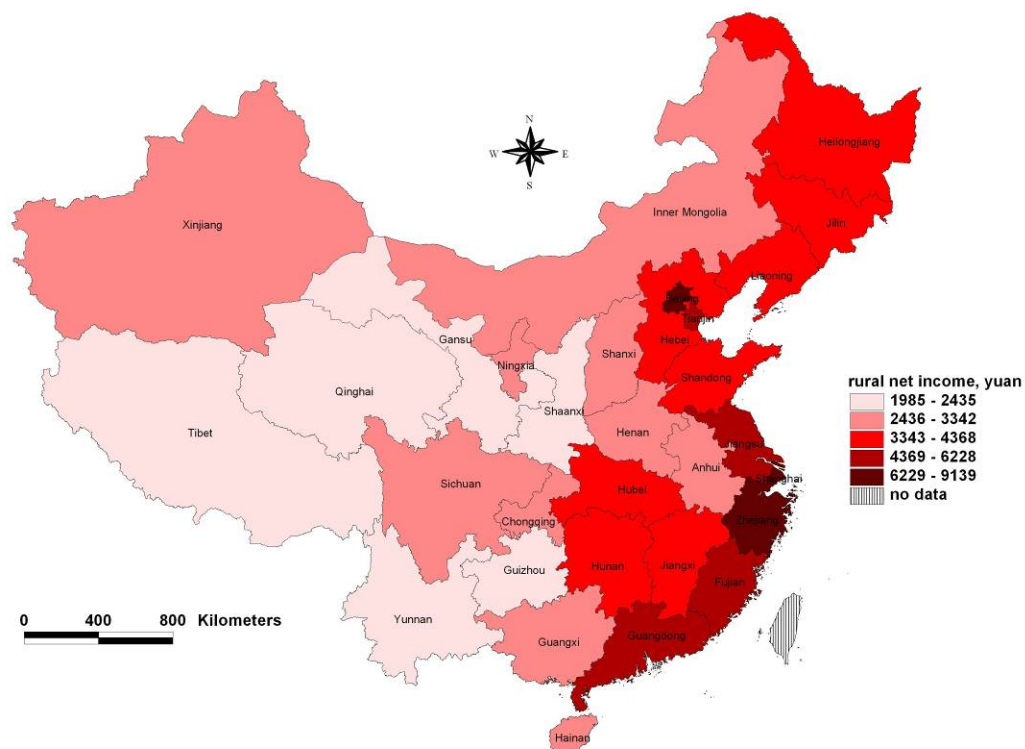


Figure 9 Rural per capita net income in China, 2006

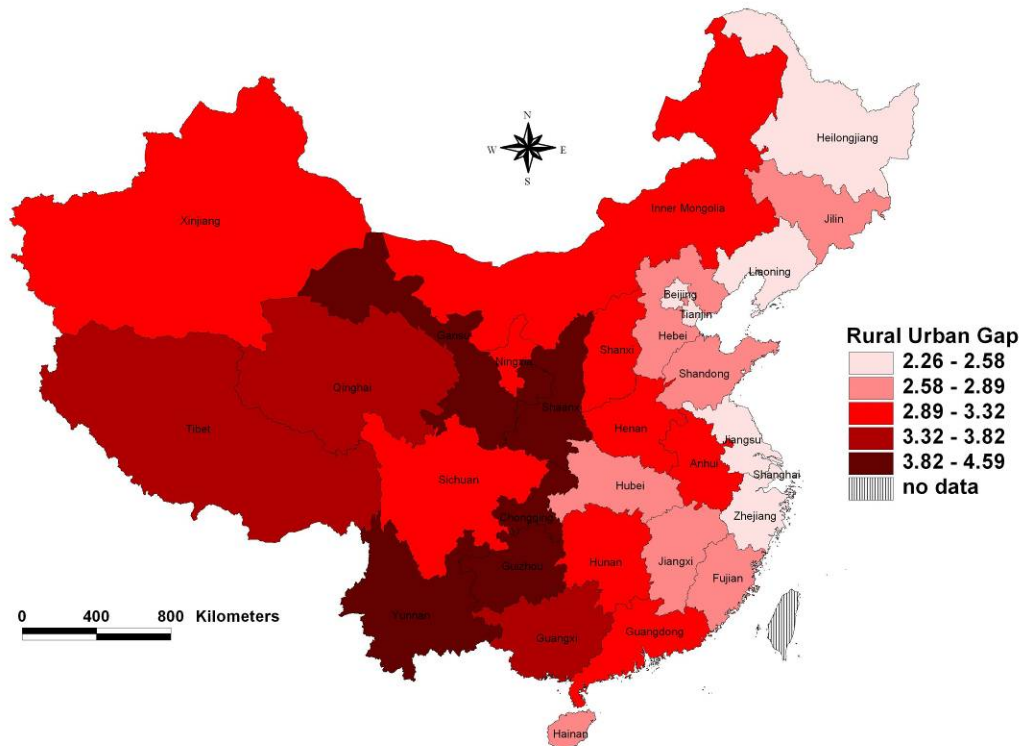


Figure 10 Rural-urban income gaps in China, 2006

The gap in Figure 10 is calculated as relative urban per capita disposable income by taking rural per capita net income as 1.

One interesting feature of the PRC's rural poverty is that individual and family characteristics appear to have been less important than in other developing countries. Lin (2003) gave reasons for this phenomenon: (1) as a result of collective production and egalitarianism limited asset-based income inequality, land use rights were equally distributed and there were relatively few landless farmers unlike in India. (2) Access to social services such as education and medical care in the PRC tends to be village-, not family-, specific. (3) Because of the compulsory system of primary and secondary education, most children receive basic education and become literate. (4) Continued state control of some major agricultural inputs, such as fertilizer, and some major outputs, reduces opportunities in these markets. Lin (2003) also proposed a poverty indicator that fuses income and inequality components. Table 12 indicates that the income gap between urban and rural residents narrowed in the early 1980s and then widened again beginning in the mid-1980s. "This is because the 1978 economic reforms started in rural areas and benefited the rural population more in this period." (Lin, 2003). Rural per capita income as a percentage of urban real per capita income increased to 54 percent in 1985, but by 2000, it had become lower (35.9%) than the pre-reform level of 38.9%.

Table 12 Gini coefficients in the rural areas and rural/urban income per capita

Year	Rural Gini Coefficients	Rural Per Capita Income as Percentage of Urban Per Capita Income
1978	0.21	38.9
1980	0.24	40.1
1985	0.23	53.8
1990	0.31	45.4
1995	0.34	36.8
2000	0.35	35.9

Source: China National Statistical Bureau.

According to McGranahan & Tacoli (2006), rural poverty has been steadily decreasing (Fig 13), whereas urban poverty is increasing and includes three distinct groups: (1) temporary or unregistered rural migrants, (2) urban residents made redundant from state-owned enterprises following economic reform, and (3) residents of peri-urban areas who have lost their land to urban expansion. Following the NBS *diagnostic line* poverty measure of 1,875 Yuan income per capita per annum in 2000 prices, the number of poor holding official urban residency status over the 1991 to 2000 period has oscillated between 15.3 and 10 million in response to layoffs from SOEs as the public sector underwent structural reform. Actual urban poverty is higher when floating populations are included, since urban migrants are twice as likely to be poor as official urban residents (ADB 2004). City governments, which are primarily responsible for the welfare of the urban poor, are setting up benefit lines by costing 20 items of goods and services for basic subsistence (the “basic needs” approach). The reason is to identify potential recipients of poverty relief assistance and determine the magnitude of such assistance. “Methods of determining the line vary among cities. Some have designated a special group of officials to compile a detailed list of the local examples of the basic goods and services and to survey their prices. Other cities make an educated guess in setting their poverty (benefit) line.” (ADB 2004). The benefit lines for major PRC cities are shown in Table 13.

Table 13 Benefit Lines as a proxy for Poverty Lines in 35 Key Cities (Yuan per month/person, 1998 data; ADB 2004)

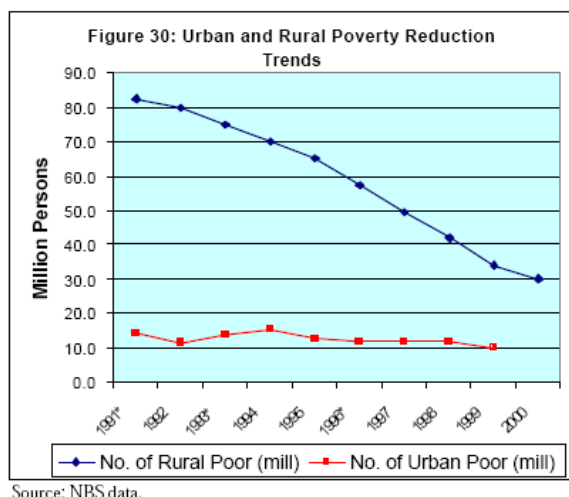


Figure 11 Development of rural and urban poverty in China during the Nineties (ADB 2004)

City	Benefit Line	City	Benefit Line
Shenzhen	319	Lhasa	170
Urumqi	156	Shanghai	280
Chengdu	156	Guiyang	156
Xian	156	Wuhan	195
Kunming	182	Changsha	200
Nanjing	180	Nanchang	143
Nanning	183	Xiamen**	265-315
Qingdao	200	Taiyuan	156
Hangzhou	220	Changchun	169
Chongqing	169	Tianjin	241
Huhot	143	Haikou	221
Shijiazhuang	182	Beijing	280
Zhengzhou	169	Shenyang	195
Jinan	208	Fuzhou	200
Guangzhou	300	Xining	155
Hefei	165	Harbin	182
Ningbo	215	Lanzhou	156
Dalian	221		

Note: The average of all benefits lines in the table equates to 2,365 yuan per capita per annum.

Satterthwaite (2000) postulated a need for an understanding of poverty that no longer separates ‘rural’ and ‘urban: “Where you live and work influences whether or not you face deprivation and the nature of that deprivation.” The author stressed the importance of agriculture for the economy of many urban areas, for example the peri-urban and desakota zones which supply cities with fresh fruit and vegetables. According to Satterthwaite (2000), “three of the most important factors influencing the prosperity of most local urban centres are: (1) the value per hectare of the crops (the higher the value, the more local urban development); (2) the potential for local value added activities (and the scale of forward and backward multiplier linkages); and (3) the land owning structure (the perfect stimulus to local urban development is lots of prosperous relatively small farms growing high value crops).” It is not appropriate to set the same standards of poverty to rural and urban households, as many low income urban households face particularly high costs for basic commodities, like rent and drinking water, schooling, public transport, food, health care, child care etc. It is logical that some of these effects (e.g. the price drive) spill over also into the deaskota areas. This is complemented by the absence of a subsistence economy, a pillar of support for poor rural households.

GENDER ISSUES OF POVERTY AND MIGRATION

Males are having better opportunities to escape rural poverty. This is part driven by the educational differential between men and women, also by the lack of vocational training opportunities for poor women and local social attitudes. (ADB 2004). Those rural women who become migrant workers generally have lower formal educational levels than their male counterparts (Tab. 14), making it more likely that they obtain lower-paid jobs in labour-intensive industries involving low-skill repetitive tasks. Other reasons for male dominance amongst migrants are that many migrants are construction workers which is almost exclusively a male profession and that women take on more duties in childcare

(DFID 2004). In China and other parts of Asia, lack of institutional childcare can be a severe barrier for employment of migrant and resident women (Ruel & Garret, 2004).

Table 14 Distribution by gender of educational levels of migrant workers in the Pearl River Delta triangle (%)

	College	High School	Middle School	Primary School	Un-educated
Men	2.4	30.2	60.0	7.1	6.4
Women	1.2	9.0	68.3	20.4	1.1

Source: CASS (1996)

Despite these difficulties, a survey conducted by the Centre for Chinese Agricultural Policy found that the percentage of rural women becoming migrant workers rose from 13 percent in 1990 to 76 percent in 2000 (China Daily October 8, 2000). Zhang (1999) studied the motives and experiences of young female migrants in Tianjin, all in their late teens or early twenties, and single, to complement the prevailing literature in China that focuses on quantitative surveys and macro-level data collection, which aims either to provide a basis for governmental decision making, or to influence policy processes in other ways. The female migrant informants from diverse origin (Heilongjiang to Anhui) were composed of two sub-groups: those working in the city itself, in either domestic or catering services, and those contracted as workers in enterprises with sole overseas investments in Tanggu Economic Development Zone, bordering the Bohai sea.

The motives among the two different groups varied quite a lot: The young women in the catering sector escaped a situation, where their family income would not change much, if they were at home or not, as they came mostly from over-populated rural areas like Anhui with small agricultural property per household. In contrast, the majority of the female migrants working in the factories set up by foreign capital were better educated, which was a consequence of recruitment policies demanding at least junior high school education. They wanted to earn more money, be independent, and try to pursue some form of further education alongside work.

Most of the female migrants obtained information on the urban labour market through relations in the cities, such as relatives and people sharing the same birthplace ('laoxiang'). The early arrivals often served as job agents, and sometimes offered stop-over bases for those who come later. In the case of the women working in the city, "informal associations based on their native places equipped them with an extra, collective bargaining power against their urban employers." (Zhang 1999). As public funds dried up in the wake of financial reforms, the Women's Federation, a nation-wide network para-governmental organisation, took measure to save itself and its jobs, among other measures, by successfully setting up labour service companies ('laodong fuwu gongsi') linking supply and demand, especially in the domestic labour market, and establishing

more secure contractual arrangements for both employers and employees. “Rural women’s outmigration and their active engagement in the marketplace in pursuit of self-envisaged goals [have challenged] the spatial and socio-economic boundaries culturally and institutionally defined for them, contributing to the rearrangement of social, political, and sexual orders.” (Zhang 1999).

The exodus of able-bodied males who engage in migrant labour goes along with a feminisation of agriculture and consequential increase in women’s work-loads in agricultural production. Younger women in poor and vulnerable households can easily become victims of organised and apparently growing trafficking in females. “Studies in poor border areas of Yunnan have revealed the trafficking in women, often cross-border to Thailand and Laos. Apart from human rights and dignity aspects, and the obvious affront to PRC traditional community values, this trafficking exposes these women, and later their home communities to STDs and HIV/AIDS” (ADB 2004). Health aspects were investigated by Zhang (2005) looking at the sustainability of migrant work under the aspect of ill-health associated with hard physical labour and lack of protective measures in work situations that can be endured often only for a surprisingly short time.

Female migrants were disadvantaged in the urban marriage market for lack of household registration (*houkou*). In 1998, new regulations were approved that allowed children to inherit their father’s *houkou* (Chan & Zhang 1999). Men are traditionally attributed an ‘outside’ role and women ‘inside’ responsibilities. Moreover, under the patrilocal tradition, daughters would eventually move out and join their husbands’ families, adding to their labour resources. The eventual loss of the daughters’ labour discourages the natal families from investing in the education of girls (Li 1994). The pressure on rural women to get married escalates once they reach their early 20s. Getting married mostly translates into returning to the village and the termination of urban work. Fan (2003) presented a collection of statements by female migrants describing motives, chances and obstacles to migration. These have been extracted from a survey document on labour migration in China by the Ministry of Agriculture (NNJYZ 1995). The pursuit of economic growth has led to a growing unawareness of Maoist policies that aimed at mitigating stratifications by class and gender. This has facilitated a labour regime marked in part by segmentation and gender segregation and indirectly reinforced gender-based socio-cultural traditions that could have negative implications on the status of women in the countryside (Fan 2003).

