

Transition strategies for sustainable development of Resource-based cities

A case study of Yumen city

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Abstract: There are hundreds of resource-based cities in China. They are built or experienced rapid development during the Chinese planned economy period and had their glorious past. However, they face serious environmental, economic and social problems when mineral resources in these cities are exhausted after decades of exploitation. Sustainable development of resource-based cities is a hot topic in the recent fifteen years in China. Scholars did a great deal of studies on sustainable development of resource-based cities from the economic transition, social development and environmental protection aspects. Many resource-based cities in China have experienced decades of transition. This paper analyses the current situation of resource-based cities in China and takes Yumen city as a case study to propose strategies for the transition of resource-based cities based on sustainable development theory. This study is also of significance to the transition of other resource-based cities in China and other oil cities in the world.

Introduction

Resource-based cities are a special type of cities which exist widely in the whole world. Their development is highly relevant to the exploitation of the natural resources. Research about resource-based cities started from 1920s in western developed countries. The earliest research is from Arousseau (1921)

who illustrated that “mining towns” have “communication” function when he studied population distribution in different urban groups. Later studies about resource-based cities can be summarized in the following four aspects: 1) the social and population changes in resource-based cities, 2) the life cycle development of resource-based cities, 3) the relationship of resource-based cities with other cities, 4) the policies and transformation of resource-based cities. Marsh (1988) stated that one to two thirds of the population in resource-based cities have a strong sense of belongings to the resource-based cities; he (1988) concluded that the residents in resource-based cities enjoy the life there. Bradbury (1983) described that resource-based cities have six stages, “youth”, “adolescence”, “transition”, “maturity”, “winding down” and “closure”. He (1983) illustrated that most of the wealth created by small “mining towns” was taken away by those industry cities these mining towns serve. Bradbury (1988) also points out that the transition of resource-based cities could be carried out by making policies, for example, to build an early warning system for the exhaustion of resource, to develop strategies for the relocation of the mining companies and residents, to create employment training programs, and to develop special social aids system to help the towns’ transition and the people who are living in the towns.

From 1950s, researchers in China also did a lot of studies about resource-based cities. The study about Chinese resource-based cities experienced three stages (Li, 1978; Zhou, 1988; Fan, 1993; Liu & Luo, 2006; Wang, 2010): 1) from 1940s to 1970s, the research was focusing on the distribution and regional function analysis of resource-based cities; 2) from 1970s to 1990s, the industry structure and economic problems were the research focus; 3) since late 1990s, Chinese scholars turned to study the transformation and sustainable development of resource-based cities. However, sustainable development of resource-based cities is still a worldwide challenge. China has hundreds of resource-based cities; most of these cities are facing resource exhaustion and transformation (Li, 2013). Sustainable development is the goal for resource-based cities in China (Wang, 2010; Yan, 2011); one of the essential factors that is highly relevant to the success of the transition of resource-based cities is the sustainable development transition strategies.

Background

Definition of resource-based cities

Resource-based cities are those cities whose main industry is based on their natural resources (Li et al., 2013; The State Council of China, 2013), such as Dortmund and Essen in Germany, Bad Bleiberg and Brixlegg in Austria, and Fuxin and Yumen in China. Due to the high relevance of resource-based cities and the mining activities, resource-based cities in literature are also named “mine towns” (Lucas 1971), “resource mining communities” (Gunder, 1981), “resource dependent regions” (Tonts, 2010), “resource cities” (Long et al., 2013), etc. Resource-based cities are products of the industrial revolution. They existed and developed earlier in Western developed countries, and much later in developing countries (Yang, 2010). Wang (1999) defines a city as a resource-based city when there are more than 40% of a city’s population working in the industry which is directly or indirectly relevant to resource mining. Zhao & Yu (1999) define the cities whose output of mining industry takes up more than 50% of their total industry output as resource-based cities. In addition, development of resource-based cities has three stages: developing stage, developed stage and transition stage (figure 1). In the developed stage,

