Planning Practices Coping with Migration in Backward Area in Western China: A Case Study of Liupanshui City

(Planning towards Migration in Backward Area)

Dan Shao, Ye Mu, China Academy of Urban Planning and Design, China

1. Introduction

Regional disparities are generally greater in developing nations worldwide, and China is an extreme case of sharp divide between east costal area and west hinterland (Polese, 2009). Inevitably, internal migration in China of concentrating to the more developed east becomes a trend as shown in figure 1, leaving significant out-migration in the middle and west (Zhang, 2012). The amount of migrants nationwide was up to 230 million accounting for 17% of Chinese population (Zhao, 2013). The dilemma is that in out-migration area, outflow is necessary to enlarge the resources possession per person and hence to improve the income, while population scale is still a key factor to persistent development of cities within it.



Figure 1: Change of proportions of resident population in four economic regions¹ from 1990 to 2010 (resource: National Bureau of Statistics, edit by author)

Liupanshui is a typical case locating in out-migration area in Guizhou Province in southwest China. It was built according to plans to form a modern industrial city specialized in coal and steel. Rise of cities in west China is usually based on mineral resources under government intervention. The prosperity was started by first immigrants since 1960s. However, markets not favoring the location along with the depletion of resources lead to a declining position. Migration here shifts from net inflow to a concurring situation of net outflow of the region and aggregation to the city. Problems of low urbanization and the widening rural-urban gap are worth attention. A series of plans made by government since 1983 aimed to improve the capacity of the city, and strategies of urbanization were proposed. Also, the planning area extended from the city to the administrative area. These plans play important roles affecting the migration in all aspects. Nevertheless, application of point-axis development (Lu, 1987) and satellite town theories did not accomplish the goal very well of cultivating urban hierarchy to accommodate new residents.

This paper described the achievements and obstacles of the city as a background as well as causes to the migration. On this basis, this paper focused on both demographic changes driven by migration and the planning practices for comparison to review the principles and methods taken. Implication involves that planning practices in backward area, also regarded as the out-migration area, face challenges from expanding the scale of city to blending into the region. Cities within the area have common problems in finding paths and driven forces to urbanization to reduce the gap and to avoid decline.



2. Achievements and Obstacles of the City

2.1 Circumstances

Liupanshui become a prefecture-level city in 1978 combined by three constituent counties, Liuzhi, Pan, and Shuicheng, and was the second established city in Guizhou Province. The administrative area of Liupanshui is approximately 10000 square kilometers with a population of 2.85 million in 2010 (Population Census Office, 2010). Per capita GDP of the region is 17462 Yuan (that is 2640 USD in 2010 exchange rate) rank second place in the province (Guizhou Bureau of Statistics, 2011). Population residing in the city was about 550 thousand, and the built-up area was about 54 square kilometers in Zhongshan District, the municipal district of the city. Measured by urban population and industrial output, Liupanshui is the second largest city in the Province and was designated as one of two sub-centers after the provincial capital Guiyang (Guizhou Provincial Government, 2001). The city has gained great economic success relying on dominant industries including coal, electricity and steel.

2.2 Initiation of Prosperity Led by Government

Liupanshui was built under the guidance of government's "Third-front city policies"² since 1960s. Most of these cities were distributed in traffic underdeveloped areas but rich in natural resources at that time (Huang, 2013). The initiation of the prosperity was led by government through national construction projects and migration policies.



Figure 2: Location of Liupanshui based on the map of main coal producing areas and present situation of transportation in 2010 (resource: CAUPD, edit by author)

As figure 2 shows, the geographic location for coal deposits and closing to iron ore is the primary condition to success. Liupanshui locates in the heart of Yungui Coal Base which is one of the thirteen state coal bases in China and the only one in the region south of Yangtze River. Advantages were created through continuous input on railways by government to ensure competitive prices of the products. Nowadays, Liupanshui is a major rail hub in southwest China, and three railway lines intersect here as shown in figure 2. Migration policies reinforced the scenario above. Immigrants encouraged by government, mainly composed by engineers and skilled workers from north mature industries, turned the newly built plants into operation in a relatively short time. On this basis, the newly built city was started and kept a considerably high growth rate in past decades. Planning decisions and strategies directly determine the structure and morphology of the city instead of forming itself spontaneously.



