

AUTHOR ACCEPTED MANUSCRIPT

FINAL PUBLICATION INFORMATION

The Roadmap for Green Development of Western China

The definitive version of the text was subsequently published in

Chinese Journal of Population Resources and Environment, 11(3), 2013-10-01

Published by Taylor and Francis

**THE FINAL PUBLISHED VERSION OF THIS ARTICLE
IS AVAILABLE ON THE PUBLISHER'S PLATFORM**

This Author Accepted Manuscript is copyrighted by the World Bank and published by Taylor and Francis. It is posted here by agreement between them. Changes resulting from the publishing process—such as editing, corrections, structural formatting, and other quality control mechanisms—may not be reflected in this version of the text.

You may download, copy, and distribute this Author Accepted Manuscript for noncommercial purposes. Your license is limited by the following restrictions:

- (1) You may use this Author Accepted Manuscript for noncommercial purposes only under a CC BY-NC-ND 3.0 Unported license <http://creativecommons.org/licenses/by-nc-nd/3.0/>.
- (2) The integrity of the work and identification of the author, copyright owner, and publisher must be preserved in any copy.
- (3) You must attribute this Author Accepted Manuscript in the following format: This is an Author Accepted Manuscript of an Article by Kruk, Robyn; Thompson, Derek; Liu, Jiyuan; Deng, Xiangzheng; Wang, Peishen *The Roadmap for Green Development of Western China* © World Bank, published in the Chinese Journal of Population Resources and Environment 11(3) 2013-10-01 <http://creativecommons.org/licenses/by-nc-nd/3.0/>

The Roadmap for Green Development of Western China

Kruk Robyn^a, Thompson Derek^b, Jiyuan Liu^c, Xiangzheng Deng^{c,d*}, Peishen Wang^e

^aNational Mental Health Commission, Sydney NSW 2000, Australia;

^bRoyal Road University Canada, Victoria, BC, V9B5Y2, Australia;

^cInstitute of Geographic Science and Natural Resource Research, CAS, Beijing 100101, China;

^dCenter for Chinese Agricultural Policy, CAS, Beijing 100101;

^eWorld Bank, Washington, D.C. 20433, U.S.A.

Received 6 June 2013; accepted 27 July 2013

*Corresponding author. Email: dengxz.ccap@igsnrr.ac.cn

Abstract: China has made some remarkable achievements in sustainable development, but the constant deterioration of the overall trend of the environment has not yet been effectively curbed. To achieve the goal of sustainable development, we must first ensure coordination and coherence of national development goals in different areas and adhere to green development road. To achieve objectives related to the green development, and clarify the direction of green development in the next 20 years, a roadmap is needed to guide and coordinate the process. This paper described the concept of green development roadmap, came up with green development roadmap for the western region and further elaborated it. The roadmap clarified the objectives and guiding principles of the green development in the western region, pointed out the areas which deserve more concern and institutional innovation, and build a green development monitoring and evaluation (M & E) framework. Finally, the paper gave corresponding policy recommendations based on the established roadmap.

Key words: green development, roadmap, the western region

Currently green development is China's important issue and objective to implement and achieve sustainable development, which is more needed by western region where ecological environment is fragile and the economy is relatively backward. The economy, environment and human capital of the western region and the challenges it is facing are crucial to the success of the country's sustainable development. There are also great opportunities in determining the future way of the development in the western region. The central government clearly holds the major levers for change through the manner in which it invests its capital, targets its support for industry and innovation, sets its rules for natural resource planning and land use, and through the priorities and means it delivers programs to address social and human capital inequities. China needs to have a green growth trajectory built on the strong policy in the 12th Five Year Plan Period. If Western China fails to achieve such a green growth trajectory, China will pay the costs in the economic, environmental and societal spheres. A green development roadmap is greatly needed for Western China to lead green development. On this account, the paper investigated the research progress of theories and methods of green development at home and abroad, and combining the situation of development in western region, designed and analyzed the green development roadmap of Western China, in the hope that the strategy of green development can be implemented in Western China.