3. MESO-LEVEL PATTERNS AND DRIVERS OF CHANGE IN DESAKOTA REGIONS

CHANGES IN LAND USE STRUCTURE AND AGRICULTURAL PLANTING STRUCTURE

According to the National Land Use Survey in 1996, in accordance with the new land use classification statistics in 2002, the agricultural land area in China is 659.04 million hectares, the area of land for urban and rural construction is 29.25 million hectares, and the rest is largely unused land. The agricultural land includes cultivated land

with area of 130.04 million hectares, the orchard land with area of 10.02 million hectares, the woodlands with area of 227.61 million hectares, and the pasture land with area of 266.06 million ha. The land for urban and rural construction includes residential land and mining ground with area of 24.08 million hectares, land for transportation with an area of 1.65 million hectares, water conservancy facilities land with an area of 352 million hectares.

In 2005, China's agricultural land area dropped to 657.04 million hectares, the area of land for construction purposes rose to 31.93 million hectares, unused land dropped to 261.71 million ha. For agricultural lands, the cultivated land area dropped to 122.08 million hectares, the orchard land area rose to 11.55 million hectares, the woodlands area rose to 235.74 million hectares, and the pasture area dropped to 262.14 million ha. For construction land, residential land and mining ground increased to 26.02 million hectares, land for transportation rose to 2.31 million hectares, water conservancy facilities land area rose to 3.6 million hectares.

Between 1996 and 2005, areal increases in descending order are woodland, residential land and mining ground, orchards, transportation land, other agricultural land, and water conservancy facilities.

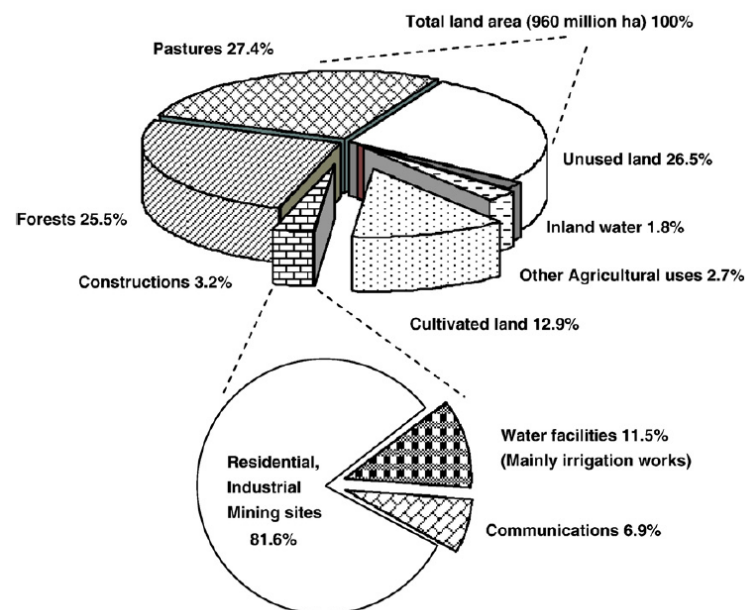


Figure 12 Land use in China (source: MLR, 2004)

Areal decreases in descending sequence are cultivated land, pasture land, and unused land. Arable land greatly diminished. In the five years between 2000-2005, the end-year cultivated land area decreased 6.161 million hectares, of which land development increased 1.098 million hectares of arable land, agricultural restructuring increases 990,000 hectares of arable land, land consolidation increased 331,000 hectares of arable land, land reclamation increased 288,000 hectares of arable land, construction occupied 1.257 million hectares of arable land, 6.14 million hectares of cultivated land were turned into ecological use, agricultural restructuring reduced 2.118 million hectares of arable

land, natural hazards destroyed 316,000 hectares of arable land. Because arable lands turned into ecological use are of low quality, the construction occupation of cultivated land becomes the main reason of productive farmland losses in China. In 2000-2005, construction land increased by 1.927 million hectares, of which 1.257 million hectares was arable land, accounting for 65.2% of the new construction lands. In the long term uncontrolled pollution also entails loss of land suitable for agricultural production.

According to the latest estimate by the experts from the Chinese Academy of Sciences (CAS), the acreage of the soils polluted by heavy metals alone accounts for 20 million ha, almost one-sixth of the cultivated land total, causing an annual grain yield loss of 10 million tons. In China, polluted soils are mainly distributed in the intensively cultivated areas and peri-urban zones.

Untreated discharges of industrial and municipal refuses, inappropriate use of agrochemicals and urban wastes, and irrigation of sewage and polluted water are major causes of soil pollution. (Chen 2007). Most of the municipal solid waste (MSW) is still dumped in peri-urban and desakota areas, where it can end up a hazard to the environment, especially to groundwater due to lack of underground sealing and suboptimum planning with only patchy map coverage of groundwater vulnerability. The Chinese government has introduced a regulation of charges and quality standards for the omnipresent plastic shopping bags to decrease the generation of plastic waste. Although some of the more valuable recyclable material is singled out at an early stage through informal collection by poor people, there is a huge capacity for improving waste separation and recycling especially of organic material, a cause of much higher processing costs and opportunity costs by forfeiting the use of organic matter as soil amendment or for climate-friendly energy generation rather than incurring largely uncontrolled methane emissions from waste dumps. Poorer residential areas were found to generate more organic waste (Fig 13), which could be turned into some source of income for poor people participating in sustainable waste management.

Efforts are made to phase out the use of coal in urban household, as coal ash has a disproportionately large negative impact on China's MSW programs. About 25,000,000 tons of coal ash are now disposed in the urban waste stream. Coal ash mixed with organics degrades finished compost quality by introducing heavy metals. Coal ash in the combusted waste stream also reduces an incinerator's efficiency, and coal ash is very abrasive and reduces the operational life of collection vehicles and waste processing facilities (Hoorweg et al. 2005).

In Ningbo municipality's peri-urban area, the leading environmental issue, and true of the study area as a whole, is untreated wastewater, generated by enterprises within the periurban area itself.^{54,55} Although peri-urban areas account for 46 percent of industrial wastewater discharge in the Ningbo extended urban area (city proper plus peri-urban), only 36 percent of this wastewater is treated up to standard in the periurban area compared with 57 percent in the city proper. The solid-waste issue is different in that 83 percent of solid waste generated in the Ningbo extended urban region is from the city proper. However, solid waste becomes a peri-urban problem in that much of the solid waste being generated in cities proper is being improperly disposed in the peri-urban areas (Webster 2002).

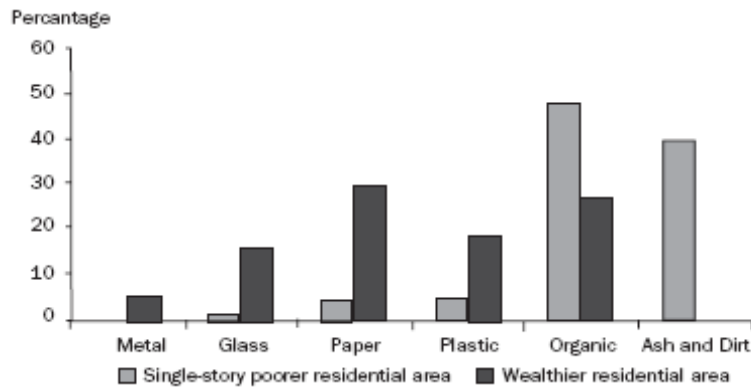


Figure 13 Variations in waste generation and composition by affluence: Beijing, China (from Hoornweg and Thomas 1999)

As mentioned before, another high-priority environmental problem, and the one of highest concern to officials, is the loss of agricultural land to urban-industrial land uses. The government has set a minimum limit of 120 million hectares of agriculturally used land and recently quintupled the tax for use of agricultural land for non-farming purposes (Xinhua 2007-12-07), which is especially high (6.7 US\$/m²) in areas with less than 1mu (0.67 ha) per capita of arable land. Driving forces of the conversion of farmland into non-agricultural uses in the rural-urban fringes of China have been analysed by Xie (2005). The measures are too recent for knowing the effects of these new policies on the conversion of agricultural land in desakota regions. The government is acting despite contrary views of some researchers regarding the likeliness of a future food crisis (Huang & Rozelle 2003). Food security concerns of policy makers are fuelled by global developments like climate change, to which China is vulnerable, especially its water resources for food production. About 40% of China's food is produced with the help of irrigation. Near urban centers the use of water for food production is contested by higher value usages and large demand in the city. In upstream areas, agricultural pollution may be the reason for dispute. An example of water-related conflicts in desakota zones will be touched upon in the case study.

Within a wider concept of understanding human beings as dependant integral parts of the ecosphere (nature), it is possible to look at human-dominated transformations of nature as ecosystems, comprising not only agricultural, but also urban ones. In the same way, favorite concepts of ecology can be applied also to cities, for example the urban metabolism approach introduced by Wolman (1965). Kennedy et al. (2007) have picked up the method to demonstrate to what extent cities are efficient in resource use and in what way they impact on their surroundings. Fresh water inputs and wastewater releases, solid waste disposal, energy inputs, contaminant emissions, and nutrients (including food) are important parameters of urban metabolism. Water is by far the largest component of urban metabolism in terms of mass. Wolman's calculations for the 1960s for a one million-person U.S. city estimated the input of water at 625,000 tonnes per day compared to just 9,500 tonnes of fuel and 2,000 tonnes of food. Most of this inflow is discharged as wastewater, with the remainder being lost to evaporation from watering vegetation and

some leakage to the groundwater. Data from the cities in Figure 14 provided by Kennedy et al. (2007) show that wastewater represents between 75% and 100% of the mass of water inflow.

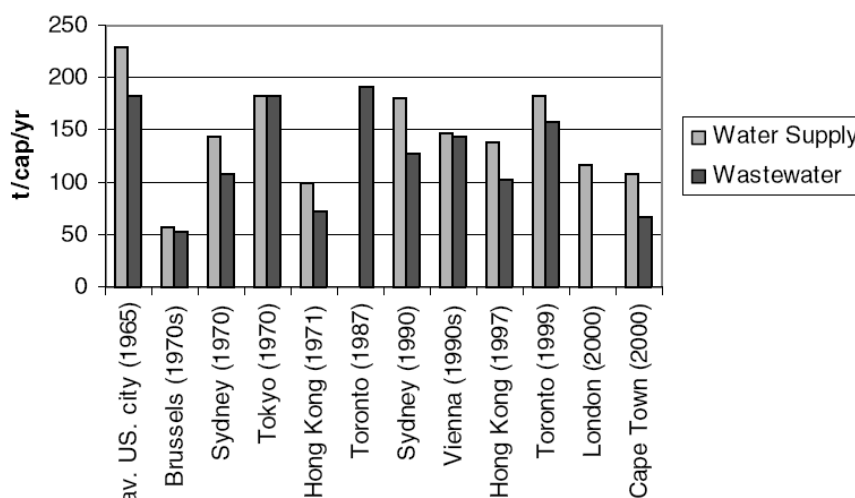


Figure 14 Fresh water inputs and wastewater releases of selected cities (Kennedy 2007)

When comparing the net material flows of cities, which rise disproportionately compared to population growth, there is evidence suggesting that cities are becoming increasingly material-intensive; however such calculations require caution, as outflows of material, eg. waste construction material may come back in the form of recycled inputs unless they are used for backfilling holes excavated for construction material. In any case, the storage and turnover time of building materials is high. The notion that denser cities are more transport energy efficient is contested, but probably true, as spread-out American cities like Los Angeles consume more energy/capita for transport as Hong Kong. However, this may also be due to the separation of suburbs as residential areas and the city center as employment area, and due to the lack of public or community transport. Unrestricted traffic in dense urban areas can hardly contribute to increase the energy efficiency of transport.

Girardet (1992) suggested that for cities to be sustainable from a nutrient perspective, they should practice fertility exchange, in which the nutrients in urban sewage are returned to local farmland. This relationship between the city and its hinterlands requires adequate sewage treatment and an appropriate means of sewage transportation, etc. (Kennedy et al. 2007). “For many goods, including food, modern cities no longer rely on their hinterlands; rather, they participate in continental and global trading networks. Thus, full evaluation of urban sustainability requires a broad scope of analysis.” (Kennedy et al. 2007). The authors postulate, that such analysis should be pursued more and standardised for the sake of comparison between cities. Bai (2007) mentioned that one can go one step further by using the metabolism concept also for industrial ecosystems. To compare with city metabolism, it may be questioned at this point why such approach should not also be applied to “desakota ecosystems”, if the necessary information on flows in and out of such areas or parts thereof could be obtained.

Bai (2002) found that the "out of sight, out of mind" strategy implemented by some municipalities, mostly through industrial relocation and waste export, had had negative social, economic, and environmental effects on the cities that receive the waste or host the industries, while improving the environmental quality in the exporting municipalities. The authoress exemplified the problems associated with this strategy in three east Asian cities, including Dalian. "The combination of traditional industrial siting theory and more recent environmental concerns can sometimes result in the concentration of industries with environmental risks in areas that are close to major cities, and that have inexpensive land availability, smaller populations, and lower ecological consciousness or fewer regulations. Some waste-management industries tend to locate treatment sites at the boundaries of several different jurisdictions." (Bai, 2002). In the case of Dalian, which moved major polluters (heavy industry) to suburban locations within the same jurisdiction, the relocation was successful as a whole, given that the quality of municipal wastewater greatly improved and the city could simultaneously make use of the deserted locations by establishing more rewarding economic activities and real estate.

Urbanisation brought the increase of total food consumption and the structural changes of food consumption in China, and thus drove the change of agricultural planting structure. By studying urban and rural food consumption development in China, it can be found that urban residents consume more vegetable than rural residents. Thus, urbanisation has brought total vegetable demand to increase. The amount of spending by outside dining increased with the people's income level, especially for urban residents.. Outside dining increased the consumption in vegetables, fruits, meat, aquatic products, and edible plant oil. Significant quantities of edible oil or disposed of, for example in cities like Chongqing. Due to their potentially high value for fuel or energy production on the one hand, and the strong potential damage such oil can inflict if entering the water cycle on the other, more information is needed about actual and potential reuse of edible oils in China. In 2002, Chongqing municipality issued a 'Circular on Strengthening Oil Containing Wastewater and Solid Wastes Management in the Food Trade of Chongqing'. No further information was found about the scope of the circular and its success of enforcement, not even in the comprehensive development study of OECD (2007), dealing with several wastewater-related issues in a city, which behind London and Mazowieckie, Poland, has the highest intra-regional disparities among TL2 regions: "Untreated wastewater from households and agriculture run-off are the largest sources of organic pollution with high social impacts." (OECD 2007).