2.3 Weakening of Advantages Driven by Market

Admittedly that the "three-front" city policies had positive effects on promoting the process of industrialization and increasing number of cities and towns in west China, these implanted ones do not lead to the general development of region. Location is a major obstacle to overcome. Figure 3 illustrates the radiant intensity and economic density³ of Liupanshui and major cities in the surrounding area of southwest China. As shown in the map, areas around Chengdu and Chongqing tend to form urban agglomeration, while capital cities including Guiyang, Kunming and Nanning are their own provincial center. The advantage of proximity to Chongqing distinguishes Zunyi from Liupanshui in the peripheral area.



Figure 3: Illustration of the radiant intensity and economic density of Liupanshui and major cities in southwest China in 2010 (resource: by author)

In fact, the gross domestic production gap between Liupanshui and top cities in the province is expanding. The economic share of Liupanshui in the province slightly decreased after 2008 as figure 4 shows manifesting a declining position.



Figure 4: GDP growth of top four cities and the economic share of Liupanshui in Guizhou Province from 2001 to 2011 (resource: Guizhou bureau of statistics, edit by author)

The government shaped location advantages by improve transportation and bring immigrants. However, they are weakened by market from several aspects. First, the perfection of regional transport network relatively lowers the advantage of Liupanshui, along with the depletion of resources result more price competitive coal input from the north. Cheap iron ore overseas is changing southern ports more profitable for steel industries. Meanwhile, the government monopoly for purchase and selling being replaced by free market gradually compresses the



profits together. Recently, consideration on the market trends as well as construction cost leads to an altered straightforward route of the regional transportation including highways and high speed railways bypassing the city as shown in figure 5. Also, relaxation of policies activated migration throughout the country in 2000s, and as a consequence, first immigrants and their descendants are likely to going back their hometowns while local villagers are able to finding jobs in more developed regions instead of the nearby city. Advantage brought by migration is also undermined due to the loss of current and potential urban residents.



Figure 5: Illustration of the evolvement of transportation in Liupanshui and the region (by author)

2.4 Increasing Concern on the Fragile Environment

Liupanshui locates in typical karst area which is extremely ecological sensitive. Increasing concern on this fragile environment becomes an important driven force to out-migration from the point of government. Excessive mining and development activities have already caused irreversible impacts including rocky desertification and pollution of upstream water sources. These harsh conditions are severe constraints to the previous underdevelopment as well as major obstacles to the sustainable development of future.

3. Demographic Changes

3.1 Methodology

Approaches to data of population in China rely on existing statistical systems and institutions mainly including the statistics bureau, municipal public security bureau and family planning commission. Commonly used indicators include registered population, resident population, migrants, temporary residents, etc. In this paper, direct and indirect methods are applied to describe the demographic changes driven by migration.

Direct data are available from the municipal public security bureau in the name of temporary residents which means dwellers with permanent household registration elsewhere residing in the place for more than 6 months, and annual changes of registered population are also



available reflecting part of the mechanical growth. In addition, bureau of labor and social security estimates the scale of migrant workers annually.

Indirect data utilize resources from the statistics bureau reflecting resident population in half a year scope in a certain region. National population censuses conducted about every 10 years are fundamental resource. The difference between registered and resident population can be representative to the scale of migrants. As supplement, the natural growth rate calculated by family planning commission can be used to separate the mechanical growth.

Migration is studied in two different scopes. One is taking the administrative area as a whole to study migration trends in the region. Another one involves analysis of counties within the administrative area to study the distribution and relocation of population.

3.2 Migration: Outflow Trends in the Region

Statistics of resident population is available only in recent years comparing with registered population. For a long time, the migration is constrained due to policies, thus the resident population is very close to the registered. As announced by 2010 population census, the resident population of Liupanshui was 2851.2 thousand, with an increase of 10.7 thousand or 3.90 percent from the year of 2000.