1 Macro background of green development

1.1 The inevitable choice of China's social and economic development

The core challenge of 21st century socio-economic development is how to achieve human development, while maintaining the core function of the ecosystem out of destruction. In the process of development in the past few decades, China has achieved remarkable economic development and progress, which is the first step toward real prosperity of society, but the fruits of economic development are at the expense of environment and expansion of the gap between the rich and the poor. To transform economic growth mode (Wen, 2010), converting development from the traditional “black” to “green” (CCICED, 2011), from ecological exploitation to ecological construction, and from ecological deficit to ecological surplus is crucial for China’s sustainable development.

Although China has invested large amounts of capital for the remediation of the ecological environment, and made certain achievements in the conservation of ecosystem services, there are still some areas where continuous deterioration has not been fundamentally curbed. The effective implementation of the regional green development strategy in the individual regions (especially the relatively fragile ecological environment in the western region) and the close integration of the regional development objectives cannot be delayed.

1.2 Challenges of green development

Since the beginning of the 21st century, China has been committed to promoting the Scientific Outlook on Development under “the guidance of economic and social development”. How to coordinate the relationship between socio-economic development and protection of the natural environment is one of the most important challenges in the process of China's rapid economic growth. Sustainable, green, low-carbon economy is the trend of world economic future development, and is the inevitable strategic choice in pursuit of “efficient, sustainable, equitable” social development (Dai, 2009) as well. And the 12th Five Year Plan which has just been introduced by China fully reflects it (He, 2011).

Under the current economic slowdown, China is still faced with new challenges of a series of green transformation and urged to achieve balanced development with economic reconstruction, and implement technological and institutional innovation in particular. To achieve the goal of a balanced development is to realize socio-economic development mode transformation from traditionally pure pursuit of economic growth mode to the equal growth mode of enhancing the natural, human, social and economic capital. Adjustment of economic structure should be aimed at achieving the transformation from investment-driven economic growth of the primary and secondary industries to a service-based economic growth mode, and should actively expand domestic demand and enhance the level of modernization of key industries’ economic growth pattern. The goal of implementing scientific and technological innovation is to enhance the capacity of scientific and technological innovation, the key is the building of human capital and investment in "research and development" (R&D). Implementation of institutional innovation goal is to achieve economic development of institutional mechanisms transformation from reliance mainly on the government's financial regulation and enforcement by administrative means to regulatory market mechanism-based, supplemented by government coordination mechanisms. China is vast with regional differentiation, which makes China's green transformation difficult to be generalized, each regional characteristic of the green transformation is vital for China. To achieve this goal, it is necessary to establish a strong government

top-level leadership and a management of multi-level coordination mechanism so as to have a clear division of responsibilities at regional level, guarantee the policy enforcement, and call for a wide range of social participation.

1.3 Green development for area

Achieving socio-economic development integrated with protection of the natural environment is one of the most important issues of the 21st century, and also the common challenges of the developed and developing countries, especially in fast-growing emerging economies such as China. Therefore, as a new development path, green and low-carbon economy has become the strategic choice of China to seek efficient, sustainable and equitable development mode. This policy initiative as well as a series of specific measures has been clearly stipulated in China's 12th Five Year Plan which provides direction for the implementation of China's green development strategy.

To support the green transformation at the national level, the key is to implement a fundamental change in the regional level development mode. In addition to the strong leadership of the high-level decision-making, multi-level co-ordination and clear duties and responsibilities of the regional level are required to improve institutional and implementation capacity, improve the effect of implementing policy and promote the green transformation of China.

Regional green development is based on the theory of environmental protection and scientific development and green ecology, in the process of regional development, with green development as a core and environmental protection, green ecology, recycling and low-carbon as the main line, and the inclusive growth between human and nature as a mode to achieve that the human development be in harmony with nature as well as a reasonable and effective allocation of resources within the region and an environment-friendly and green eco-type regional development pattern be formed.

Implementation of regional green development needs to be treated differently, that is to say taking various factors into account according to local conditions. What's more, it is necessary to identify green development driving factors and opportunities under certain conditions. In other words, "the green mode shift" in the national and regional policies implies the demand to develop diversified strategies.