Table 15 China's crop sown acreage changes in 1984-2006 (unit: 10,000 ha)

crops	1984	2006	Area change	Ratio change, percentage points
The total area of agricultural	14751.8	16857.45	2105.68	0.00
Rice	3317.8	2929.46	-388.38	-4.29
wheat	2957.6	2296.14	-661.50	-6.27

Corn	1853.7	2697.09	843.43	3.16
Other cereal	1306.5	389.92	-916.63	-4.66
Beans	953.9	1243.38	289.50	0.08
potatoes	898.8	992.91	94.09	0.06
Oil crop	867.8	1373.64	505.89	0.48
cotton	692.3	540.89	-151.43	0.32
hemp	48.6	28.31	-20.30	-0.34
Sugar crop	123.0	178.19	55.18	0.07
tobacco	89.7	133.80	44.06	0.04
Herb medicine	23.1	119.49	96.37	0.59
vegetable	492.6	2031.54	1538.97	7.73
Green feed	160.5	329.58	169.09	0.79
Other crops	636.1	417.71	-218.42	-1.44
tea	107.7	143.13	35.39	0.16
orchard	221.9	1012.26	790.37	3.54

The basic evolution trend of China's agricultural planting structure is that crops with a direct relationship to the urban consumer grow rapidly, such as vegetables, fruits, corn; traditional staple food crops and crops the consumption of which tends to saturate, decline in the area sown, such as rice, other grain and wheat. In 1984-2006, China's proportion of vegetable planting area expanded by 7.7 percentage points; followed by the proportion of orchards and maize increased by more than 3 percentage points; the proportion of green feed, herb medicine, oil crops and cotton rose by 0.8-0.3 percentage points; the proportion of tea, beans, sugar, potato, tobacco increased by less than 0.2 percentage points; the proportion of hemp, other crops, rice, wheat and other cereals diminished in varying degrees. The proportion of rice got reduced by 4-5 percentage points, the proportion of wheat fell 6.3 percentage points, which was the largest proportional fall in all types of crops (Table 15).

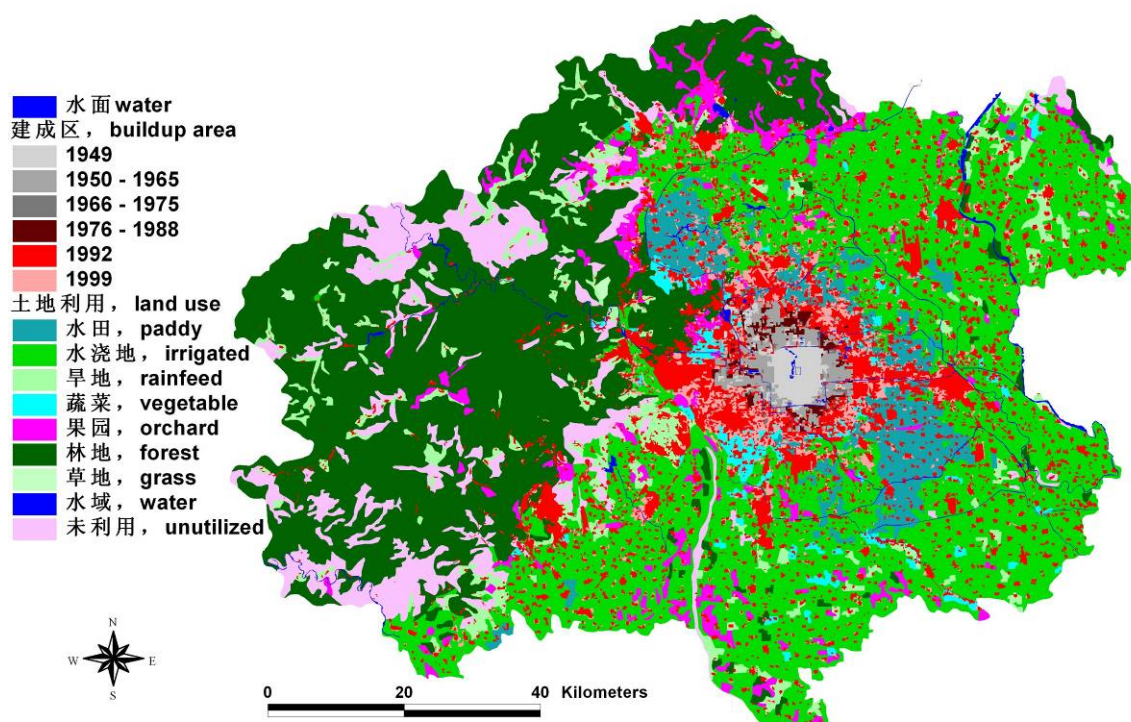


Figure 15 Urban expansion and environmental background in Beijing (1949-1999)

The rapid expansion of large cities in China began at 1980s with the reform and opening up. The development of express highways in the last two decades has accelerated the process of urban expansion. Urban development is inseparable from its own history and its natural environment. Having flat topography, vast hinterland, advanced transportation, good location advantages, a wealth of fresh water resources and adequate environmental capacity are prerequisites for the development of major cities. From the United States history of urban expansion, the popularity of private cars and highway system since the 1960s accelerated the process of rapid development of suburbanisation. With the extension of interstate highway mileage, and the rapid expansion of urban areas, the density of the built-up areas dropped sharply. Suburbanisation and the development of low-density communities in the United States caused a series of environmental problems, including urban traffic congestion, the large amount of energy consumption and the high degree of dependence on oil, pollution of the atmosphere by automobile exhaust, a huge loss of farmland and the weakening of food export advantages, as well as the loss of open space and the deterioration of the living environment. China is in the middle of a rapid suburbanisation and express highway development period, facing urban traffic congestion problems, and the need to reduce energy consumption, to control urban air pollution, and to protect open space. With more people and less land resources, the effective protection of the high quality arable land in suburbs also has significance for food safety in China.

Investigation of the Problem and Measures of Environment Pollution in Development of Rural Enterprise: Severe environmental problems arise in the course of the quick development of rural enterprises; the reasons vary from different levels of development and geographical location. Several problems surfaced in the course of an investigation of several villages in east Zhejiang province: 1.) family workshop production mode, local administrative management and reasonable territorial programming were not effective and satisfying; 2.) middle and large-scale enterprises transferred pollution disposal money partially to infrastructure construction and welfare of local people, thus alleviating themselves of pollution treatment obligations; 3.) local government put more emphasis upon local economical development, leaving environment problems in the second place. Consequently, pollution problems worsened and became serious in some rural areas.

It is not uncommon for a village or a set of villages in a peri-urban area to contain a large number of firms producing the same type of product, e.g., electronic gadgets, apparel, buttons, neckties, or toys. For example, Guizhen in Guangdong Province is typical of these spontaneous clusters: it contains 1,600 firms making electric lighting fixtures (600 “illegal”). Although the Guizhen area has only 60,000 people, it accounts for 46 percent of China’s domestic lighting market (The Economist, 2000). The infrastructure is often not sufficiently developed to facilitate waste management and avoid pollution of surrounding ecosystems.

Hence, measures should be taken to protect the environment from deteriorating further. Possible countermeasures are discussed correspondingly, to provide references for the development of rural enterprises and harnessing their pollution. Such measures include: township enterprises adopt science and technology innovations to reduce environmental pollution; the government encourages institutional innovation to strengthen supervision and management; the society adopts idea innovation to strengthen the sense of protecting the environment against pollution.

Typically, water pollution control requires a relationship with water management and hence large scales (10-100 km, covering a river or drainage basin or an agglomeration of municipalities). Usually, single municipalities are unable to generate the required vision, finance and technical knowledge. Where it is possible to enhance particular functions, mergers with other sub-sectors or utilities may be advisable.

WATER SHORTAGE IN HAI-LUAN RIVER BASIN

At around 300 m³ per person/yr, the Hai river basin has the lowest available water resources of all major river basins in China, of which it is the 7th largest in size with a total area of 318 thousand km². The annual rainfall is 550 mm on average. Nearly 70% occur in July and August during the summer monsoon. Commonly winters are dry and cold. 60% of the area lies in hilly or mountainous terrain (population density: 243/km²), whereas 40% are in the North China Plain (628/km²). The Hai river and its tributaries are not the only watercourses; the Luan and the Tuhai-Majia are also included in the Hai Basin, bordering it to the north and the south, as shown on the map from a World Bank study (Fig. 3) Beijing and Tianjin are completely inside the Basin, Hebei also, except for

some parts bordering Inner Mongolia. Shanxi, Shandong and Henan also extend into the Basin, which according to the statistics had a population of 126 million in the year 2000, about 30% urban. The Hai basin accounts for 15% of the national GNP, 13.5% above the spatial average. It contains 25 large (> 0.5 million) and medium scale cities (0.2-0.5 million). Large parts of the basin pertain to areas which are neither distinctly urban nor rural in character. This is probably true for a good share of the non-urban plains and areas in vicinity of upland urban centers, especially in the valleys.



Figure 16 Map of the Hai Basin (World Bank 2004)

Water shortage in Hai-Luan river basin (including 4 rivers, Hai, Luan, Tuhai, and Majia): At 75% probability, total water supply was 37.1 bcm (billion cubic meters), including 5.5 bcm imports from Yellow River; total water demand was 45.0 bcm; and total water shortage was 7.9 bcm in 1997. In the 2010 forecast, total water supply will be 38.3 bcm, including 4.61 bcm from the Yellow River; total water demand will be 49.1 bcm; and total water shortage 10.8 bcm. In 2020, total water supply is expected at 40.6 bcm, including 4.61 bcm from Yellow River; whereas total water demand will be 53.9 bcm; and total water shortage 13.3 bcm. In 2030, total water supply is 42.8 bcm, including 4.61 bcm from Yellow River; total water demand is 56.2 bcm; and total water

shortage is 13.4 bcm. These forecasts are not taking south-north water transfers into account.

Table 16 The south-north water diversion project, units: billion cubic meters

total	2010	2020	2050
eastern	5.0	10.0	17.0
central	9.0	14.0	14.0
western	5.0	9.0	17.0
sum	19.0	33.0	48.0
Which transferred to the north of Yellow River			
eastern	1.0	4.0	8.0
central	6.0	9.0	9.0
western	5.0	9.0	17.0
sum	12.0	22.0	34.0

Beijing and the piedmont plain are rich in water resources, particularly groundwater, but economic development demands more than supply, still needing water transfers. Tuhai River and Majia River, lacking water resources, can continue using water diverted from the Yellow River. Tianjin and central and eastern Hebei plain suffer the severest water shortages; and largely depend on water transfers from the south. Water supply by south-north water diversion project will mainly go to Beijing, Tianjin, southern branches of the Hai River in Hebei, the northern Henan plain and northern Shandong plain. By some, it is considered a paradox, that water is exported from the south to the water-scarce north, just to be overcompensated by virtual water flows that come back the other way (Ma et al. 2005), i.e. more efforts should be made to increase agricultural productivity in the areas of comparative hydrological affluence. Putting holistic considerations aside, to be fair, it should be conceded here, that the S-N transfer project has not been decided upon to support this paradox, as the transferred water is not intended for agriculture. Moreover, irrigated agriculture in the North also sustains the livelihoods of millions or smallholders.

Current water transfer activities:

Water transfer from Luan River to Tianjin. 1983-2007, in 24 years, 17.7 bcm of water was transferred from Luan River to Tianjin. The annual water supply capacity is about 2.6 bcm.

Water transfer from Shanxi to Beijing. 2003-2007, in 5 years, the Cetian reservoir in northern Shanxi has conveyed 220 mcm water to Beijing. The water went through Sanggan River, passing 4 counties, and flowed into the Guanting reservoir above Beijing. The water supply project is organised by “The Plan for Sustainable Utilisation of Capital Water Resources in the Early 21st Century”.

By 2010, Beijing's water shortage will be 10 billion cubic meters. The Miyun Reservoir had more than 2.8 billion cubic meters of water in 1999, but less than 1 billion

cubic meters in 2008; Guanting Reservoir had more than 500 million cubic meters of water in 1999, but only around 100 million cubic meters in 2008.

At present, Beijing has a problem of excessive extraction of groundwater. Where one could dig 12 meters to find groundwater in 1999, now water is found only at 23 meters.

Water is diverted from the Yellow River to Baiyangdian Lake to provide the Olympic Games with emergency water supplies in 2008. In 2008 Beijing plans for a total 3.89 billion cubic meters of water supply, including 300 million cubic meters of transferred water from Hebei in water supply schemes. The diversion scheme is to divert water through a 399 km long channel for about 120 days, until the end of May, 2008. The amount of water transported is about 600 million cubic meters from Weishan Sluice Gate in the Yellow River, including 153 million cubic meters of water from Hengshui and Dalangdian Lake, and 156 million cubic meters of water from Baiyangdian Lake.

The Beijing Olympic Emergency Water Supply Project was basically completed in 2007. The diversion canal length is 300 km, from Shijiazhuang City in Hebei to Beijing. Through this canal, Hebei will divert 300 million -5 billion cubic meters of water from the reservoirs to Beijing in 2008. Source water reservoirs include Gangnan, Huangbizhuang, Wangkuai and Xidayang in Hebei.