Table 1 shows the comparison of population growth rate and the contribution of natural growth. Although the natural growth rate keeps going down due to the birth control, the population growth rate decreases more significantly. In the period from 1978 to 1990, both the natural growth and mechanical growth contributes to the increase of population. However, the population growth was almost equal to the natural growth in 1990s which means the low occurrence of migration. In the new century, the out-migration should be responsible for the low population growth rate since 2000. Migration in Liupanshui shifts from net inflow to net outflow in past decades.

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	population growth rate	natural growth rate
1978 - 1990	1.98%	1.33%
1990 - 2000	1.12%	1.24%
2000 - 2010	0.38%	0.85%

 Table1: Annual population growth rate and natural growth rate of Liupanshui from 1978 to 2010 (resource: Liupanshui municipal government, LPS bureau of statistics, edit by author)

As figure 6 shows, the resident population was 134 thousand less than registered population in 2000, and it is reasonable to infer that the net outflow started before 2000. The difference later expanded to 338 thousand in 2010 accounting for 11% of the registered population.



Figure 6: Trends of population and growth rate of Liupanshui from 1978 to 2010 (resource: Liupanshui bureau of statistcs, edit by author)



Liupanshui bureau of labor estimates that the total amount of migrant workers residing elsewhere grows from 100 thousand to 335 thousand from 1996 to 2010. Also, commission of family planning gives the number of out-migrants up to 375 thousand in 2009. Given that the number of temporary residents in Liupanshui is about 118 thousand in 2010, the total amount of migrants including in-migrants and out-migrants may reach 450 thousand or 15.8 percent of the resident population. Nevertheless, relatively small part of migration is reflected on the changes of registered population. In this context, annual net inflow population was about 11 thousand from 1980 to 1990, and the number dropped to 4 thousand from 1990 to 1996 and finally shifted to negative in 2008. After all, the in-migrants and out-migrants remain the same at the scale of about 30 thousand from 1990 to 2011 leading to subtle influences on the population growth.

Guizhou is among the provinces with highest proportion of population outflow in the country. As figure 7 shows, population decline occurs in the listing provinces from 2000 to 2010 according to the national population census. Comparatively, Sichuan province output migrant workers earlier than the others and basically achieved balance in recent years despite of the regional wealth's accumulation. In the contrast, the outflow trends of Guizhou province is expanding and has not yet entered a stable stage. The out-migrant population in Guizhou increased 6.14 million with annual growth rate of 14.7 percent from 1996 to 2010, while the number of Liupanshui in the period is around 10 percent. Comparing with the 7.1 million net outflow populations accounting for 17% of the registered population in Guizhou, the intensity of migration of Liupanshui is relatively low.



Figure 7: Standardized data of resident population evolvement (base year = 100) of Henan, Anhui, Guangxi, Sichuan and Guizhou from 2000 to 2010 (National bureau of statistics, edit by author)

Few correspondences are confirmed between the intensity of migration and the economy performance indicated by annual growth of GDP or per capita GDP as shown in table 2. The economic growth of Guizhou province keeps exceeding the average level of the country in recent years, and Guiyang is the only inflow region in the province taking the administrative area as a whole. Although the relatively high per capita GDP in Guiyang and Liupanshui seems to be related to the positive growth of resident population, other cities are irrelevant to the conclusion. Generally, cities with higher proportion of migrants featured by more negative population growth relate to the geographic proximity along with easier transport access to the developed regions.

city	re	esident pop (10000 per	ulation sons)	GDP increase rate	per capita GDP in 2010 (yuan)	
-	2000	2010	growth rate	11 20 10 Over 2009		
Guiyang	337.45	432.46	28.16%	14.3%	26209	
Liupanshui	274.41	285.12	3.90%	15.8%	17462	
Zunyi	713.94	612.70	-14.18%	14.7%	14650	
Anshun	252.30	229.73	-8.95%	12.1%	10014	
Tongren	374.77	309.24	-17.49%	12.9%	9304	

Table2: Resident population of Guizhou province by prefecture level cities between 2000 and 2010 compared with GDP increase rate and per capita GDP (Guizhou bureau of statistics, edit by author)



Qianxinan	296.53	280.59	-5.38%	12,1%	10839
Bijie	690.63	653.64	-5.36%	14.6%	9113
Qiandongnan	422.49	348.06	-17.62%	14.2%	8839
Qiannan	379.78	323.11	-14.92%	14.2%	10861
the province	3524.77	3474.65	-1.42%	12.8%	13228
the country	126582	133972	5.8%	10.3%	29706

