PRC: Green Transformation Guide for Resource Based Regions of Shanxi Province

Summary

November 2017

Asian Development Bank

1. Executive summary

Mott MacDonald was commissioned by the Asian Development Bank to undertake TA 8962-PRC: Study on Green Transformation Guide for Resource Based Regions of Shanxi Province.   The TA outcome will provide improved strategic planning for regionally balanced green transformation of resource-based regions in Shanxi Province.

Shanxi Province is a typical example of a resource-based economy that has developed on the basis of its natural resources. The overexploitation and over reliance on the development and utilisation of its resources, particularly coal, has not led to sustainable economic, social, or ecological development, despite initial benefits from resource development.   In December 2010 Shanxi Province was approved as a "national level comprehensive supplementary reform pilot site" and an economic transition was promoted in regards to industrial transformation; livelihood improvement; urban and rural development as well as ecological remediation.   The transition process has achieved some impressive results, although Shanxi's economy continues substantially to rely on coal.

In order to do the work in green transformation research in resource-based regions, the Shanxi Provincial Department of Eco-Environment applied for technical assistance from the Asian Development Bank. Mott MacDonald was commissioned by the Asian Development Bank to undertake TA 8962-PRC: Study on Green Transformation Guide for Resource Based Regions of Shanxi Province. The TA outcome will provide improved strategic planning for regionally balanced green transformation of resource-based regions in Shanxi Province.

Eventually forming four main outcomes of the project   Output 1 is a review and analysis of international and national experiences of resource-based regions' green transformation including key issues and constraints and documentation of some successful cases;   Output 2 provides an analysis of the socio-economic status of the typical resource based regions in Shanxi; Output 3 presents the methodologies and indicators for planning the green transformation of resource-based regions; Output 4 illustrates the two pilot studies for Liulin County and Xiaoyi City.

The final report has been divided into eleven sections, an introduction; physiographic conditions in Shanxi Province; analysis of social and economic development status; analysis of Shanxi's ecological environmental quality; climate change considerations during green transformation; international and national best practices; strategy, methodology and indicator system for the green transformation of the resource-based economy in Shanxi; and two pilot studies for Liulin County and Xiaoyi City.

2. Physiographic conditions of Shanxi Province

Shanxi Province is located in the middle of the Yellow River basin bordering Hebei, Inner Mongolia, Shaanxi and Henan provinces. The territorial area consists of a hilly plateau region with extensive loess coverage. The province is crossed by rivers internally, although hills and mountains make up more than 80% of the provincial area, with plains and valleys accounting for only 19.9%. The climate is a temperate continental monsoon climate with significant climatic differences between the north and south of the province and large temperature differences between winter and summer. Precipitation is low, and is unevenly distributed through the seasons and geographically.

Shanxi Province is extremely rich in mineral resources.   The available resource reserves in CBM, bauxite, refractory clay, laterite and potassium bearing rock top the national rankings. The identified available coal reserves have been calculated at 270.9 billion tons, representing about 25% of national reserves and ranking in second place.There are abundant plant resources and the travel resources in the province.

3. Analysis of social and economic development status

There are 11 prefecture level cities in Shanxi governing 119 counties, cities and districts, 1398 towns, townships and sub-districts; and 28,079 incorporated villages. In 2015，The permanent resident population of the province is 36.6 million.   Since 2000 the province has experienced a low birth and death rate, as is the case throughout China in general, resulting in an ageing population.

Although GDP has maintained rapid growth over the past 30 years, Shanxi's GDP has been declining year by year in the country. The proportion between heavy industry and light industry in the secondary industry is extremely uneven.While Shanxi has experienced urbanisation,thathas some interesting "city diseases" such as traffic jams, urban environmental deterioration, shortage of resources etc. Urbanisation also lacks industrial support, with the urbanisation speed exceeding available employment opportunities in urban areas and thus affecting social stability. . Shanxi is a water scarce province.   Water consumption per capita is only 44% of the national average. Over extraction of water from groundwater is a serious problem, and has also caused surface water resources to dwindle.

Shanxi Province is a key energy production province. Although the percentage of energy supplied by coal has fallen, it remains as high as 98.76%, and coal

consumption has continued to grow.   Industrial production dominates energy consumption. Although Shanxi has experienced a remarkable improvement in energy-saving and resource utilisation efficiency in recent years, social and economic growth is still characterised by high carbon emissions.

The coal industry is the most important economic pillar of Shanxi. After 2000 the economy started to turn around and Shanxi experienced a rapid growth in resource product prices, deepening its reliance on resource-based industries. As the economic development entered the "new normal" with low economic growth rate, Shanxi's economy also experienced a significant decline. The development of strategic emerging industries has become an important direction for Shanxi's economic transformation.

4. Analysis of ecological environmental quality

In recent years，Shanxi's ambient air quality has improved greatly, However, the concentration of many atmospheric pollutants exceeds the national average.Water environmental pollution remains severe, especially, downstream sections of rivers pollution is getting worse.   More than 30% of surface water is classified as worse than Grade V, 3.6 times the national average level.