INCREASING URBANISATION AND POPULATION

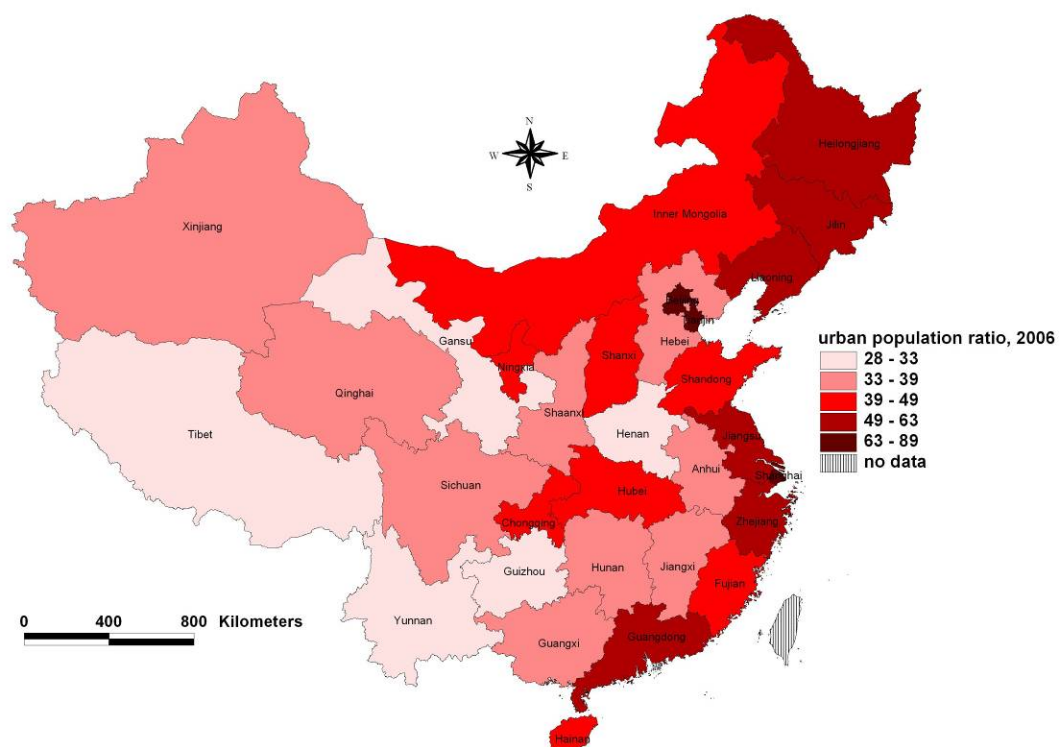


Figure 17 Urban population ratio by percentage in China, 2006

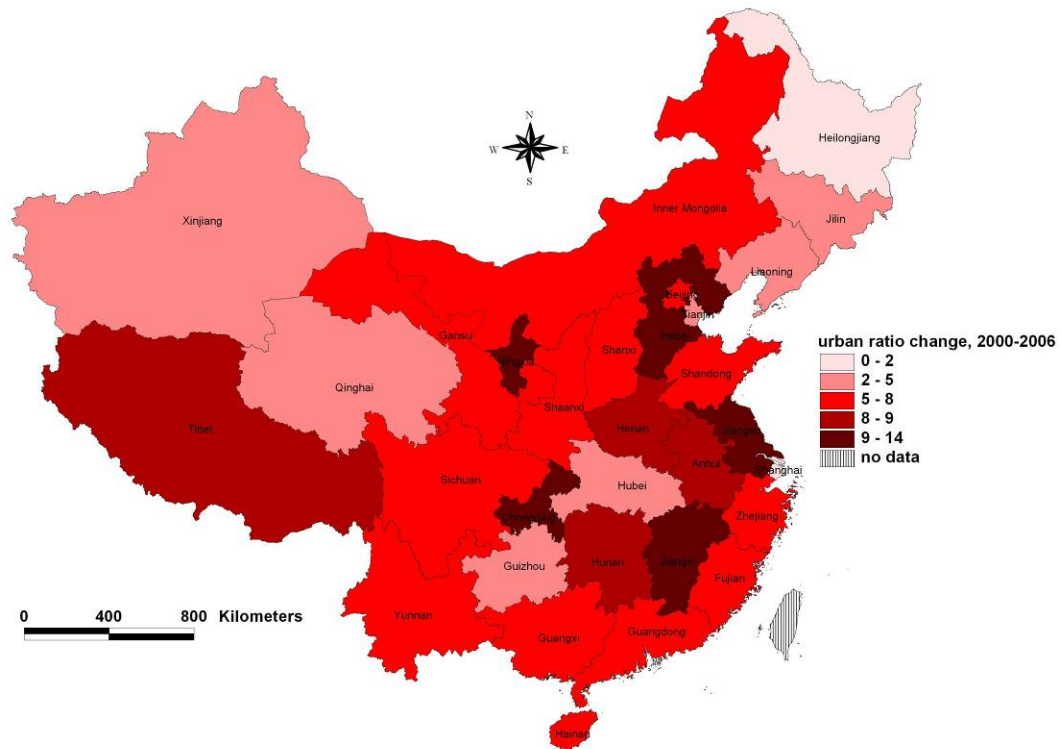


Figure 18 Urban population ratio change by percentage point in China, 2006

4. IMPACTS OF DESAKOTA AT MESO-LEVEL

The impact of desakota development on ecosystems is not necessarily negative. To meet the demand of a variety of products in urban markets, agricultural landscapes in such places may be more biologically diverse than either urban or more distant rural areas (Bai et al, 2006). Tan et al. (2006) find that landholdings in suburban areas are more fragmented, probably because farmers cultivate a wider range of (high value) crops in these areas. The economic benefits of agroforestry, typically occurring in desakota regions in the North China Plain, were analysed by Ren et al. (2005). On the whole, the contribution of the forest resource to the value of animal husbandry and gross production value of agriculture was positive, but negative to the value of farming. In urban areas forestry policies try to integrate the aspect of poverty alleviation (Liu et al. 2004). In Beijing, forests on the outskirts have been attracting more and more tourists, especially during weekends and holidays. These visitors not only create jobs at local hotels, restaurants, and the like, but provide an opportunity for farmers to sell their agricultural produce and handicrafts.

In contrast, rising levels of pollution are negatively affecting the environment and quality of life in desakota zones. An example is Lake Tai, the third largest of Chinese lakes in the Yangtze Delta Region. According to FAO (1983) the shallow (average depth: ~ 2 m) 2200 skm² lake supported 20,000 fishers harvesting a total of 113,500 tons of aquatic produce, 88% aquatic plants, the remainder fish, shrimp and crabs. However, at 56 kg/ha natural fish productivity is not very high and must be boosted artificially by

stocking of Chinese carp and Japanese Shrimp. Dams and other impediments to natural fish migration and rice cultivation along the shores may have contributed to a decline of fish and shrimp stocks (Tietze et al. 2007). As a source of water for the Huangpu River, Lake Tai is also an important indirect source of drinking water for Shanghai and smaller cities, such as Wuxi and Suzhou, which draw water directly from the lake. This water supply was interrupted for some time in 2007 due to a prolonged blue algae bloom in the lake. The boom of the local economy was largely based on small and medium-size chemical factories at the detriment of Lake Tai water quality (Fig. 19). Some of these ventures have in the meantime been closed down. Lakes of the Central Yangtze, especially in the area around Wuhan were also under pressure from population growth and land use change reducing their biodiversity and their sizes (Fang et al. 2006).

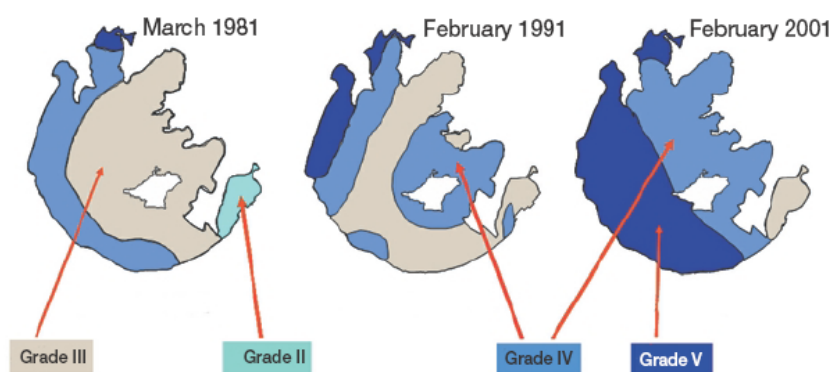


Figure 19 Historical trends of water quality in Lake Tai (from Shao et al. 2006)

Zhao et al. (2007) described spatial variations of nitrogen, phosphorus and heavy metals in surface water and sediment of a typical river network zone in the Tai Lake region. Results showed that industrial wastewater and domestic sewage were the main contributors of nitrogen and phosphorus pollution in the surface water, rather than agriculture fields. Heavy metal pollution was induced mainly by industrial activities and urban surface runoff. An inventory of emission and emission densities of chemical oxygen demand, total phosphorus and total nitrogen from agricultural and rural sources revealed that the most affected areas that should become the focus of China's agricultural and rural pollution control are typical desakota zones like the Yangtze Delta and Southeast China Coastal areas (Chen et al. 2006). Finding ways for sustainable production in intensive agriculture, like greenhouse vegetables, is already the object of joint government-NGO initiatives, for example an MOA-GTZ project in desakota parts of Hebei (ESIA 2005). Good marketing infrastructure for home consumption or export favour intensive land-use, like vegetables and flowers, pig or fish farming on the peri-urban fringe, often developing into a hazard for water quality and food security. Although excessive fertilizer use and organic manure can lead to accumulation of heavy metals in peri-urban soils, atmospheric emissions from industrial sources prevail. Yang et al. (2007) well-predicted the occurrence of Cadmium in soils of the rapidly urbanizing Chengdu plain by means of a BP artificial neural network incorporating socio-economic parameters.

Ground-level ozone, formed by the reactions of NO_x and volatile organic compounds (VOCs) under solar radiation, is also often found at sites some distance removed from urbanised or industrial regions as shown by a study in the Yangtze River delta region (Wang et al. 2005). Apart from implications on human health, ozone can also impair crop performance. More studies are needed on the mechanisms reducing the yield of food crops, which could be as much as 30% according to the Royal Society (2005).

Tong et al. (2007) have calculated the economic value of ecosystem services of the urban Sanyang wetland of Wenzhou. Nearly half of the potential value was associated with environmental purification, mainly the removal of nutrients and heavy metals. Due to intensive land use and industrial emissions upstream of the wetland, nutrients and heavy metals, from electroplating factories and other industries (which were moved outside of the region) were still accumulating rather than being removed or transformed by the wetland ecosystem. The purification service value was determined by taking the value of the ecosystem as a nutrient sink and subtracting its cost as a nutrient source. This value was found to be negative. The authors made suggestions on how the wetlands management could be improved, i.e. the goal of re-vegetation should focus on the reintroduction of vascular wetland plants, such as water candles and common reeds. According to Tong et al. (2007), the potential value of all ecosystem services of 55,000 Yuan/ha was nearly 10 times the current value at the time of investigation. In what way poor ecosystem users, e.g. fishers depend on these services, was not touched upon.

Biodiversity losses from urbanisation and other environmental effects, for example changes in ambient temperature, in the Shanghai metropolitan area have been documented by Zhao et al. (2006). Inclusion of green areas has helped compensate soil sealing from urban construction and groundwater recharge. As in Beijing (He et al. 2002), the air quality benefited from using less coal, but NO_x levels from vehicle traffic have increased. There is overt determination to put environmental requirements and green development high on the priority list of future city clusters, for example in the Guangxi Beibu Bay Economic Zone (CCTV 9 Biz China report - based on Huo and Wang, 2008).

Whereas environmental standards for the admission of transport vehicles in cities like Beijing and Guangdong are among the highest in the world (Euro-Norm 4, On-board diagnostic exhaust control, etc.), most farmers in the *desakota* areas still use small and cheap 3-wheeled one-stroke lorries, which naturally have to stay out of those cities making farmers dependant on other transport means to bring their produce to urban markets. Bigger size motorcycles, also usually forbidden in some of the large cities, are more common in *desakota* areas, but are by no means as frequent as may be expected considering the massive export of cheap Chinese motorcycles to other parts of Asia, which could be due to the fact that they are not appropriate for transporting commodities. Three-wheeled motorcycles with transport platforms fill the gap. Fuel stations occur at astonishing frequency along wide roads occupying large tracts of land, mostly ignored by potential customers, in patient slumber and expectation of future development.

Such impressions can change abruptly, though, to give way to narrower and, more dilapidated and dangerous, but also 'greener' roads coinciding with administrative boundaries like that of Beijing and Hebei. To describe some more of such '*desakota*' phenomena: In parts of the Huabei Plain, mobile phone transmission towers are

competing for perception with crude oil pumps, pecking away silently behind rows of poplar trees at the costly resource in perpetual motion. Good quality feeder roads are cut across even apparently empty stretches of landscape at apparently regular intervals. Direct marketing along major transport lines is a common phenomenon. Foreigners are proudly greeted in English not only by schoolkids, youths imitate urbanite role models with their clothing and hairstyles. Modern media of communication are widespread. Television is omnipresent, outperforming radio transmissions. Mobile phones from cheap to fancy are very common and used extensively also to establish and maintain business contacts for busy vegetable and flower farmers. Internet access is mostly available through internet cafes at township level.

Lately there has been much discussion about formal versus informal water supply systems (Moretto, 2005). Informal services are supplied by small independent providers from water vendors, tanker owners or farmers with wells to small enterprises, cooperatives, etc. running networks on their own or feeding into formal supply systems. Some of these actors may later get a chance to adapt to public recognition standards, thereby becoming formal. In countries with weak infrastructure and public finance, informal arrangements may constitute a viable alternative, but should also not be idealised as they are foremost the result of non-existent formal supply arrangements. In the literature, there seems to be a lack of information about informal water supply arrangements in general and with regard to *desakota* regions in particular. Private ownership of utilities could become the subject of monopolisation and possibly deterioration of services to save costs and boost profits. This is often countered by creating public-private partnerships, which also have the objective of reducing inherent public system inefficiencies. While this has not been the case in China, at the international level, there is a waning interest in public-private partnerships in developing countries, because of higher risks and lack of profitability, which is also related to contract-inherent conditions of providing water to poor, less easily accessible and controllable neighborhoods (Dardenne, 2006).

In any case, China is pursuing its own policies and management models. In order to avoid the inherent "administrative failure" or "market failure", Chen (2005) emphasizes the importance of changing traditional water resource management mechanism to establish a mixed mechanism of public and market water management based on China's conditions and experiences from developed countries. Three key aspects of this combined mechanism are identified: (1) recognizing and managing water rights to promote efficiency, (2) strengthening effectiveness of government management to lower transaction cost and (3) encouraging water user participation to increase flexibility (Chen 2005). The author enumerates potential benefits and shortcomings of water markets, such as empowerment of water users by providing secure rights of resources that they may trade, the difficulty of defining water rights when flows are variable, or how to enforce withdrawal rules. The Ministry of Water Resources is implementing pilot studies in areas with serious water shortage or water pollution to derive solutions which will later be extended to demonstration areas for integrated water resource management at the level of rivers or basins. In Zhangye city, Gansu province, mixed mechanism measures such as total volume control, volume based quota, and regulating land/production based upon

water resource availability, as well as public participation, establishing water markets with water right cards and tradable water tickets were introduced. This accomplished a gradual reduction of water intake in the form of meltwater from glaciers in Qinghai province, while allowing for a steady increase in farmer incomes.

Fang et al. (2006b) developed a conceptual model entitled ‘Water Resources Constraint Force’ (WRCF) and discussed it from an Integrated Water Resources Management (IWRM) point of view. The objective of their research was to determine WRCF in typical river basins and analyze how water resources management impacts on the variation of WRCF. The friction coefficient (u) between the water resources system and the socio-economic system is highest at the interface of most dramatic change, i.e. there will not be enough time to respond to the changes during a phase of maximum conflict potential (‘friction’, see Figure 20a). To solve the conflicts, different sets of strategies are typically applied as the depletion of water resources and the development of the socio-economic system proceed. The demand management phase in Figure 21 is described as follows: After an initial concentration on technical measures, like water saving irrigation technology, water resources may be temporarily channelled to sectors of higher value generation (structural management). In the final instance of adaptation of a powerful socio-economic system may entail the import of water resources from outside. In Figure 20 (b) Wuwei, which was less endowed with water resources restructured the sectoral composition (primary: secondary: tertiary) of its local economy (31:33:36 in 2003 instead of 54:23:23 in 1985), while Zhangye, which also made structural adjustments, could afford to transfer extra water into the Hei river and flood Lake Juyan which had fallen dry for a long time. However, water use rights trading faces management, legal, administrative, and fiscal barriers (Zhang 2006). As Zhangye still belongs to the severe constraint type (Fig. 21) and will soon step into a severely constrained situation, according to Fang et al. (2006b), it is necessary to yet improve water demand management (WDM) and integrated water resources management (IWRM).