Distribution of out-migrant destinations are analysed as well. According to statistics from the bureau of labour, destinations within the province accounted for only 20 percent in Guizhou in 2010, while 80 percent migrants left Liupanshui for other provinces mainly in developed east including Zhejiang, Guangdong, Jiangsu and Fujian. The outflow to Yunnan, is mainly formed by migrants from Pan, one of the constituent counties of Liupanshui on the border of Guizhou in adjacent to Kunming as surveyed by the local government. Figure 8 reflects the large scale of out-migrants going to other provinces from Guizhou comparing to average level of west region. Migrants moving within the same city only account for only 12.4 percent of the total amount. Change of registered population manifests the same trend of the predominant interprovincial migration. Ratio of registered out-migrants between moving to other provinces and within the province is about 6.5. As to the not many in-migrants in Liupanshui, 76.9 percent of them come from residences within the province. The implication is that migration contributes rather small part to the local urbanization process.



Figure 8: Rural migrant worker flows by regions in 2005 (Agricultural census office, edit by author)

3.3 Migration: Rural-urban Aggregation

The rural-urban aggregation is studied under the premise of the outflow trends in the region as discussed before. Recent master plan of Liupanshui designated the core city locating in Zhongshan district as the center of the administrative area, and Hongguo County in Pan as well as Pingzhai County in Liuzhi are sub-centers (Liupanshui municipal government, 2006). In 2010, resident population in the city is about 550 thousand exceeding the pre-assumed scale of 500 thousand in master plan, while the population of two sub-centers are 110 and 140 thousand under anticipation. Other counties are dispersed in the city with rather small population. Calculated by urban residents, more than 48 of the 94 counties resides less than 2 thousand people which are not regarded as urban areas according to Chinese standard. Rural-urban aggregation in this area is characterized by co-existing polarized development of the core city and balanced underdeveloped counties in wide area.

Figure 9 illustrates the distribution of population density in the unit of county. In the highest urbanized area in the city, population density reaches 7747 persons per square kilometers, and that is 27 times of the average level of the administrative area and almost as much as the same with Guiyang. Meanwhile, counties with higher population density tend to be along major transportation corridors. As figure 10 shows, about 90% counties are going through the negative population growth, while only about 12 percent of these out-migrants move into the core city and Hongguo county in Pan referring to the study above.





Figure 9: Distribution of population density of counties in Liupanshui in 2010 (resource: LPS bureau of statistics, edit and drawn by author) Figure 10: Distribution and population growth of counties in Liupanshui in 2010 (resource: LPS bureau of statistics, edit and drawn by author)

Rapid growth of resident population in the city shows that the polarization trend continues. The number increased from 102 thousand or 29.1 percent of total urban population in the city in 1983 to 208 thousand or 44.7 percent in 1996. The proportion then reached 67.4 percent in 2010. Classified by constituent counties or district as shown in table 3, population share of Zhongshan increased 5.11 percent from 2000 to 2010, while the others decreased in the period. Population of temporary residents also increased significantly in Zhongshan with an average scale of half of the whole residents from 2007 to 2011.

(resource. LFS bureau of statistics, LFS municipal public security bureau, eail by author)								
constituent	proportion of residents (%)		temporary residents (persons)					urban residents
county/district	2000	2010	2007	2008	2009	2010	2011	in 2010 (persons)
Zhongshan	16.52	21.63	25038	31232	50302	67161	59551	491438
Shuicheng	24.72	24.71	10480	8814	9956	12831	13316	18878
Pan	39.02	36.30	20572	22725	28657	27517	30647	176237
Liuzhi	19.74	17.36	3032	1911	2514	5361	10050	130050
total	100	100	59122	64682	91429	112870	113564	816603

100

Table3: Demographic indications by constituent counties of Liupanshu	
source: LPS bureau of statistics, LPS municipal public security bureau, edit by	[,] author)

Figure 11 shows an investigation on purposes of migration of temporary residents conducted by municipal public security bureau in 2011. Generally, more than 48 percent of temporary residents are engaged in industry despite of the differences between counties. Purpose of migration includes running business, finding work, getting educated or medical care, tourist and so on. Zhongshan or the core city shows a higher proportion on running business and seeking education and others, which suggests more possible attractions to the migrants.