2 Green Development Roadmap

2.1 Basic understanding

Green development roadmap is a specific guideline to achieve the green development goal, which integrates all activities related to green development, asks for a clear focus and direction in these activities, and integrates the government's development goals of the 12th Five Year Plan as well as the concept of green development framework into a unified green development strategy. Green development roadmap should include four aspects of objectives, principles, supporting mechanisms, and M & E framework. The goal is to clarify the overall direction of the green development. The principle is to direct the regional green development process. It improves the M & E framework, achieves the green development process of monitoring, evaluation and tracking, and provides the basis for the adjustment of regional green development strategy.

Green development roadmap is not a collection of constant policy measures, as other roadmaps. It provides a framework to review and evaluate existing policies, planning and control measures, and assists in the development and implementation of further policy action. Government puts green development into national long-term strategic planning and implementation mechanisms to facilitate its achievement. Although the state gave a lot of tilt in the allocation of financial and other resources towards the green development of the western region, which played a certain role in promoting green development of the western region, but the overall effect is not obvious (Zhang et al., 2012). China's green growth requires the strategic transformation of the approach to environmental management.

First, the Five Year Plan lacks a long-term and integrated design for green development path. The Five Year Plan is an important part of the green development strategy in the western region, but the Five Year Plan alone is not enough to achieve green development of the western region and the country. A valid green development plan should include long-term strategic arrangements, the correct guiding principles, as well as the coordination mechanism to promote efficient and pragmatic government officials to resolve the conflicts and contradictions in the current development mode with green development requirements. China's green growth strategic goal is to achieve a balanced, coordinated and sustainable development of the whole society. The realization of this goal can't be separated from sustained, reasonable financial support, at the central and provincial levels to build a sustainable and mutually coordinated green financing option. The green development of the western region will face enormous challenges in the current policies and implementation mechanisms, which is even harder to achieve.

Second, the planning goal setting may require a more comprehensive consideration of all aspects, and should develop a clear priority sequence. The 12th Five Year Plan and especially the Second Five Year Plan of Western Development have covered most of the western region's green development goals, which is an important part of the integral green development strategy for the western region. In the past two years (2010-2011), combined with the development strategies and objectives set in the 12th Five Year Plan, the National Center for Complementary introduced a series of complement and support measures and promised to increase financial support for green development of the western region. Most of these policies and measures have been properly implemented, such as adaptation measures to climate change. However, these measures are not yet well combined with the concept of green development framework and goals of the western region's green development.

Third, we must strengthen coordination among various departments and reform of institutional mechanisms to promote green development and innovation. It is needed to reform institutional mechanisms to promote green development. A generally accepted view of the public believes that the lack of connection between the various departments (horizontal and vertical) and different projects is a major obstacle in the process of the western region's green development. Therefore institutional reform is imperative (Zhang et al., 2012). At present, most countries in the world have introduced a series of measures in order to more effectively address the problem of insufficient links between the various departments. Despite the different parts of the different solutions, the core is to reduce waste, improve efficiency and effect, and redefine the relationship between all levels of government. In a certain sense, in line with China's national conditions, intergovernmental coordination

mechanism with Chinese characteristics is essential for green development of the western region. In addition, the government should also further improve and strengthen the traditional laws, regulations and enforcement measures, and further explore the performance-based market mechanism.

At the same time, it is necessary to further improve the information system to enhance the transparency of the M & E framework. Currently, the biggest problem facing green development of the western region is the lack of accurate, reliable, and "easy to obtain" data to support all levels of governments in the decision-making process of green development. These data to monitor and evaluate regional changes in stocks are of great significance. There are various reasons for the missing of data, such as a huge amount of data missing caused by vast territory and regional differentiation, access difficulties, and high acquisition costs. The lack of relevant data exacerbates the difficulty of determining whether the current economic growth mode is reasonable or whether the green development demands can be met. International experience shows that the obtaining of a large amount of data about sustainable development is the premise to assess the regional renewable and non-renewable natural resources carrying capacity, the development of regional planning for sustainable development and the development of relevant policies.