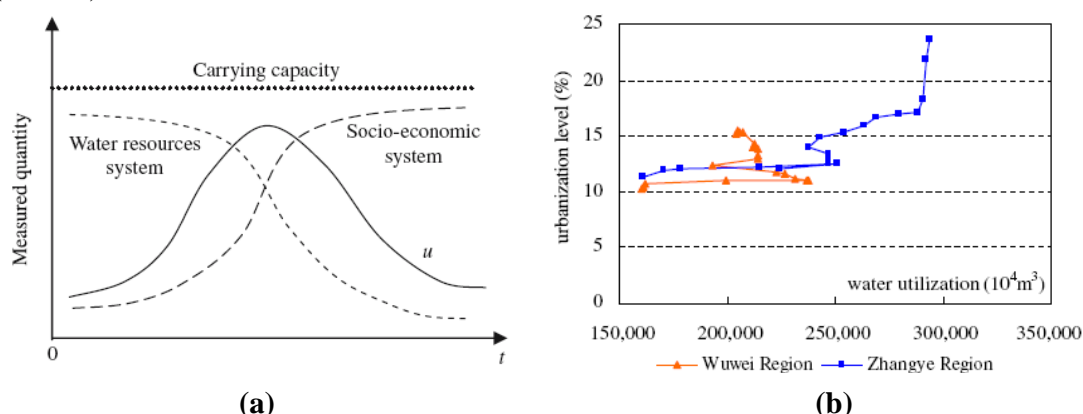


Figure 20 Friction coefficient between water resources and socioeconomic systems (a) and relationship between urbanisation and water utilisation in two cities of the Hexi corridor (b); from Fang et al. 2007

High transaction costs of measuring water intake at hundreds of millions of small parcels throughout China and collecting fees on a farm-by-farm basis, would probably not

be the most cost-effective solution. The fragmentation of agricultural land is also an obstacle to effective extension, prerequisite to the dissemination of water-saving technologies. These are more easily adopted in protected agriculture, especially greenhouses, commonly found in peri-urban and desakota areas where farmer have better access to capital savings derived from 10 times higher selling prices of winter compared to summer vegetables (Lohmar et al. 2004).

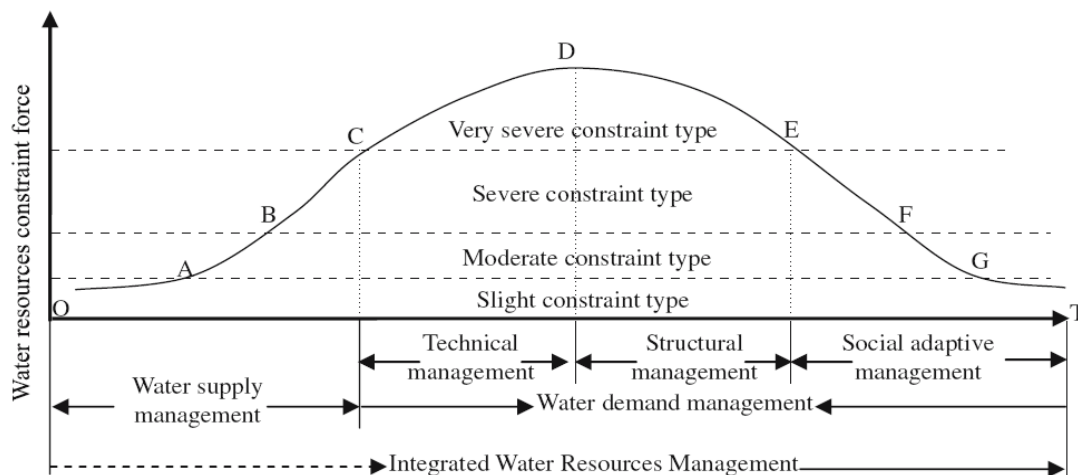


Figure 21 Water resources management impact on the variation of WRCF (from Fang et al. 2007)

Recently, a new incentive-based model of water allocation has evolved: ‘Bounded service providers’ are identified from among the most entrepreneurial men and women of the village. Some of the service providers were women, although the majority by far were men. In most cases, the village committee remained responsible for maintenance and repairs, while the manager (provider) was responsible for water distribution and fee collection (IWMI 2006). Fees are fixed in terms of hours of pumping or kWh of electricity used and range from lucrative, where new drip or sprinkler systems were in use, to low in villages where there was significant pressure from farmers to keep fees low.

A survey by Shen et al. (2004) revealed that institutional arrangements like farmers associations thrive best where agriculture is relatively highly commercialised, markets are readily accessible and higher levels of education are prevalent among farmers, conditions that can be found in desakota areas of China. As their success is less likely among poor farming communities, support for such associations should not generally be viewed as a substitute for poverty alleviation programs. Few studies or surveys in China highlight the role of women in farmer organisations in China. Discussion of membership in farmer associations is usually on the basis of households, without identifying which member of the household is the active member in the association. According to Fock & Zachernuk (2005) this is regrettable. There are good examples of women setting up very successful farmer professional organisations (Guo, 2003).

In water-scarce urbanizing regions of China, the biggest potential for (future) conflict is related to water and food. Eradication of extreme poverty and hunger is the No. 1

Millennium Development Goal, lack of water and food an important cause of social instability and unrest.

THREATS TO DESAKOTA DUE TO WATER SHORTAGE

Focusing on water resource challenges in Hai river basin and countermeasures: The Hai river basin is the region that suffered the most severe water shortage problem in China. Per capita water availability is 305 cubic meters, 3.7% of the world average. The Hai river plain is likely to be affected by continuous water abundance periods and drought periods, as most recently 4 years of drought in 1997-2000. The annual discharge of the Hai River varies dramatically from 23.4 bcm in a drought year to 51.8 bcm in a flood year. The Hai river plain area has average annual water resources of 16.4 bcm, in which 15.4 bcm is ground water. Per capita water availability is 190.6 cubic meters, and southern part only has 155.4 cubic meters per capita (not 305 as mentioned above ?). Current water shortage in Hai river basin is 6.5 bcm annually; the problem of ground water over-extraction is severe in the Hai river basin. Figures from the recent groundwater survey in the North China plain reveal over-abstraction of more than 2 billion m³ only for the shallow aquifer in the Hai River plain and nearly 3 billion for the whole basin (cited by Lu et al. 2008). The deep aquifer in the plain has been drawn down on a large regional scale. Locally, depression cones reach more than 100 meters below the surface entailing subsidence and other geological hazards. Salinity in coastal areas, part of that from groundwater intrusion due to over-abstraction, and in the middle part of the plain ('Heilonggang') are further limiting groundwater availability and constitute a challenge to sustainable groundwater management (Schweers et al. 2008).

The long-term capacity of water transfer to the Hai river basin from the south to north water diversion project is 17 bcm, more than the forecasted long-term water shortage, 13.4 bcm. Even if the water shortage can be alleviated by the south to north water diversion project, ground water recharge and groundwater level recovery may take a long time. In 2000, industrial wastewater accounted for 3,38 billion tons (63%) of sewage discharge, and municipal sewage discharge for 2.01 billion tons (37%). The annual runoff of the Hai River is 22.6 billion m³ and the Luan has 5.75 billion, so the sewage discharge makes up about 20% of total runoff. 80% of Hai river reaches are polluted (often Grade V) and 50% of groundwater is unsuitable for drinking due to non-point agricultural pollution (NO₃⁻, pesticides). The overall water balance of the Hai basin is negative (Fig. 22). The deficit is covered by groundwater over-exploitation (Fig. 23) and water transfer from the Yellow River.

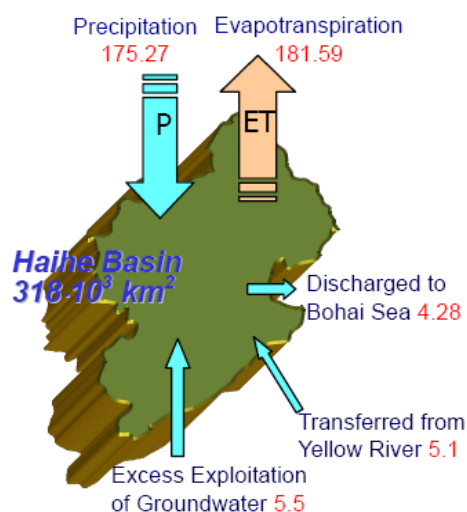


Figure 22 Hai basin water balance (figures vary annually and are in this case not representative of the annual average)

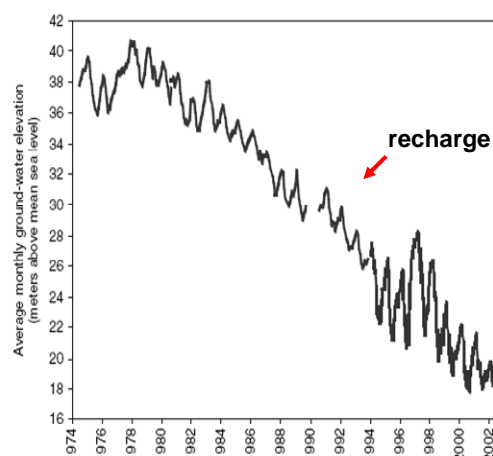


Figure 23 Groundwater hydrograph of well in Luancheng County, Hebei (from Kendy et al. 2003)

CHANGES IN GOVERNANCE AND INSTITUTIONS OF WATER RESOURCE MANAGEMENT

Major measures by the Chinese government to solve the water shortage problem are to develop water saving agriculture to cut down irrigation water demand per hectare, and develop water recycling system in industrial production and less water demanding industries to cut down water demand per 10000 Yuan GDP.

The relocation of Capital Iron and Steel Company from Beijing to Tangshan, Hebei will save 100 mcm water for Beijing. After the relocation of Capital Iron and Steel Company from Beijing to Tangshan, Hebei, the company will eliminate over 7 million tons of lower level iron and steel production capacity, which could save over 65 million cubic meters of water. In the meantime, a desalination project is designed in Caofeidian seaport, which can desalinate 30 million cubic meters of seawater annually.

30 billion Yuan ecological City sites in Tianjin: 'Tianjin Binhai New Area' located in the eastern part of the coastal area, including three functional areas, Tianjin Port, the development zone, bonded zone, and three Administrative Region, Tanggu, Hangu and Dagang. Tianjin Binhai New Area has a total population of 1.4 million and covers 2,270 square kilometers. Suzhou "Zhongxin Industrial Park" is the second inter-governmental cooperation project between China and Singapore. The investment amount for the Ecological City could be as high as 30 billion Yuan. Under the theme of environmental protection, the "sewage treatment projects, "desalination" and other projects are discussed. Circular utilisation of water resources will be huge emerging industry in Tianjin Binhai New Area.

At the urban end of the spectrum, there is discussion about possibilities of improving water supply and wastewater services, which could also help release pressure on water resources in upstream desakota areas. The main idea is that quality and use efficiency can be improved by raising prices to a level that is covering the costs of service delivery. A World Bank study (2007) showed that rising costs of water services will lead

to a situation where the widely accepted share of 3-5% of income for such services will be exceeded and reach up to 8-10% for example in Chongqing by 2020. It should be noted that such prices would only reflect the objective of financial self-sufficiency for the water authorities and not reflect the total economic costs of supply and service. Approaches of protecting poor people from undue hardship are grouped into either income support measures or tariff-related measures (OECD 2003). Three general approaches are used in China, namely, Increasing Block Tariff (IBT), income support, and price waivers for the poorest households. IBTs reflect the true cost of water to customers using large volumes of water while allowing subsidised prices for essential use. "Thus, the charges applied to the top block of consumption could reflect the marginal cost of water. The lower blocks provide an element of subsidy and hence protection for low income households." (World Bank 2007).

While progress has been achieved in some areas, the complex implications on water management associated with burgeoning cities and their hinterlands require new institutional arrangements or better coordination and complementary delineation of responsibilities among existing institutions, and more capacity building. Nickum & Lee (2006) blames the inadequacies of water supply and sanitation on the lack of coordination between administrative jurisdictions, for example municipalities in the Pearl River delta, who enter into an uncoordinated contest for the most upstream and cleanest water delivery point of river courses like the Pearl tributary Dongjiang. In 1993, Shenzhen, suffering shortage due to deteriorating water quality, has founded the first metropolitan Water Service Bureau (WSB) in the country. These Offices are above the Water Resource Bureaux (WRBs) in the hierarchy and can govern the interactions between urban areas and the rural periphery. The Water Service Bureaux should be responsible for the coordination of all matters regarding water in their jurisdiction, but have a tendency to concentrate on the most important issues, for example flood control in the Pearl River delta. It appears that many difficulties are associated with the fear of making entrenched competencies of existing institutions redundant. This is symptomised for example by the lack of clout and integration of public concerns in river basin commissions. Therefore, it is suggested to erect the administrative structure needed for better coordination between jurisdictions, at the basin or sub-basin level, on the foundation of the existing institutional framework by largely following the principles of consultation (including functional units), representation and co-determination.

PATTERNS OF POVERTY IN DESAKOTA AREAS

The Phenomenon. Beijing-Tianjin-Hebei economic circle: In accordance with the State Development and Reform Commission standards, the Beijing-Tianjin-Hebei economic circle includes Beijing, Tianjin and eight cities in central and northern Hebei Province, Shijiazhuang, Langfang, Baoding, Tangshan and Qinhuangdao, Zhangjiakou, Chengde, and Cangzhou. In this economic zone, Beijing, Tianjin and Hebei developed relatively independently. Beijing's "air suction phenomenon" led to the appearance of a large area of the "Beijing and Tianjin poverty belt". The "European City" and "rural Africa" existing at the same time in the radius of 100 km is extremely rare in the world. Air suction phenomenon refers to that there is a big economic development gap between

Beijing and its neighboring region. Talents and resources of the surrounding area are gradually concentrated to Beijing, which makes the gap between Beijing and the surrounding areas widening further.

Reasons: the talents and resources of Beijing-Tianjin-Hebei are gradually concentrated in Beijing; causing surrounding areas to develop relatively slow, including components such as tourism. There were 2.726 million poor people in Hebei Province, which formed a poverty ring surrounding Beijing-Tianjin. To obtain much more than affordable widened the gap between rich and poor and formed the "isolated island effect". The "poverty belt around Beijing and Tianjin " is in a transition zone from semi-arid to sub-humid climate, including seriously desertified Bashang plateau, rocky desertified Yanshan and Taihang Mountains, and the salinity-affected Heilonggang basin, which have been the poorest parts for several hundred years. Now, 81% of the water for Beijing and 93 percent of the water for Tianjin come from Hebei. As the water source for Beijing and Tianjin, in order to provide adequate and clean water resources for Beijing and Tianjin, Hebei continuously improves water protection standards, increases constraints for resources exploitation and industrial and agricultural production development, which inevitably has somewhat hampered the region's economic development.