Figure 11: Purpose of surveyed temporary residents of Liupanshui in 2011 (resource: LPS municipal public security bureau, edit by author)

3.4 Confronting Challenges

Case study on the demographic change of Liupanshui proved the limited effect on the development of region stimulated by the implanted city in terms of urbanization. Despite of the concurring outflow trends in the region and rural-urban aggregation, the urbanization of the city remains in rather low level and increase. Generally, urbanization rate in high-income countries are higher than low-income countries which implies positive correlations between regional wealth and urbanization. As to Liupanshui, urbanization rate of 28.65 percent (Population Census Office, 2011) equated to only 57 percent of average level of the country or 87 percent of the province. Per capita GDP in Liupanshui accounts for 60 percent of the state average and per capita income ranked 8 of 9 in the province (Guizhou Bureau of Statistics, 2011). The poor performance is largely because of the location in Guizhou and the weak ties between the city and its populous hinterland. Over 50 percent of the residents are engaged in agriculture while providing only 6 percent of the economic growth indicated by GDP (LPS Bureau of Statistics, 2011). The low productive capabilities reveal the extreme poverty of the agricultural area in Liupanshui.

The accelerating trends of aggregation to the core city along with high incidence of poverty lead to an expanding rural-urban gap. Ratio of income gap between urban residents and villagers increased from 4.1:1 in 2003 to 4.7:1 in 2007. Extra payment from the government reduced this gap to 4.3:1 in 2009 which is still rather high comparing with the average level of 3.2:1 in China (Bureau of Statistics, 2010).

The annual growth rate of urbanization in Liupanshui is only 0.56 percent in the past decade comparing with 0.99 percent of the province or 1.35 percent of the country. Reasons to the slow increase are multifarious. Actually, indicated by proportion of registered non-agricultural population, Liupanshui ranks second place in the province after Guiyang which means the number of original urban residents in the city were more due to the three-front city policies. However, relatively low intensity of migration is corresponding to the slow growth. As a contrast, the proportion of migrants in Zunyi was up to 24.7 percent while the urbanization rate increased 12.06 percent in the same period. Meanwhile, Shuicheng surrounding the city is a state-level poverty-stricken county with a population of 450 thousand below the poverty line of 2300 yuan in 2011 (LPS Bureau of Statistics, 2012), and that is about 64 percent of the total residents. As shown in figure 9 and 10, in the wide area of low population density. the outflow trends are not as clear as Pan and Liuzhi as well which illustrates that poverty holds back the migration. Other reasons including poor education and cultural segregation with local ethnic minorities reduce the local intention to migration. On the other hand, the city did not offer sufficient jobs to new migrants constrained by the dominant coal and steel industries. The scale of workers engaged in mining industries has been around 65 thousand persons for more than 10 years, while proportion of employees engaged in industry raised from 7.83 percent in 2001 to 16.45 percent in 2005 and then dropped to 14.31 percent in 2010 (LPS Bureau of Statistics, 2011). The static change of job opportunities in industries in recent years is related to the continuous fall of resident populations. Additionally, unlike



under government intervention, the migration for the whole household family under market economy can be costly and leading to the temporary and pondering migrants.

Signs indicate that the trends of migration discussed above will continue, and both pull and push factors as often explained to urbanization here are insufficient. Basically, the migration benefits the local development as has been proved many times in out-migration area. While considering the individual differentia, out-migration has raised great challenges to cities. In the region with high poverty occurrence, field surveys also proved that these out-migrants are probably urban residents living in counties who can afford the migration instead of people in extreme poverty sharing limited resources. To understand the confronting challenges and reasons behind is very important to planning decisions.