2.2 Necessity

In the process of green development, the western region should be the focus, where road map should be initially implemented. In a certain sense, the main opportunities and challenges of China's green development are in the western region. The missing of regional green development roadmap sets the western region's fragile natural ecosystems and local culture at risk again. While the rich and diverse natural ecosystems and national culture protection is the most important content of the green development in Western China. The current approach of development in the western region is of high ecological and social risk. To reduce this risk and achieve regional development, the key lies in correctly handling regional differences, resolving historical issues and implementing new green economy growth mode. Different from other regions, all the challenges in China's green development are facing by the western region. More importantly, with increased dependence on natural resources of national economic development, the challenges faced by the western region in terms of the ecological environment in the process of China's socio-economic development will be further intensified (Ouyang, 2009).

In order to enhance the level of green development of the western region, the state has already put a lot of manpower, material and financial inputs to the western region and have also achieved some goals, but the regional environment and development issues has not been properly solved yet. This is partly due to the vast area of the western region and the complexity of the problem, but more importantly is due to the lack of coordinated measure of the roadmap. In addition, the implementation of many green development opportunities depends on the innovation of ways and means. If we continue adopting the original mode of development, these opportunities shall be missed.

3 Green development roadmap of the western region

Green development roadmap of the western region include the goals, principles, important areas of concern, governance mechanisms, and M & E framework of western region's green development (Table 1). It is worth mentioning that the roadmap is not intended as a replacement for the detailed work that the government of

China needs to pursue to undertake such a strategic planning approach.

Table 1 Green Development Roadmap for Western China

Goals & Objectives	Principles	Policy Focus	Governance Mechanism	M & E Framework
-Overall goal of green development --Indigenous capacity --Eco-friendly growth --Social inclusiveness -Objectives --Ecosystem protection & management --Mineral and energy management & pollution control --Poverty reduction & labor quality promotion --Sustainable urbanization --Industrial transformation --Economic growth & social equality	-Government leadership -Regional differentiation -Interdependence & coordination -Shared targets & accountability -Informed decisions -Long-term -Market and non-market signals and mechanisms combination	-Improved ecological protection & construction & wealth creation -Green energy and mineral exploitation & pollution control -Enabling & regulating new green industry -Enhanced green urban development -Improved institutions	-Government regulation --Plans --Legislation & regulation --Tax & fiscal transfers -Market adjustment -Carbon market -Emission market -Natural resource pricing reform -Legal system	-Environment assessment -Monitoring and evaluation matrix targeting at each policy focus area -Life-time monitoring mechanism charged by the third party -Public participation -Evaluation on the four 'capitals' --natural --economic --social --human

3.1 Green development objectives of the western region

Green development of the western region needs specific goals. The government should further refine the western region's "balanced, coordinated and sustainable development" goals, by setting more specific development goals to increase the operability of the green development strategy. To enhance the four 'capitals' (i.e. the Nature capital, Economic capital, Social capital and Human capital) that support green development in the western region, it should serve the fundamental goals of environmentally friendly, social inclusion and endogenous growth.

3.2 Guiding principles of the green development of the western region

Comprehensive multi-level government involvement is the premise of the green development of the western region, the green development of the western region needs to adhere to the principle with the government in the first place. In a sense, the green transformation of western region must put the government and strategic planning in the first place, and depend on governmental support at the national, provincial and local levels, at the same time, changing from the view of taking GDP as the most important (and even the first) path to the view of establishing new growth concept, a green development path. The leading role of government can be realized through the introduction of policy and regulatory measures, the development of appropriate regulatory frameworks, the release of price signals and the establishment of an incentive mechanism. To implement the responsibility system for local government, the rights and responsibilities of green development in western region should be appropriately delegated to departments of provincial and local government in the western region, and to relieve central government's the pressure of transformation. While the local governments are entitled the administrative and fiscal powers, they should shoulder on the corresponding responsibilities and obligations.