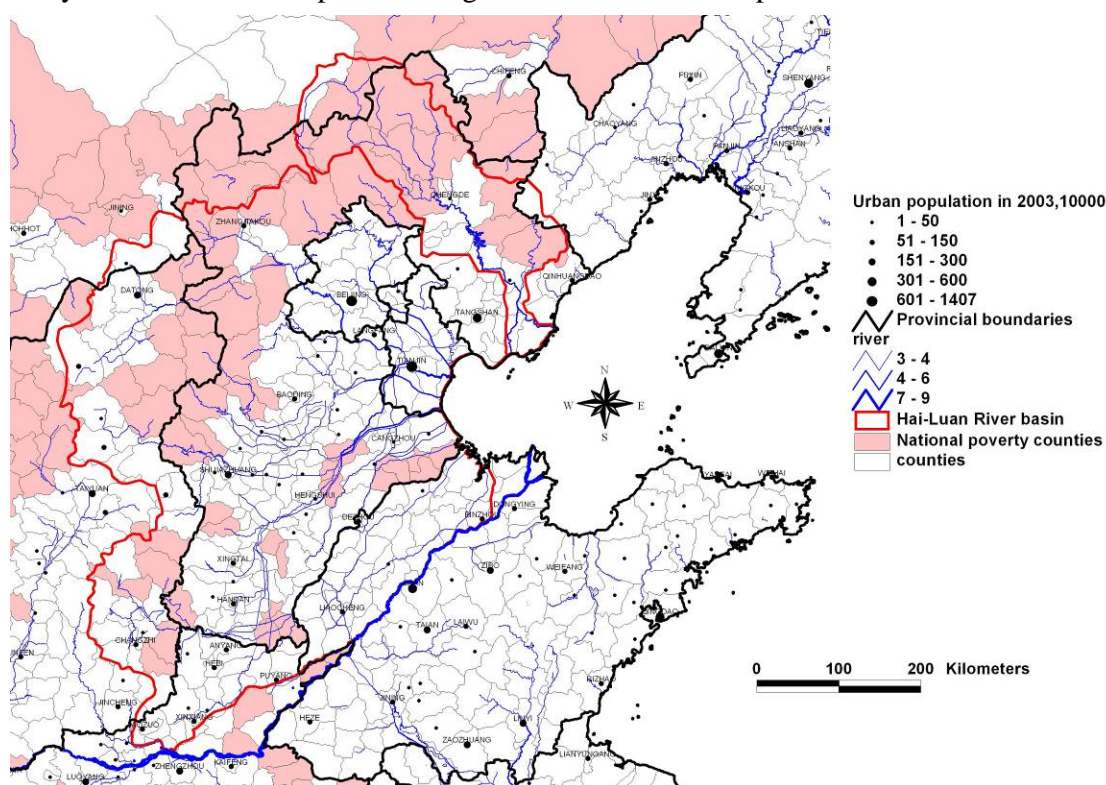


Figure 24 The poverty belt around Beijing and Tianjin

Problems: With the huge economic gap, neighbouring regions of the capital have large poverty-stricken populations; this inevitably leads to the influx of low quality labour force to the cities, and the formation of an urban poverty class and poor residential areas. This not only has a direct impact on the international image of the cities, but also affects the capital's social security. At the same time, the long-term existence of "poverty belt

around Beijing and Tianjin” will inevitably affect the ecological environment of Beijing-Tianjin-Hebei region. For example, Tianjin and Tangshan’s water supply scarcity is frequent, the capital Beijing repeatedly sucked in emergency water to attenuate its water supply crisis, Guanting Reservoir lost its function of drinking water reservoir due to pollution and low flows, and strong sandstorms occurrence at increased frequency. All of these have more or less direct relations with ecological problems caused within the poverty belt around Beijing and Tianjin.

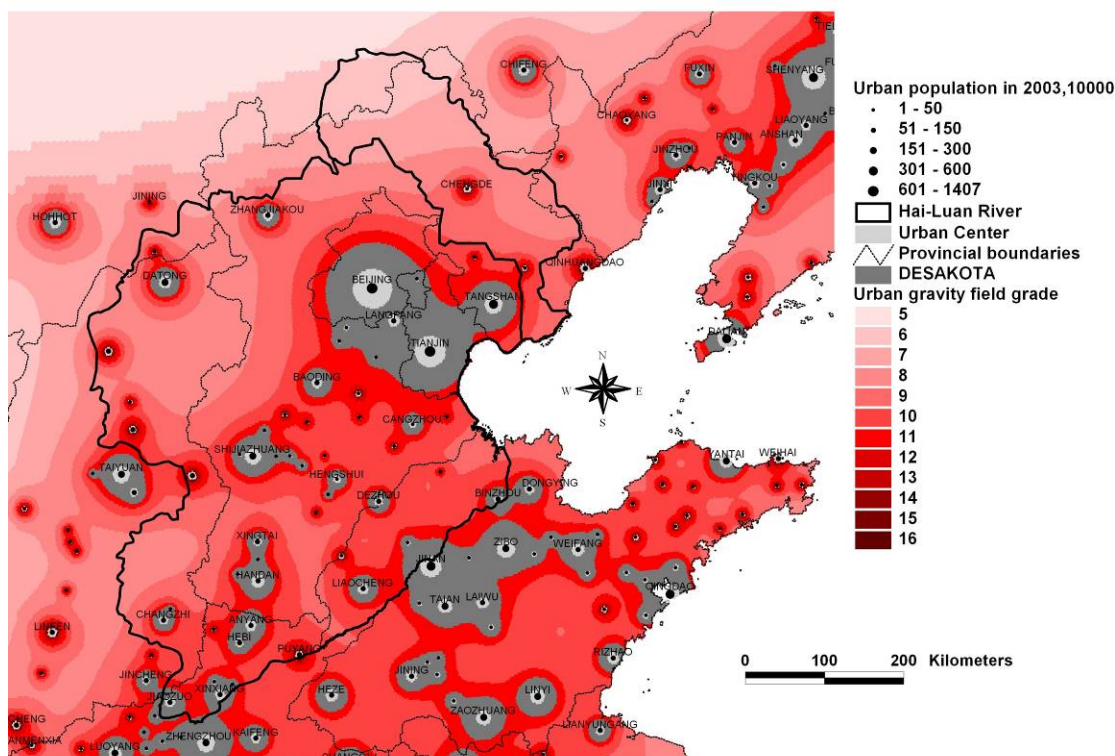


Figure 25 Defining DESAKOTA in the case study region

Not much material is available on the relationship between “desakotisation” or ‘rurbanisation’ of rural areas and poverty. The question is: In what way does the transition in desakota areas compromise the use of ecosystems and impoverish (some) actors who depend on natural resources and were living better off them before. The confiscation of land for development without what previous land users considered proper compensation is one of the processes that has been reported in the past and might still be going on at some scale at present. Other factors comprise marketing restrictions for agricultural produce due to high levels of pollution in some areas, restrictions on using previous water sources for irrigation due to rising volumes of untreated effluent in rivers and ditches, the need to pay for public services (e.g. drinking water) that were essentially free and available before. In general, the hypothesis in desakota regions of China is that people are gaining more income from agricultural activities and have better chances to diversify income by engaging in non-farming activities. To some extent this may be confirmed by the overlay of maps 24 and 25: few poverty counties appear to coincide with gravitational areas that are within the sphere of larger urban agglomerations. Rather they tend to coincide with the remoteness and inaccessibility of mountainous areas like

Hebei counties upstream from the Miyun reservoir or dry zones with natural resource problems such as saline soils in the Heilonggang. A statistical evaluation of spatial coincidence of poverty at the highest possible resolution and natural and socio-economic influence factors might yield some conclusions on causes and possible remediation of poverty in rural areas and desakota zones.