4. Review of Planning Practices

4.1 Market over Government

In the context of urban planning system in China, master plans are major strategic plans with statutory status set by law. Liupanshui has made three versions of master plans including "1983 to 2000 master plan", "1997 to 2020 master plan", "2006 to 2020 master plan" after the economic reform in 1978. Currently, a new version from 2012 to 2030 is being prepared. State's virtual monopoly over urban investment and decision making has steadily eroded which is also revealed in planning practices (Leaf, 1998). First, the revised cycle of plans is shortened from 14 years to 9 years and to 6 years if taking into account the ongoing version. The multi-shareholders in market economy are particularly prone to uncertainty. On the other hand, the corresponding plans especially those involve market development tend to break through the laws regulated in master plans manifesting strong driven forces of the market.

4.2 Setting Goals: Wavering Strategies of Urbanization

For a long time, there is controversy over the strategy of urbanization of giving priorities to large cities or small towns in the state's level. Urbanization even processed backward due to policy guidelines in the 1960s and 1970s. The prevailing view of activating small towns while constraining metropolitans become unified national strategy which deeply affects territorial planning practices in the 1980s and 1990s. In the 1983 master plan of Liupanshui, settling immigrants engaged in mining and steel industry was the primary task. Building new towns based on coal deposit was the main concern at that time. Urban populations in 1990 and 2000 were predicted according to the number of employee in the state industries. Scale of urban residents was considered to be very important, and hence the population gathering in new towns was estimated over-optimistically.

In 1990s, enlightened by the Guangdong experience on loading small-scale industries in counties, impulses on developing small towns were spread nationwide. Generally, new towns planned in 1983 developed under expected and the result was attributed to the lack of inter connections between cities and towns. With the support of a new round of large-scale construction of transport infrastructure since 1960s, integrating the administrative area to cultivate urban hierarchy was the main strategy in 1997 master plan. "Point-axis" theory was the rationale of the urban system pattern–promoting central towns along railways and major roads to foster development axis and town clusters subsequently. Meanwhile, scale of the core city was to build a comprehensive central city of western Guizhou instead of its own service base as proposed before. Multiple industries with all kinds of shareholders and industrial types were encouraged to enhance the diversity and capacity of the core city. Also, a short guidance to the migration of surplus labor in rural area was mentioned. Principle of proximity was applied and urbanization was designed to rely on the migration of nearby rural residents within the administrative area.



Most of the designated central towns developed faster than the others in the period but still less than expected in scale. "Coordinating urban and rural" in 2003 and "building socialist countryside" in 2005 are main guidance of the state in the new century. Urbanization strategy put emphasis on both urban and rural area in 2006 master plan. The goal of urbanization was to consolidate the urban system and to promote share prosperity of both urban and rural residents. As to cities, the core city combined with satellite towns were planned to build metropolitan area, and central towns were dispersed evenly in the administrative area to be centers for the surrounding rural population. Satellite towns would function as decentralized area of the core city as well as attractions to cost sensitive industries. Other central towns located in the hinterland were counted on new roads to develop in the plan. Migrant workers were not mentioned in this version though there were indications. Infrastructures including small-scale irrigation and low-level country roads were planned to alter the poverty of rural area. Combination and displacement of villages were important part of the strategy.

During this period, building roads were turned into the operation of market nationwide. As a consequence, comparing with free country roads, toll highways with high investment and high profits fit the mode better. Hence, the strategies of satellite towns and central towns based on accessible transportation network can never achieve. Also affected by the market, rapid real estate development in the city significantly increased house prices and increased costs of immigrants while the governments still offer very cheap land to heavy industries. The changeable emphasis between cities, towns and rural area tends to distract the urbanization.

4.3 Spatial Structure: Compromise of Urban Hierarchy

Urban hierarchy is a ranking of settlements according to their size and functions, along with the distribution of cities and towns shape the spatial structure. The region of Liupanshui is not a traditional agriculture land, and cultivating urban hierarchy means to explore new towns all the time. Decisions made by plans directly guide the distribution of population within the administrative area due to the following investment on industries and infrastructures. As reviewed before, both 1997 and 2006 master plans rely on pre-procedure of transportation, but different in the thinking of polarized and balanced development. 1997 master plan proposed clearly to concentrate 72 percent of counties to the main transport corridors. The summarized spatial structure of "Two principal axes and one secondary axis of development" was inherited in the 2006 version. Figure 12 shows the evolvement of the distribution of central cities and towns in three versions of master plans.