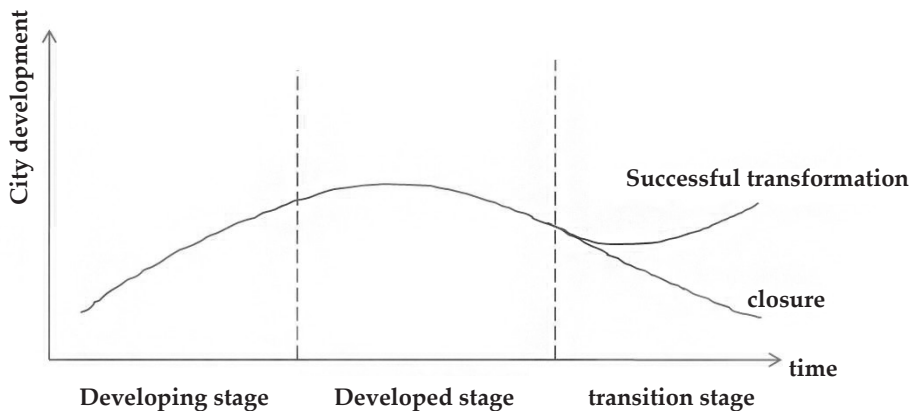


Fig. 1: Development stages and paths of RBC (Developed from Landis, 1934; Lucas, 1971; Bradbury, 1983; Bradbury, 1988 and Halseth and Sullivan, 2002).

resource-based cities have high economic performance but weak urban functional performance with high environmental pollution and ecologic damage. When the resources are exhausted, resource-based cities have bad economic performance and weak urban functional performance with bad environmental problems and social problems (Zhou & Long, 2001).

General situation of resource-based cities in China

There are 262 resource-based cities in China; these resource-based cities can be divided into four types based on the development stages: growth-type, maturation-type, recession-type and regeneration-type. Resource-based cities had huge contributions to the economic development of China in the past; they produced billions of tons of raw coal, crude oil, iron ore and billions of cubic meters of timber for China since 1949 (The State Council of China, 2013). After decades of exploitation, more and more resource-based cities face resource exhaustion. Until the year 2011, 67 resource-based cities were defined to be in their recession stage because they had more than 70% of their resource reserves exploited. The Chinese government has set up special aid funds for the transformation of these resource-exhausted cities. However, the transformation of these cities is not all optimistic: there are still serious social, environmental and economic problems in these cities.

Sustainable development of resource-based cities in China

Resource-based cities in China have challenges in terms of sustainable development

Chinese resource-based cities are characterized by high quantity, wide distribution, outstanding status and huge historical contribution (The State Council of China, 2013; Li, Long, & Chen, 2013). One third of the national important projects were allocated to resource-based cities from 1949 on; these projects took up nearly half of the total national investment. However, after decades of development, resource-based cities are facing severe challenges for realizing sustainable development because of the unbalanced global political and economic environment, and the incompatible and unbalanced domestic

economy development. Currently, the historical problems of resource-based cities are still not solved and resource-based cities are still lacking endogenous dynamic for economic development. In these resource-based cities in China, 70 million square meters of slums need transformation, 140 thousand hectares subsidence area need to be repaired, more than 60 thousand of miners are unemployed, and more than 1.8 million people are living at a minimum living standard. Moreover, the mining industry output in most of these resource-based cities accounts for over 20 percent of their secondary industry output, while the modern manufacturing industry and high technology industry are just in a start-up phase. In the long term, resource-based cities have little ability to attract manpower and capital when compared to other cities in China, and they are also not good at innovation to develop new industries (The State Council of China, 2013; Yu et al., 2011). Particularly, resource-based cities suffer more from the economic problems which mainly come from the Chinese planned economy period. They have weak performance in scientific research and education, which results in low innovation ability for the future development. They also have bad urban transportation and communication systems, and bad environmental performance, which leads to unsatisfactory living conditions for the residents there (Zhang et al., 2009; Li et al., 2013). In summary, resource-based cities in China still have a long way to go for a sustainable development future.