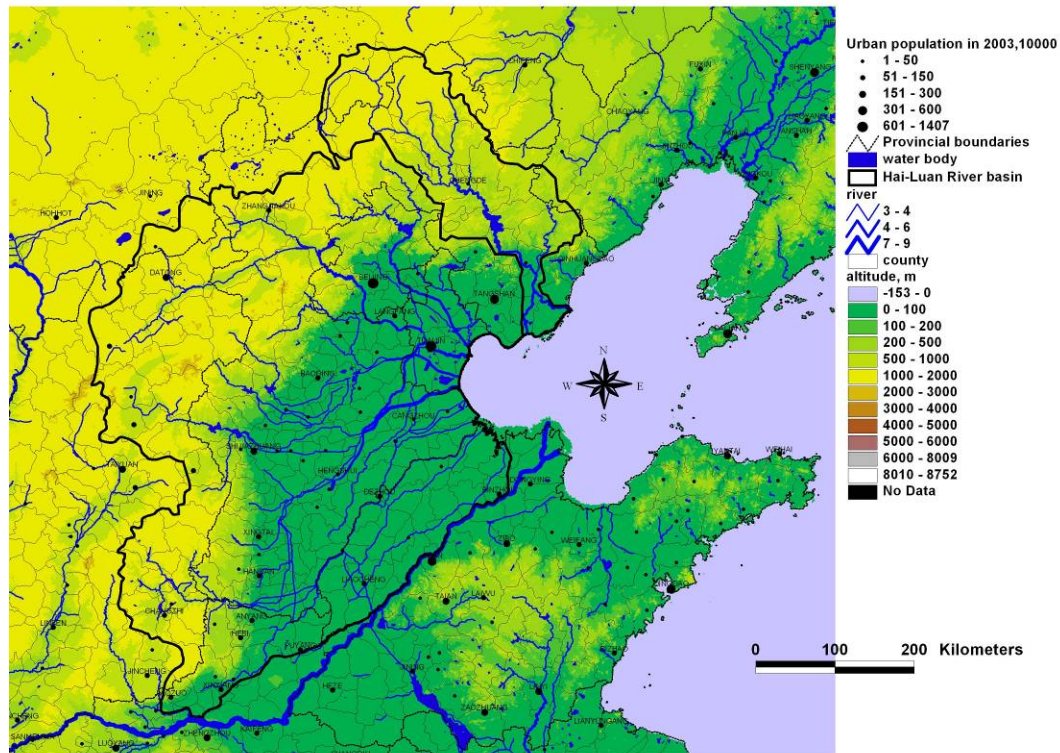


Figure 26 River system and topography for Hai-Luan River Basin

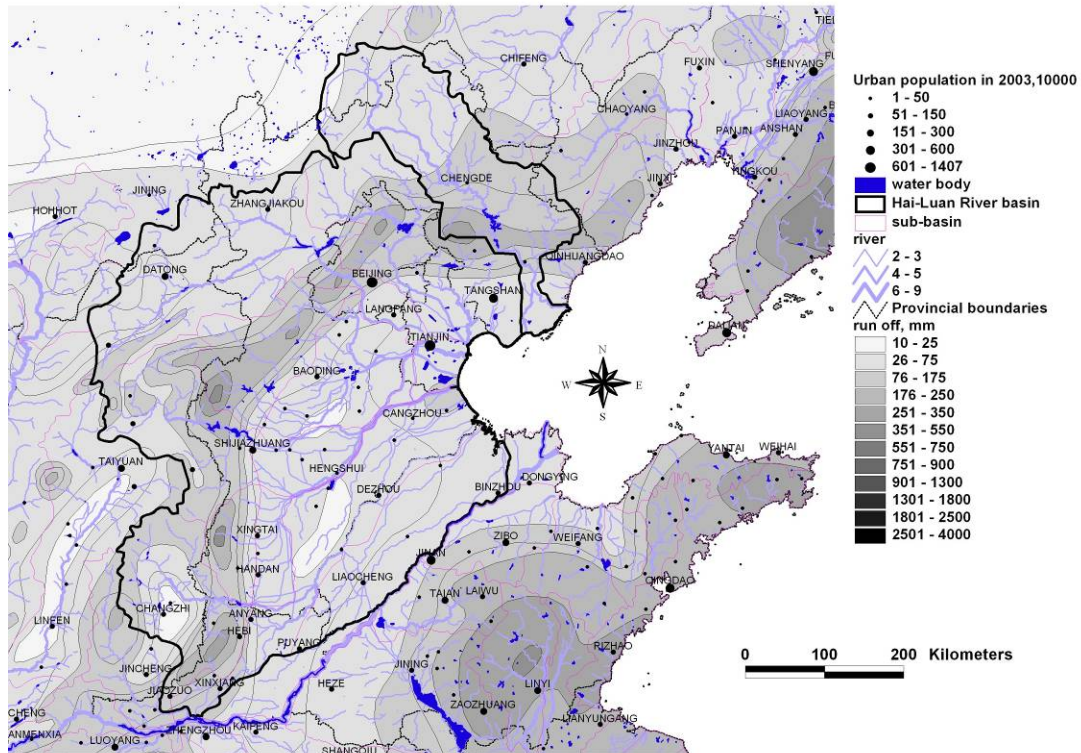


Figure 27 Runoff in Hai-Luan River Basin

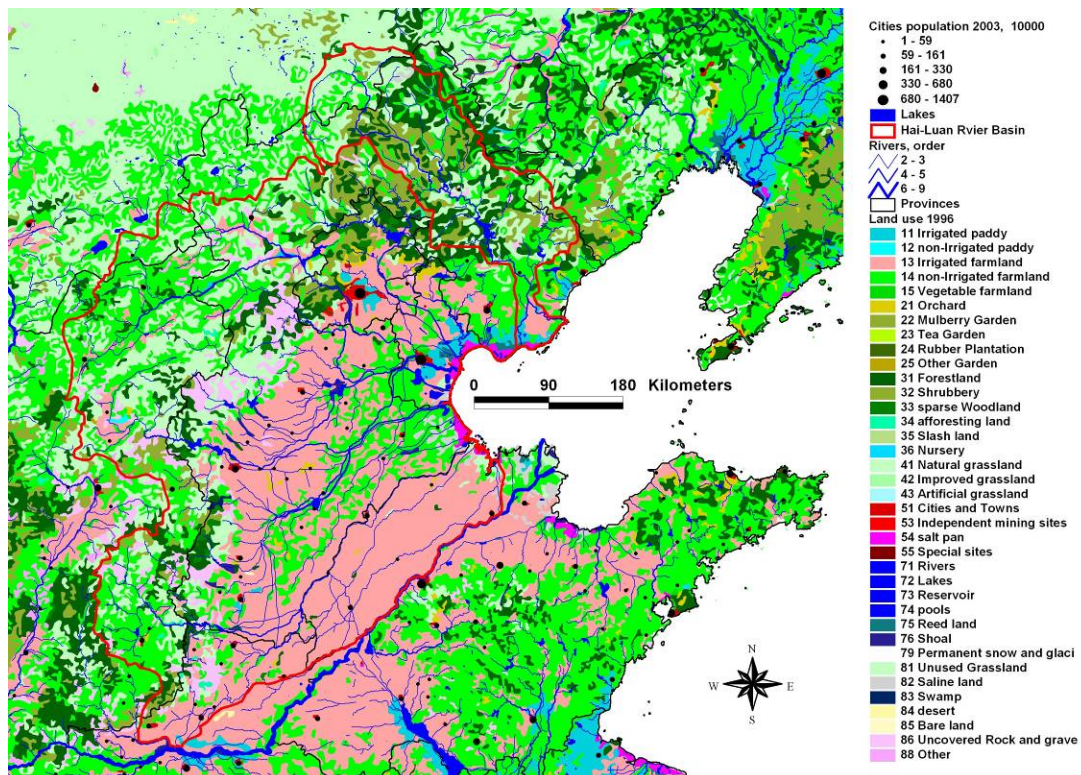


Figure 28 Land use pattern for Hai-Luan River Basin

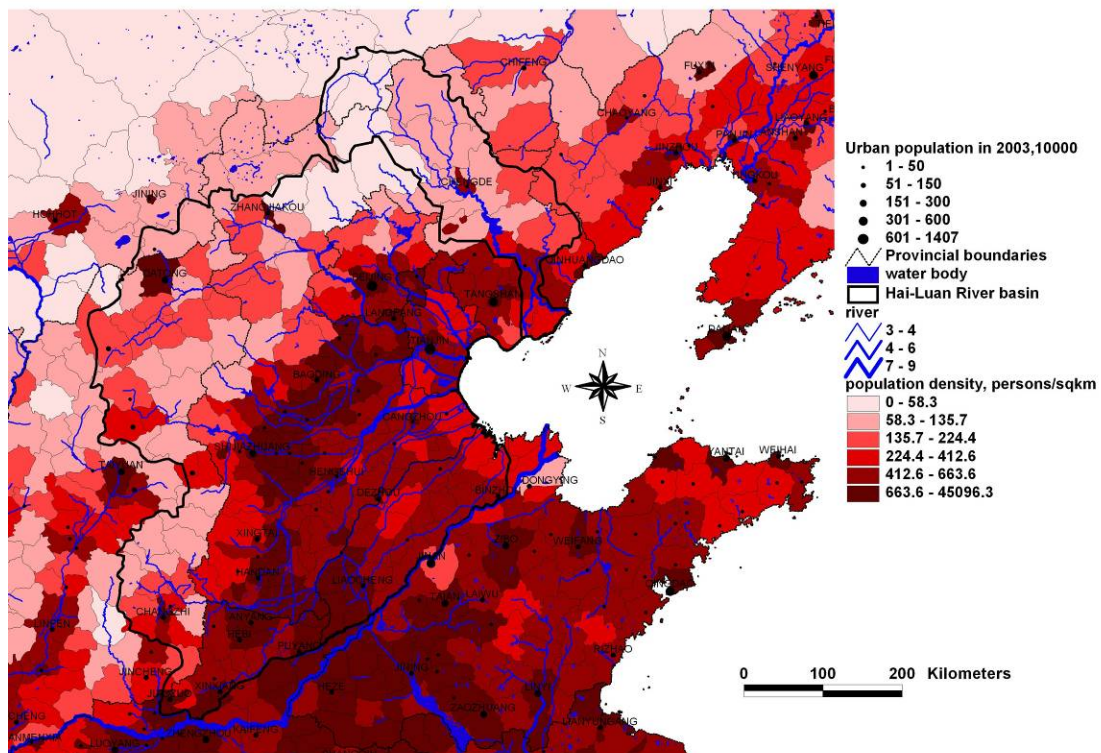


Figure 29 Population density by county in Hai-Luan River Basin

5. POTENTIAL ENTRY POINTS

- To identify water-based ecosystem services and improve their management and accessibility for the poor.
- Poverty alleviation through agricultural development. Extension of water saving irrigation technology, irrigation area development, and saline soil improvement in plain areas.
- Poverty alleviation through tourism development. Ecological compensation and tourism development in the mountain areas of Hai-Luan river basin.
- Urban water saving activities. Selection of water saving industries to improve economic structure, including industry allocation study in accord with the water supply and water pollution.
- Improvement of water management. Comprehensive water allocation management strategy study at the whole watershed, including south to north water transfer, ground water recharge, and ecological water usage.
- Long-term sustainable development water management strategy research. Including long-term forecast of economic development, and urbanisation in Hai-Luan river basin, and related water allocation and management strategy (integrated water resource management).
- Desakota: New town development in the new countryside building movement. Urbanisation of the whole desakota villages, household registration reform, and

taxation reform in the desakota villages, public infrastructure construction and maintenance.

- h. With the issue of ID cards for all citizens, the mobility of workers within China has greatly increased and supported the development of the economy, especially in boom areas. The issuance of a social security card would give support to the process of removing barriers to mobility and disadvantages for migrants due if it goes along with an enhanced flexibility of the social security network.
- i. Not only the state, but also companies should resume more responsibility to train workers and help them adapt to change in a socio-political environment, where the work force is moving up from the primary (agriculture) via the secondary (industry) to the tertiary sector (services).
- j. Natural disasters like the cold front taking the southern and middle parts of China by surprise in 2008, drive up the value of agricultural commodities and lead to a price hike, much to the dismay of citizens and the government trying to curb inflationary tendencies. However, this situation could also be viewed as a chance to improve the income situation of farmers, most of whom, unlike traders, have not received a share of the profits of the hike, by raising the prices of some basic agricultural commodities, which have remained stable for quite a while. The situation of poor people without access to land should be considered by policies to buffer hardship resulting from rising prices for staple food.
- k. Strengthen the capacity and scope of institutions like the Women's Federation, which are working simultaneously at the rural and the urban end of the desakota continuum, to provide better opportunities for migrants, for example young women, protect them from exploitation and help with selection and training in support of the labour market, adding quality, reliability and security for both employers and employees.
- l. Improve solid waste management from separation and collection to deposition and protection of vulnerable aquifers, making use and providing opportunities to poor people to participate and benefit from innovative services in the cities and in desakota zones, where solid waste material often ends up being deposited. This should be done on top of what happens already in the informal sector, although this can be used as a foundation; management of organic waste, which has a high share in China, even more so in poor areas, is crucial, as it drives up the costs of processing other waste components while having a high intrinsic value.
- m. Apparently, there is a need to enhance the spatial coverage and resolution of environmental and socio-economic parameters (quantity, quality, vulnerability, density, poverty, etc.) needed to improve regional planning, making it a consultative, but highly efficient and forward-looking optimization process that feeds into government decisions and is not just a vehicle to react to project decisions made without such knowledge, minimizing their impact. The new ministry (formerly SEPA) that handles environmental affairs could play a central role in the coordination process. Such planning approaches could be tried out in new economic development zones which include desakota characteristics like the Guangxi Beibu Bay Economic Zone.

- n. Support allocated to the establishment of Water Service Bureaux to coordinate water affairs within jurisdictions in an effort to bridge the urban rural divide was an important step. However, improved integrated water resource management, frequently overshadowed by lack of communication between jurisdictions at the basin level, requires better coordination or strengthening of existing institutions, such as the river basin commissions. It appears that many difficulties are associated with the fear of making entrenched competencies of existing institutions redundant. Therefore, it is suggested to erect the administrative structure needed for better coordination between jurisdictions, at the basin or sub-basin level, on the foundation of the existing institutional framework by largely following the principles of consultation (including functional units), representation and co-determination.
- o. Resettlers unanimously prefer to be relocated in a concentrated resettlement manner, in which households from the same area build their houses in either a large or small centralised cluster. It could be worth studying to what extent addressing such aspirations might enhance the effectiveness of the resettlement process bearing in mind socio-economic costs, such as the loss of social networks. Gender issues are also important in this regard, as rural women still have disadvantages in education which reduces their adaptive capacity in a new urban or periurban environment. This is relevant, because resettlement often magnifies the process of desakotisation.

6. KEY DATA GAPS AND RESEARCH QUESTIONS

Based on the review, identify key knowledge gaps and/or research questions pertaining to the relationship between ‘drivers’ and management of ecosystems, related services and poverty alleviation. Any methodology or capacity gaps known should also be identified.

- a. A statistical evaluation of spatial coincidence of poverty at the highest possible resolution and natural and socio-economic influence factors might yield some further conclusions on the causes of poverty and potential remediation in desakota zones, like the ‘poverty belt’ around Beijing and Tianjin.
- b. data gap concerning ground water mining, and ground water over tapping.
- c. data gap concerning the valuation of ecological service and compensation standards.
- d. research questions including the mechanism for inter-provincial ecological compensation, such as Beijing compensating rural people in Northern Hebei, or even Shanxi and Inner Mongolia for measures leading to sand storm reduction and water transfer.
- e. research questions including surface water and groundwater property right definition and resource management.
- f. More light needs to be thrown on the socio-economic aspects of agricultural water management, especially the potentials and limitations of service provision by local ‘managers’ of water distribution and fee collection, and how this can be

used as a vehicle to support water-savings; likewise more information is required on water-saving potentials of block tariffs and other instruments in the domestic sector under special consideration of the impact on poor population groups.

- g. With regard to waste management, disposal practices of edible oils deserve special consideration as they have a very high caloric value, can be transformed into biofuels or energy, but if not properly attended, may cause havoc if entering the hydrological cycle. Chongqing, which is undergoing rapid transformation along the *desakota* scale from rural to urban, would be a suitable location for such study. The municipality has taken steps to improve the situation and it is necessary to analyse the consequences also with regard to transferring lessons to other regions of China.
- h. More research is needed on causes and effects of ozone, including its impact on agriculture and forestry, considering that yield losses of up to 30% in agriculture have been reported. This is relevant to *desakota*, as there seems to be a high impact of ground-level ozone in the remote urban periphery of Chinese urban clusters.
- i. The government has reacted to the loss of arable land by setting a lower limit of 120 million hectares in China and raised considerably the tax for using agricultural land for non-farming purposes. Since these measures are new, it might be worth investigating or collecting information about ongoing investigations regarding their effectiveness. Around two thirds of the transformations go on account of construction, which includes a variety of phenomena including small business. The question arises to what extent such 'construction' happens out of what might be viewed a necessity and to what extent it is just a way of saving money by not building in specially designated areas.
- j. Non-agricultural land use subsumed under 'rural construction' is often a synonym for Town and Village Enterprise (TVE) development, which by some is considered providing a 'bottom-up impetus vital to China's economic vitality and a primary factor sustaining China's continued economic miracle'. Yet the environmental performance of such small establishments is generally not up to standard. More studies are needed about TVE's environmental and economic performance in *desakota* areas, including poverty alleviation benefits.
- k. Against a background of scarcity of both natural resources and energy, it could be worth studying the advantages and disadvantages of putting more emphasis on condensed growth of urban centers or a more spread-out development under the inclusion of periurban and *desakota* regions with a highest possible degree of autonomy in terms of resources, energy, infrastructure, administration, cultural affairs, etc. in areas that are strategically suitable for such development. Spread out would not mean being wasteful of land resources, but being overall more resource efficient, generating in most respects a higher quality of life for the inhabitants of such areas compared to either life in the metropolis or in rural surroundings. The metabolism approach from ecology might be borrowed and developed further to support such comparative analysis.

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Abstract: To feed its 1.3 billion population with a per capita cultivated land far below the world average, China is already facing a great challenge of land scarcity. Accelerated urbanisation along with explosive economic growth has further worsened the shortage of agricultural land over the last two decades. Increasing concern over land is expressed in terms of soil availability for grain production and soil quality degradation. Based on official statistics and data derived from satellite imagery, dynamics of China's cultivated land over the past two decades is outlined and the causes and destinations of cultivated land loss are analysed in this paper. Particularly, urbanisation-related land-use changes and their spatial variation across the country are demonstrated. Furthermore,

impacts of urbanisation and associated waste disposals, consequent shifts of soil utilisation on areal soil quality are expatiated. It is initially concluded that China's cultivated land is shrinking at a rather shocking rate. Although conversion to urban and industrial uses took up a comparatively small share of total cultivated land loss, urbanisation should still be considered as a great threat to future agricultural production for several reasons. Urbanisation is increasing the risk of soil pollution through waste disposal and acid deposition derived from urban air pollution. Facing rapid urbanisation, China is making positive policy responses to the challenge of decreasing availability of cultivated land and offering unremitting efforts towards the goal of national food security.

Chen Ming 2005. The Mixed Mechanism in the Management of Water Resources in China. Chinese Journal of Population, Resources and Environment Vol. 3 (4): 3-12.

The author gives an comprehensive account of the situation of water resource management in China. Strengths and weaknesses of public water supply systems are compared with water market mechanisms. The author enumerates potential benefits water markets, such as : (1) empowerment of water users by requiring their consent to any reallocation of water and compensation for any water transferred, (2) security of water rights tenure to the water users from which incentives for investment, e.g. water-saving technologies arise, (3) a system of marketable rights to water would induce water users to consider the full opportunity cost of water, including its value in alternative uses, thus providing incentives to efficiently use water and to gain additional income through the sale of saved water, and (4) a system of tradable water rights will provide incentives for water users to take account of the external costs imposed by their water use, reducing the pressure to degrade resources. In the case of water trade between the agriculture and the urban sectors, the environment may benefit in two ways. First, the water market induces a shift towards improved water management and efficiency in agriculture, reducing irrigation-waterrelated pollution. Second, with the water market, farmers may afford to internalize externality costs (i.e. by converting to rainfed cultivation or water-saving irrigation, reducing excessive use of fertilizer and renouncing on some yield and income, that would be over-compensated by the price of traded water). Disadvantages of water markets include: "measuring water, defining water rights when flows are variable, enforcing withdrawal rules, investing in necessary conveyance systems, sale of water-for-cash by poor farmers, and finally, externality and third party effects and environmental degradation: a transfer of water from agriculture to urban use may reduce return flows, which may affect a third party. In addition, increased industrial and urban water use may create extensive environmental pollution if necessary measures to limit industrial and municipal untreated sewerage disposal are not introduced". The mixed mechanism is defined as "the political economy of water management and reform, in which there is particular emphasis on the distribution of benefits and costs and on the incentives that encourage or constrain more productive and sustainable resource use." Mixed water resource management systems in California are cited as a positive example, where "solutions for groundwater management are not imposed upon, or even considered, unless a management problem exists, thus preventing interventions that can derail efficient utilization of groundwater." In China, as in most countries, water is publicly owned and a water right is usufruct-it is a right to use, not a right to own water. The

establishment of formal water rights gives rise to strong pressure for improving the data required to manage the resource. This reduces the pressure of a "race to the bottom," since those who have rights have a powerful interest in sustainability.

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In China (officially 43 per cent urban in 1997), the number of official cities has soared from 193 to 640 since 1978. But the great metropolises, despite extraordinary growth, have actually declined in relative share of urban population. It is, rather, the small cities and recently 'citized' towns that have absorbed the majority of the rural labour-power made redundant by post-1979 market reforms. Moreover, as Gregory Guldin has urged, urbanisation must be conceptualised. as structural transformation along, and intensified interaction. between, every point of an urban–rural continuum. In his case-study of southern China, the countryside is urbanizing in situ as well as generating epochal migrations. 'Villages become more like market and xiang towns, and county towns and small cities become more like large cities.' The result in China and much of Southeast Asia is a hermaphroditic landscape, a partially urbanised countryside that Guldin and others argue may be 'a significant new path of human settlement and development . . . a form neither rural nor urban but a blending of the two wherein a dense web of transactions ties large urban cores to their surrounding regions.'