Industrial park refers to a certain region designed to obtain scale effect within or outside a town. Industrial parks play important roles in providing job opportunities in current China. As to Liupanshui as shown in figure 13, the existing ones are symbolized in red circle, and all the projected parks are willing to load coal chemistry industries. Many of these parks were not built in central towns under the guidance of the master plan, since many of them were decided by external forces including senior government and private investors. The implement of industrial parks show the complicated situation in considering the urban system.

Both plans divided towns into 4 categories within the administrative area, including the center or the core city, the sub-centers, central towns and other towns as shown in table 4. The core city and the two sub-centers were confirmed in the 1983 master plan and were sustained in the following plans. However, the central towns are changeable over years both in size and location. 1997 master plan chose towns close to the central cities to form urban clusters, while 2006 master plan picked new growing point in the low population density area to balance the spatial layout. The reality is that the distribution of wealth of counties is very close to the map of population density. Despite of the general development along the axes, the time distance subjected to terrain prevented the interactions between the core city and sub-centers. The distribution of population growth as shown in figure 10 also proves the not well performances of the chosen central towns. The aggregation trend to core city is keeping and satellite towns as well as central towns in hinterland did not fulfill the expected scale and



function. The figure implies that Pan is more economically active comparing with Liuzhi, the earliest mining community being replaced by Pan in Liupanshui.

The 1997 and 2006 master plan underestimated the outflow trends in the region, and made prediction of rising population according to the historical statistics. Urbanization rate would reach 42 percent or 1.0 percent annually from 1997 to 2020 as proposed in 1997 master plan. As planned in 2006, the urbanization rate would reach 48.5 percent in 2020. The over-sized population combined with the high rate of urbanization led to overestimated urban residents especially those allocated to counties. The plans revised themselves into larger cities along with smaller central towns based on existed conditions, which can be considered as a compromise of the theoretical urban hierarchy.



Figure 12: Distribution of designated central cities and towns in 1983, 1997 and 2006 master plan (resource: LPS municipal government D, edit and drawn by author) Figure 13: Distribution of projected and current industrial parks classified by industrial type in 2011 (resource: LPS municipal government, edit and drawn by author)

(unit. thousand persons) (LPS municipal government, edit by author)								
		2000		2020		2020		
categories	city/town	(1983 version)		(1997 version)		(2006 version)		
		number	population	number	population	number	population	
1 st	The core city	1	240	1	450	1	800+100	
2 nd	Hongguo	1	80	1	200-300	1	350	
	Pingzhai	1	80	1	200-300	1	200	
	Yangjiazhai	1	80					
3 rd				3	50-100	11	10-100	
				9	20-50			
4th				28	4-20	28	<10	
	total		740	43	1470	42	1700	

 Table4: Comparison of urban hierarchy in scale between 1983, 1997 and 2006 master plan (unit: thousand persons) (LPS municipal government, edit by author)



5. Conclusion

Demographic changes in Liupanshui are featured by concurring outflow in the region as well as the polarized urban aggregation, and the migration trends are expanding. The dominant out-migration contributes rather small part to the local urbanization. Advantages shaped by government are currently weakened by market, and planning practices need to adapt to the change. To enhance the activity of city and to reduce the rural-urban gap are confronting challenges to sustainable development. From past experiences, planning intervention as a method guiding the population growth as well as the relocation of residents is still effective. In the case of Liupanshui, an implanted city surrounded by extreme poverty in segregation, it is necessary to examine the principles and methods taken according to the specific characters. As to the investment on transportation, the bidirectional effects are worth attention: migration in region with convenient access to transport networks is intensified both on inflow and outflow. Under the background of seeking more balanced development of the country, planning practices in backward area should endeavor to improve the city within the region.

Endnotes

1. Four economic regions refer to eastern, middle, western and northeastern provinces divided by geography. Many indications are summarized by these divisions, and Guizhou is among the 12 provinces in west region.

2. "Third-front city policies" focuses on the defense industry and heavy industry carried out in large-scale industrial constructions from 1964 to 1978 in mid-west China.

3. Radiant intensities were calculated by urban production multiplying urban population. Data resources are from statistical year books, and the map was made with ArcGIS by author.

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