Resource-based cities in China are experiencing transition to sustainable development

Transition of resource-based cities is a long process: those successfully transformed resource-based cities all experienced decades of continuous changes in all the aspects of sustainable development (Yang, 2010; Liu, Zhou, & Yao, 2011). The transition of resource-based cities receives attention from the central government since the 20th century: there are more than thirteen policies which were announced by the State Council of China to support the transition of resource-based cities. Many resource-based cities are in the transition process for more than ten years. They achieved improvements in terms of the four dimensions, social sustainability, economic sustainability, environmental sustainability and institution sustainability, of sustainable development.

Some of these resource-based cities realized to get rid of their resource-based industries and transformed to a comprehensive city with good competence abilities (Yu et al., 2011; Sun, 2014). However, most of these cities still have their problems: the transition results are still not optimistic. Many cities cannot get rid of their dependence on natural resource-relevant industries or have not found new opportunities for sustainable development in the future (Sun, 2014).

Core issues of sustainable development of resource-based cities in China

Sustainable development contains four dimensions (see figure 2). All these four dimensions are essential for resource-based cities' sustainable development; they are inter-dependent, inter-influenced and should be given equal attention to ensure a sustainable outcome (Rogers et al., 2008). The four dimensions of sustainable development are also the four crucial factors of a resource-based city. A sustainable resource-based city is a comprehensive system with better economy, better life, better society and better environment. Therefore, all the four dimensions of sustainable development are equal important in the transition strategies and creating endogenous power for the city is the key for developing the four dimensions.

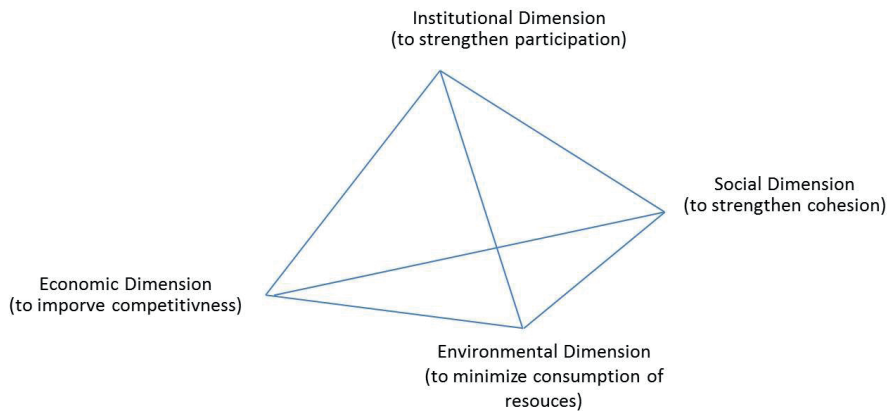


Fig. 2: Prism of sustainability model (Source: Janschitz and Zimmermann, 2010)

Transition Strategies – a case study of Yumen city, China

Issues of Yumen city

Yumen City is a county-level city between two important cities, Urumqi (capital city of Xinjiang Province) and Lanzhou (capital city of Gansu Province), located in Gansu Province in the northwest of China. It has two train stations (one of the two is an express-train station) and it is close to several high way entrances and airports. Yumen is well known for its oil production; the main industry of Yumen City was oil drilling and oil refining, which highly depends on the oil. Yumen city was built as an oil base in 1955 and became a prefectural-level city three years later. In the year 1961, it was announced a county-level city by Chinese central government, governed by Jiuquan City. After decades of exploitation, Yumen city reached its depleting stage in the 1990s because of the exhaustion of the oil reserves. In the year 2001, almost the whole 50,000 employees of the oil company moved out of Yumen city with their family members to the neighbor city Jiuquan. In the year 2003, Yumen city government center also moved to a new area, which is 77km away from the old community. Most of the citizens moved their home to the new area, while less than 10,000 people were still living and working in the old community and this number is reducing year by year. In 2009, Yumen city was highlighted as one of the 68 resource-exhausted cities in China. This helped it to get some special financial supports from the Chinese central government and since then Yumen city also gets more attention from the public and media. Based on three points, sustainable development theory, resource-based cities situation in China and the current situation of Yumen city, strategies from five aspects for the sustainable transition of Yumen city are proposed as follows.