Although Shanxi has achieved a remarkable improvement in energy saving and resource utilisation efficiency in recent years, its social and economic growth is still characterized by high carbon emissions due to its resource-based industrial structure and energy consumption pattern. There is an urgent need to strengthen natural ecological protection. Although forest coverage rate increasing year by year, it is still lower than the national average. There has been severe damage to the ecological environment in areas where mining activities have taken place, resulting in ground subsidence and land degradation or damage due to coal gangue or tailings.

Economic development is still in contradiction to environmental protection. Environmental quality is below people's expectation and structural pollution has become more prominent. Scientific and precise pollution control is at a low level and mechanisms and systems for ecological environmental management have to be improved. Therefore, provincial environmental protection is still facing severe challenges.

5. Climate change considerations

Climate change has been recognized by International Funding Institutions, and national and local governments as a specific challenge to sustainable development and economic growth, given the significant impacts and risks to humans, resources,

environment, infrastructure, and society as a whole. The unique geographical location and landscape of Shanxi suggests complex climate change scenarios. In the past 50 years, the annual average temperature in Shanxi has risen whereas precipitation has decreased. The frequency and duration of extreme hot or cold weather has been increasing.   Regional climate change forecasts in Shanxi to the year 2100 suggest that both annual mean temperature and precipitation will increase.

Under the background of international climate change, combined with the on-site inspection of Xiaoyi and Liulin pilot cities, it is proposed that the priority indicators for mitigation and adaptation to climate change in Shanxi's green transformation are carbon emission intensity, renewable energy, coal consumption efficiency, and access to modern energy, carbon capture, utilization and storage (CCUS) and other indicators.

6. International best practices

Through investigation and study of industrial transformation cases in different regions of the world, the analysis and summary of local policy, tax solutions, market mechanisms, power generation, pollution control, government officials training, coal substitution, agglomeration theory and new industry incentives, environmental and ecological restoration Solutions to key issues such as practice. Summarize the good practices of successful cases of green transformation. With regard to climate change, it is proposed to strengthen carbon price indicators, improve energy efficiency through energy price reforms, improve environmental standards, strengthen law enforcement, provide appropriate support for investment in renewable energy, and formulate policies that are conducive to private enterprises investing in low-carbon fields. Promote policy recommendations such as green production and green consumption.

7. National best practices

There are many resource-based cities in China. In recent years, the rise in the number of resource-exhausted cities has led China to explore a more sustainable development path, and some achievements have been made. This section analyses a series of regional and structural issues faced by resource-based cities, such as simple industrial structure, ecological deterioration, lagging infrastructure construction and prominent social conflicts. It systematically summarizes policies and measures unveiled by the central government to promote the transformation of resource-based cities and analyses the government's role in the transformation of

resource-exhausted cities. Seven different resource-exhausted cities, namely Jiaozuo City in Henan Province, Fuxin City in Liaoning Province, Baiyin City in Gansu Province, Panzhihua City in Sichuan Province, Datong City in Shanxi Province, Liaoyuan City in Jilin Province and Daqing City in Heilongjiang Province were selected as examples for analysis in terms of transformation background, course and results. Practical experience of transformation and development in these cities is summarized to provide inspiration for transformation and development in other resource-based cities. As observed from the existing transformation practices, resource-based regions face many conflicts and issues including over-dependence on resources, short industrial chains and severe ecological pollution. It is inevitable that resource-based regions should push forward green development, circular development and low-carbon development. It is important to take precautions, make plans in advance as well as to study and formulate strategies to guide the sustainable development of resource-based regions. Scientifically selecting the transformation path according to actual regional resource-based economic development is key to transformation of resource-based regions.

8. Strategy for green transformation of resource-based economy in Shanxi

Shanxi's economic development will be highly dependent on resource-based industries for a long time into the future.   However, with the continuous progress of industrialization and urbanization, the acceleration of industrial transfer in the eastern regions and central government's decision on deepening reform across the board, there is an important opportunity for Shanxi to realize balanced industrial development.

Shanxi was considering industrial restructuring as early as the 1980s and in the 1990s organised special plans, which, due to many reasons, failed to be implemented effectively.   Between 1999 and 2010 a series of measures were introduced to facilitate economic transition.   In 2010 the "national comprehensive supplementary reform pilot site for resource-based economic transformation" in Shanxi was established. Shanxi started a series of reforms centering on key fields and key links. In 2012, the Master Plan for National Comprehensive Supplementary Pilot Reform for Resource-based Economic Transformation in Shanxi was issued, which determined the milestone targets from 2013 to 2015 and from 2016 to 2020.

There are many opportunities and challenges for Shanxi's Green transformation. Generally Shanxi's transformation should be driven by the principle of green, recycling and low-carbon development, taking into account the economic and social

development strategy proposed under the 13th Five Year Plan. This includes adjusting and optimizing spatial arrangements, accelerating industrial transformation upgrading, promoting resource saving across the board and strengthening the natural ecological system and environmental protection.