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The transitional process in China is marked by prominent roles of state institutions, which are a key determinant of the opportunity and reward structure in the newly developing labour market. Migrant labour and the occupational and sectoral changes in the urban economy have further shaped the evolution of the labour market in Chinese cities. In this paper, Fan argues that labour market returns are not only functions of human capital but are heavily influenced by state-controlled institutional status. Specifically, he examines the variations in income and benefits returns among non-migrant urban residents, permanent migrants who possess urban residence, and temporary migrants who are denied permanent residence rights in cities. The empirical analysis employs data from a recent survey conducted in Guangzhou, one of the largest and most rapidly changing cities and one of the most popular destinations of migrant workers in China. The findings show that permanent migrants' income returns are especially high and that temporary migrants' benefits returns are especially inferior. Furthermore, they suggest that permanent migrants' advantaged positions are conducive to their continued success in the labour market when they shift to more profitable occupations and sectors such as commerce and self-employment. The findings of this paper support the notion that in China resident status functions like ascribed attributes that have effects on labour-market returns independent of achieved attributes, and that migration and labour-market segmentation are intricately related to the reward structure in the urban labour market.

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A study of 25 villages in the Chinese provinces of Hebei, Henan, Shaanxi, Liaoning and Jiangsu during two field visits in 2002 and 2003 and more recent follow up showed that North China has achieved a significant measure of success with variants of a model best described as a "Bounded Service Provider" which is operated by farmers turned irrigation entrepreneurs. In a few villages, the management contract was auctioned to the highest bidder. But in most instances, the procedure involved informal negotiation between prospective candidates and the village committee and/or the township water bureau. Where township water bureaus had set up expensive drip or sprinkler irrigation systems, the management contracts had been secured by the village leaders themselves. The irrigation fee is invariably determined by the village committee and/or the township water bureau, a distinctive feature from privatisation. Periods of management contracts range from 5 to 20 years. Fees are also dependant on the contribution of the provider to capital costs, i.e. the higher the share of costs by the provider, the less of a say the village committee would have, and/or the longer the term of the contract to the provider.

Kendy, E., Molden, D. J., Steenhuis, T. S., Liu, C.M. and Wang, J. 2003. Policies drain the North China Plain: Agricultural policy and groundwater depletion in Luancheng County, 1949-2000. Research Report 71. Colombo, Sri Lanka: International Water Management Institute.

A vastly changing political and economic landscape over the past 50 years has led to major water-management changes in the North China Plain. However, a comprehensive water balance analysis of Luancheng County, Hebei Province, indicates that a single, longstanding policy is responsible for steady groundwater declines. That policy is the promotion of groundwater pumping to meet the crop-water requirements not supplied by precipitation.

Kirshen P., McCluskey M., Vogel R. and Strzepek K. 2005. Global analysis of changes in water supply yields and costs under climate change: A case study in China. *Climatic Change* (2005) 68: 303–330.

Kirshen et al. (2005) investigated how climate change might impact on water supply yields and supply costs. Yield was defined as the actual supply available that can be obtained from a river basin with a high level of reliability, considering the annual variations in groundwater, surface water, water demands, and the capacity of wells and storage in reservoirs. Enhancing the natural yield of river basins (usually much less than mean annual discharge) by the construction and operation of reservoirs and the

groundwater pumping system is associated with costs. The authors followed the hypothesis that groundwater and surface water were interconnected and directly subtracted groundwater abstractions from surface water flows. Total basin water availability was equaled with the streamflow at the mouth of basins. This refers to the theoretical streamflow obtained from the Global Runoff Data Center (GRDC) in Koblenz, which was used in combination with climate models and storage reservoir and groundwater yield models to determine the required storage and groundwater pumping capacity that could reliably meet varying domestic and irrigation demands, and instream environmental needs.

The prior objective of the research was not accuracy, but the development of a model that could be used with internationally available data. The hydrological model “abcd” (inputs: monthly rainfall, temperature, PET; output: monthly watershed streamflow) from Thomas et al. (1983) was calibrated with historic stream flow data from 12 stations using a nonlinear programming algorithm in combination with basin soil water holding capacity data (from FAO), as this was found to be the best parameter for describing regional variations in ‘abcd’ parameters. Groundwater consumption was subtracted from streamflows by monthly demand coefficients based on the difference between PRT and precipitation, assuming that agricultural demand was dominant. Reservoir storage was calculated from the remaining streamflows, applying a fixed 10% to urban and industrial demands, and the same demand coefficient (used for groundwater) to 90% of surface water demand for irrigation. Sustainable minimum streamflow requirements were set to 80% of base flow in the dry season and 60% during the wet season. The methodology presented is certainly elaborate and interesting, but some of the assumptions are over-simplifying (e.g. a share of 90% water use in agriculture does not apply to the Hai and some other river basins) and the results in individual cases appear surprising, for example the fact that the flows in the Hai basin are going to be less 50 years from now with sulphate aerosol-inclusive than with non-inclusive models (see NDRC 2007), whereas quite the opposite will be the case in the Huai river. This may have to do with shifts in industrialisation patterns, where sulphate emissions inhibit temperature rises, but if this is true, then why will there be less runoff in the Hai basin than today then 50 years from now under the non-sulphate inclusive assumptions?

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- Liang, Z. 2004. China's Floating Population: New Evidence from the 2000 Census, Population and Development Review, 30, 467-488.

Over the last two decades, a new demographic phenomenon in China has attracted increasing attention in academic journals, newspapers, and magazines. The “floating population,” or *liudong renkou*, refers to the large and increasing number of migrants without local household registration status (*hukou*). The growth of this population group reflects fundamental social and demographic changes in Chinese society since the early 1980s. It would have been very difficult to imagine such a large number of individuals living outside of their places of household registration 30 years ago, for the simple fact that one could not survive in cities without local *hukou* status at that time. China’s market reforms since the late 1970s have significantly weakened the government’s control over geographic mobility and its ability to enforce the *hukou* system. Despite the demographic importance of this population, estimates of its size are wide ranging (Cai et al. 2001), and little is known about its impact on communities of origin and destination.

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Lohmar B., Wang Jinxia, Rozelle S., Huang Jikun, and Dawe D. 2004. Market and Trade Economics Division, Economic China’s Agricultural Water Policy Reforms: Increasing Investment, Resolving Conflicts, and Revising Incentives. Research Service, U.S. Department of Agriculture. *Agriculture Information Bulletin* Number 782: 27 p.

Abstract: Water shortages in important grain-producing regions of China may significantly affect China’s agricultural production potential and international markets. Falling ground-water tables and disruption of surface-water deliveries to important industrial and agricultural regions have provoked concern that a more dramatic crisis is looming unless effective water conservation policies can be put into place rapidly. While China’s water use is unsustainable in some areas, there is substantial capacity to adapt and avert a more serious crisis. Recent changes in water management policies may serve to bring about more effective water conservation. This report provides an overview of these changes and some analysis of their effectiveness. Wheat is the most likely crop to show a fall in production due to water shortages, but cotton, corn, and rice may also be affected.

Long Hualou, Wu Xiuqin, Wang Wenjie, and Dong Guihua. 2008. Analysis of Urban-Rural Land-Use Change during 1995-2006 and Its Policy Dimensional Driving Forces in Chongqing, China. *Sensors* 2008, 8, 681-69.

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Satterthwaite D. 2000. Seeking an understanding of poverty that recognizes rural-urban differences and rural-urban linkages. World Bank's Urban Forum on Urban Poverty Reduction in the 21st Century in April 2000: 28 p.

The author covers a range of topics, focussing among other topics on differences between urban and rural poverty, the importance of agriculture for the economy of many urban areas, and an understanding of rural-urban connections and distinctions. He provides a table elaborating on differences in rural and urban contexts of relevance to poverty reduction, mentioning a range of topics under the rubriques of livelihoods and asset-bases, the environmental health context, housing and basic services, social aspects, and governance. The imprecision of rural-urban distinctions is demonstrated for example by the number of people in urban areas like Beijing (29%), Shanghai (30%), Shenyang (24%) and Xi'an (53.8%) who work in agriculture. Main characteristics of the rural-urban continuum, were summarised in a figure, which reflects the 'fuzziness' of boundaries between the two poles.

The rural-urban continuum (from Satterthwaite, 2000)

RURAL		URBAN
<p>Livelihoods drawn from crop cultivation, livestock, forestry or fishing (i.e. key for livelihood is access to natural capital)</p> <p>Access to land for housing and building materials not generally a problem</p> <p>More distant from government as regulator and provider of services</p> <p>Access to infrastructure and services limited (largely because of distance, low density and limited capacity to pay?)</p> <p>Less opportunities for earning cash; more for self provisioning. Greater reliance on favourable weather conditions.</p> <p>Access to natural capital as the key asset and basis for livelihood</p>	Rural-urban interface	<p>Livelihoods drawn from labour markets within non-agricultural production or making/selling goods or services</p> <p>Access to land for housing very difficult; housing and land markets highly commercialised</p> <p>More vulnerable to 'bad' governance</p> <p>Access to infrastructure and services difficult for low-income groups because of high prices, illegal nature of their homes (for many) and poor governance</p> <p>Greater reliance on cash for access to food, water, sanitation, employment, garbage disposal.....</p> <p>Greater reliance on house as an economic resource (space for production, access to income-earning opportunities; asset and income-earner for owners – including <i>de facto</i> owners)</p>
Urban characteristics in rural locations (e.g. prosperous tourist areas, mining areas, areas with high value crops and many local multiplier links, rural areas with diverse non-agricultural production and strong links to cities)		Rural characteristics in urban location (urban agriculture, 'village' enclaves, access to land for housing through non-monetary traditional forms.....)

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The authoress first describes the societal framework of gender issues in China, focusing on resettlement in the Three Gorges Project. On the base of structured interviews, surveys and sample community investigations she provides a vivid portray of gender differences in the resettlement scheme. The authoress concludes that: "The TGP resettlement policy and schemes need to be made more sensitive to gender differences and to women's specific concerns. Displacement and resettlement associated with the TGP may exacerbate inequalities and leave women with increased vulnerability and impoverishment. The problem, however, is deeper: it is not merely a question of gender issues in themselves, but of the underlying gender inequality. This needs to be addressed through national strategies to raise women's status; gender-aware agrarian reform programmes to relieve the heavy workload of women in agricultural sectors; access to employment for women in rural and urban areas through job creation and enforcement of equal opportunities; providing training in practical production techniques and skills allowing resettlers to adapt to the labour market in their new environments. Women have limited opportunity to participate in the decision-making process of displacement. The

pre-displacement stage is critical; timely and accurate information should be spread through media and other channels about the realities of distant recipient communities, the agricultural production and non-agricultural employment opportunities there, and the reality of experiences of existing resettlers. All levels of government need to be involved in pre-displacement training, networking, information dissemination, and supporting resettlers to integrate themselves in their new environments. Resettlement policy needs to integrate a gender policy perspective, ensuring that women and men are provided with equal opportunities to develop and utilize their skills and to participate in decisions on their displacement and resettlement. Urban and rural women displaced via various resettlement schemes and at different stages of the process of resettlement may have different experiences, characteristics and issues. Changes and new issues relating to woman resettlers will surface in the rapid transformations of economy and society in China. Whether displaced women can achieve equal development in the resettlement process remains to be further monitored.”

Tao Ran and Xu Zhigang. 2007. Urbanization, rural land system and social security for migrants in China. *Journal of Development Studies* 43 (7)7: – 1320.

Abstract:

Temporary migration due to lack of social security for migrants, rural land tenure insecurity due to frequent land reallocation and abusive land requisition due to lack of functioning land markets are all major policy challenges that China is facing in its yet-to-be finished economic transition. Although there have been intensive studies and various policy recommendations on these issues, most discussions have so far neglected the close interrelationships between these issues and have failed to analyse them in an integrated framework. The paper aims to establish such an analytical framework. By taking into account the impacts of China's characteristics, that is a large developing country in transition, on the country's migration and rural land policies, we propose a policy package to address these challenges in a holistic manner.

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Abstract:

This study assesses how the transfer of rural labour to non-farm sectors affects China's national economy and the role the agricultural sector plays with respect to rural-urban migration. Econometric models using official Chinese statistics are used to: evaluate the marginal productivities of rural labour in agriculture versus non-agriculture; identify determinants of rural labour transfer; and assess the socioeconomic impacts of these transfers. It is concluded that though agricultural growth stems problems relating to over-urbanisation, there are significant economic costs and undesirable social consequences associated with under-urbanisation. Gains brought about by flexibility in

the transfer of rural labour to non rural labour include higher GDP and reduced discrepancies in living standards for rural and urban populations.

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Tong Chunfu, Feagin R.A., Lua Jianjian, Zhang Xiufeng , Zhua Xiaojun, Wang Wei, and Hea Wenshan. 2007. Ecosystem service values and restoration in the urban Sanyang wetland of Wenzhou, Chinae. *Ecological Engineering* 29: 249–258.

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The author emphasised that the reform processes which led to the access of China to the WTO in 2001 have affected broader quality of life indicators such as inequality, natural resources and environment, health and education as well as jobs and poverty. Wen concludes that the urban middle class is becoming more environmentally conscious, partly due to influence from the West. Yet many of them want more cars and other luxuries while demanding that the government should clean up the environment. “We will get rich first, then we will have the resources to clean up the environment” is the popular thinking. According to Wen, it is a different story for many rural residents. Many of them reap little benefit from the rapid industrialisation while bearing the brunt of environmental destruction. Unlike many urban residents who are far removed from the real impact of their activities, farmers instantly see through the artificial dichotomy of environmental protection and development when their fisheries collapse or their crops fail. “Many of them are poor and want a better life, but they know it cannot be achieved by abusing nature.”

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Xie Yichun, M. Batty and Zhao Kang. 2005. Simulating Emergent Urban Form: *desakota* in China. UCL Casa Working Paper Series. 33 p.

http://www.casa.ucl.ac.uk/working_papers/paper95.pdf

The essential question of what “*desakota*” means and particularly how the phenomenon manifests itself in China, has been addressed by Xie et al. (2005). Growth patterns at the urban fringe are described as “emergent”, reflecting processes which act from the bottom up, producing growth and change which is organic and unplanned in its genesis. Rural landscapes usually within the hinterlands of large cities, are rapidly urbanizing, not through rural depopulation to the cities with their subsequent outward growth, “but through a process of spontaneous change in which a majority of the rural population are transforming their lifestyles and activities into urban pursuits in situ.” The authors have used a transition matrix of historic land use changes and ancillary data that drive change to model future land use development in a *desakota* region near Suzhou.

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