Strategies for industry transition: from single industry to multi-industry, from unsustainable industry to sustainable industry

Since the year 2002, Yumen city successfully developed wind power station facilities, machinery manufacturing industry, building materials production industry, chemical fertilizer production industry and agricultural industry, instead of totally depending on its oil industry. Yumen city is developing its electric power industry by making use of the wind power, solar energy, and

water energy; electric power industry is now the new main industry in Yumen city. Yumen city also makes use of its big amount of useful industrial land and unemployed population from the oil industry to develop the manufacturing industry. Besides, Yumen city has built three industrial zones with good preferential policies in land use, electric power and tax rates. Based on these new development opportunities, Yumen city has successfully attracted a big amount of investment. In summary, new environmentally friendly industries should be developed earlier prior to the resource-exhausted stage (the earlier the better), a multi-direction industry strategy is considered a core requirement for the sustainable development of resource-based cities, and the industry development strategy should be based on the local advantages.

Strategies for a long-term development: emphasizing research and education in transition

Those successful transition cases of resource-based cities proved that, from a long-term perspective, strong endogenous development capacity is essential for the transition of resource-based cities. Yumen, as the first oil base of China, brought forth numerous of oil experts, researchers, managers and industrial workers. However, Yumen city currently does not have good research capacity and high educational development level. The policies which courage the research in high-tech industries (for example, circular economy technologies, pollution remediation techniques, energy efficiency technologies, etc.) can be helpful. The improvement of technology will not only bring creative ability to Yumen city, but also help the current oil industry, which is suffering from resource-exhaustion, production difficulties and high cost of exploitation. Besides, the input in education should also be increased. A better education system helps Yumen city to improve its labor capital and brings more opportunities to the citizens.

Strategies for the environment: environmental modification

After decades of mining, the old community of Yumen has serious environmental problems: the average daily TSP in the old community is up to 0.85 mg per cubic meters, which is 1.8 times higher than the national secondary standard, the ecological vegetation in the oil mining area is widely destroyed,

and the crude oil contamination and the oil industry waste water polluted the water sources and soil in the surrounding villages and towns. The relocation of the city center and the oil company family district gives the residents a better living environment, but it did not solve all the pollution problems. In the old city, the environmental modification is still one of the most important environmental issues. In the new city, the green space construction, the sewage treatment, the solid waste treatment, and the medical and hazardous waste treatment should strictly follow the national standards. Therefore, the oil company and local government should work together to process the environmental modification programs. The new coming company should strictly follow the national emission standards and the investment projects in the industry zones should be environmentally friendly.

Strategies for urban comprehensive development: sustainable city building

It is a common problem in almost all the resource-based cities that the city development lags the industry development. The old Yumen city has a chaotic city environment: it has a mixed land use of industrial land, commercial land and residential land, and it has less green public space and less public services. The relocation of Yumen city and the oil company's family district gives Yumen city a chance to build a nice living environment for the citizens. The construction of the new city should strictly follow a sustainable city standard. This means that the new city should provide the citizens good transport service, good communication service to link people to health, work and other services, environmentally friendly living places, a well-run government management system, equal opportunity for all the citizens, high quality buildings for living, development opportunities for local cultural and community activities, and a creative and vibrant local economic development environment (Bell & Morse, 2008).

Strategies for transition management: propose to set an authoritative sector for the transition

Because the oil company in Yumen city is still a state-owned company and it is managed directly by the Chinese government, the transition of Yumen city cannot be carried out efficiently without the authority from the central government. A special department with enough authority from the central

government could help to solve the potential conflict of interest between the local government and the oil company, and protect the transition fund from inefficient and improper use.

Discussion and Conclusion

The transition of resource-based cities is a long-time process. It needs several generations' constant contribution and continuous work on the transition strategies and it also needs different interest groups to work together. Proposing sustainable transition strategies is one of the most important steps for the sustainable transition of resource-based cities. It is a comprehensive and complex work. The strategies mentioned in this paper are also of significance to the transition of other resource-based cities but the different backgrounds and local situations also need to be considered. Besides, the sustainable transition policies based on the strategies are also important for the realization of the transition.

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