9. Guide on Green Transformation Planning for Resource-Based Regions and Study on an Indicator System

Shanxi is one of the most typical resource-based regions in China, which is facing a series of conflicts and issues such as simple industrial structure, which is overly reliant on coal, an extensive development pattern, insufficient technical innovation, resource dependent growth path and severe ecological deterioration. This section analyses economic conditions and environmental status, industrial foundation and environmental pollution. For key development difficulties such as the simple industrial structure, extensive growth pattern, weak technological support and human capital as well as resource loss and ecological damage, the basic characteristics of traditional development patterns in resource-based regions, and green transformation is discussed. An assessment indicator system comprising 19 indicators is proposed to cover economic transformation, livelihood improvement, resource saving and environmental protection. The indicator system has been developed on the basis of international indicator systems for sustainable development and green development and national indicator systems for ecological demonstration area construction and economic and social development assessment, taking into account the inherent requirements and essential attributes of green transformation development. This indicator system will allow assessment of green transformation progress in resource-based regions in Shanxi in a relatively scientific and objective way, specifying the goal of green transformation and developing technical methodologies and guidelines, thus providing technical assurance for green transformation planning in resource-based regions in Shanxi.

Assessment Indicator System for Green Transformation Progress

Economic transformation	Livelihood improvement	Resource saving	Environmental protection
• GDP growth rate	• Number of unemployed persons	• Percentage reduction in energy consumption	• Forest coverage rate
• Proportion of			• Per capita public green

Economic transformation	Livelihood improvement	Resource saving	Environmental protection
industrial added value of extractive sector • Proportion of strategic emerging industrial output value to GDP • Proportion of Added value of service industry to GDP • Tourism added value • Organic, green and pollution-free cultivated area	who join re-employment training • Proportion of livelihood expenditure to general public budgeted expenditure • Proportion of the poor • Proportion of extractive sector employment to total employment	per unit of GDP • Percentage reduction in fresh water consumption per unit of industrial added value • Proportion of non-fossil energy to primary energy consumption • Utilization rate of staple industrial solid wastes	area • Rate of ecological rehabilitation and control of mines • Percentage of days with good air quality • Percentage of water body with Class V surface water quality

10. Development Plan for Green Transformation in Xiaoyi City

This section provides details of the pilot study in Xiaoyi City. Xiaoyi is a region in Shanxi Province that began to abandon a resource-dependent development pattern and explore economic transformation early. Over the years, it has gradually developed an industrial system based on coal resources and supported by diversified development, leading the economic transformation development in resource-based counties in Shanxi Province. However, Xiaoyi still faces social, economic, and environmental issues, for example, an unbalanced industrial structure, severe environmental pollution and insufficient innovative ability, representing a microcosm of Shanxi's dilemma between resource-based economic transformation and environmental protection. To deepen the green transformation development in Xiaoyi, based on the assessment indicator system for green development, this section analyses the green transformation development level and short comings, and puts forward five tasks aimed at green transformation: i) further encouraging local governments to integrate their various types of urban plans into a single master plan and adhering to the red line of ecological protection so as to promote the construction of a liveable city; ii) accelerating the establishment of featured agriculture and agricultural product processing systems relying on Shanxi, fostering strategic emerging industries, so as to accelerate traditional industry upgrading and

develop modern service industries; iii) strengthening infrastructure construction such as transportation, water supply and drainage, gas supply and heat supply facilities so as to enhance urban-rural service functions and carrying capacity; iv) comprehensively promoting urban air quality improvement, implementing river basin ecological rehabilitation and mining subsidence area control and relocation; and v) promoting green consumption consciousness to foster the idea of green development.

11. Development Plan for Green Transformation in Liulin County

This section provides details of the pilot study in Liulin County. With abundant coal resources, Liulin County has experienced rapid development of its coal industry since 2002, which has stimulated the rapid growth of its economy. The coal industry as a proportion of total industries in the county is over 80%, indicative of a typical county-level resource-driven economy in Shanxi Province. Coal resources are the reason for its prosperity and problems. During development, Liulin faced increasingly prominent deep-seated problems and conflicts such as a simple industrial structure, environmental deterioration, and severe ecological damage. Following the requirements for green transformation, using the assessment indicator system for resource-based green transformation comprising four aspects, namely economic transformation, livelihood improvement, resource saving and environmental protection, this section analyses major constraints on the implementation of green development in Liulin and on this basis puts forward five major tasks: i) optimizing spatial development framework to form an urban development strategic layout centered on one core – the urban area and four points, with industrial parks being the vehicle for industrial spatial layout; ii) developing featured agriculture such as walnut and red dates to drive agricultural industrialization, strongly developing new industries such as new aluminium-derived industries, coalbed gas exploitation, new energy and electronic information technology to promote transformation and upgrading of traditional industries such as coal, power, chemical engineering and building materials, and accelerate featured tourism and modern logistics development; iii) strengthening environmental access polices with the implementation of air, water and soil pollution control and mining subsidence area control so as to accelerate the improvement of ecological quality; iv) promoting infrastructure construction such as transportation, water supply and drainage, gas supply and heat supply facilities to comprehensively enhance service functions and carrying capacity of the county; and v) facilitating the change into green production and living.