The implementation of the principle of regional differences, and pursuit of mutual coordination and cooperation and the clear and common goals and responsibilities of the green development of the western region are also very important. Western region's internal natural conditions and socio-economic development level are significantly different. In the development and introduction of national and local strategies and

measures for the western region's development, if we treat it as a whole and apply the same set of standards, the problems faced by the region will not be resolved properly, resulting in the failure of the green transformation of the region. Therefore, we must recognize that the lack of "one size fits all" policy in addressing the environment and development of the western region combined with the actual implementation of differentiated regional green development policies. In other words, the western region mutual green development requires the cooperation and coordination of the various regions. We must recognize the differences in the western region and clarify regional interdependence and mutual responsibility. It should be pointed out that the green development of the western region cannot be achieved by a single division. Coordination and cooperation between various departments is the premise of dealing with the contradiction between the environment and development in the region and addressing current problems. Trans-regional, sector and administrative planning is an important mean of cooperation rather than competition.

Fostering green development decision-making mechanism with the long-term goal, playing the complementary role of market mechanisms for policy monitoring and building a complete and trans-departments data information system to ensure the achievement of the green development of rational decision-making are very important. Green development is a long-term challenge that requires long-term adherence to the implementation of measures for sustainable development, and introduction of a minimum to 2030 Development Plan. Related decisions need to take the long-term goals and constraints of the current situation into account. In addition, the complementary roles of regulation and market regulation in promoting green reform should be clarified. In general, the market signals and mechanisms are helpful for the enhancement of the economic benefits in the regional development process, while the government regulatory means, such as administrative intervention are even more important in regional environmental conservation. We need to build an integrated data sharing system, ensure the authenticity, accuracy and completeness of resource and environmental data from various departments to facilitate the exchange of information. Data information system should be operated independently by the various departments and be open not only to government departments but also to the public in order to strengthen public supervision. In this way, we can ensure the rationality of the regional natural resource development and land-use behavior.

3.3 Principal areas of concern and institutional mechanisms

The western region should promote ecological protection and achieve real regional prosperity by strengthening investment in infrastructure, employment, engineering, and human capital. To alleviate poverty of the western region, we must first coordinate the relationship among infrastructure construction, the improvement of the education level and the creation of employment opportunities. Due to the fact that most of the poverty concentrated areas have a very fragile ecological environment, it is necessary to vigorously implement the ecological compensation and ecological construction projects, especially where natural resources and cultural tourism resources are very rich, with a huge development prospects. Long-term development plans are required to achieve a win-win situation of the environment and cultural resources.

The western region needs to promote industrial transformation based on regional assets to expand employment and prevent the extension of polluting industries. Western China has significant assets that can be capitalised on to create and expand employment and investment. Examples include eco-construction programs, tourism, agricultural product processing, and a service economy. At the same time the pollution from old "brown"

industry needs to be cleaned up while preventing the relocation of new “brown” industry in the region. Such initiatives will require extensive initiatives in coordination and re-prioritising, in particular central government funding programs. This includes (but is not limited to) new applications of infrastructure works, extension and local retention of resource taxes, incentive funding for innovation, and establishment of thresholds for waste emissions inside the restricted development zones.

The western region needs to promote sustainable urbanization as a new growth point of the regional economy, implementing a site-specific differentiation of urban development policies and build cities and towns with different sizes, types, structures and functions, strengthening urban infrastructure construction, and reducing the environmental load. Given the fact that western region's low level of socio-economic development and financial capacity and the reality of urban infrastructure prior to the construction of a large number of inputs, the government should take the lead to build an effective and efficient financial mechanisms to ensure the prophase investment of urban environmental infrastructure, rather than waiting for the western towns to do so.

Develop a long-term, green, eco-city development strategy. Building standards and regulations need to be established and implemented. A compact urban development mode needs to be adopted to avoid excessive urban sprawl. Public transportation systems should be given higher priority. A long-term, green industrial development strategy needs to be established as an integral part of urban development strategy to support urban functions. And state-of-the-art and suitable technology, planning and management approaches need to be sought out and adopted. Invest in “soft” infrastructure. Invest in building a number of medium-sized, attractive and highly livable cities that provide a state-of-the-art physical and cultural living environment, with higher education institutes and R&D centers. These cities can be anchors of the region in attracting and retaining high-level human capital and high-added-value industries, and eventually hubs for regional innovation and incubation. Adopt a system approach towards integrated urban-rural development to enhance urban-rural mutual support and co-development. This should enhance and harness positive spill-over effects from urban development.

Implement the planning of Main Functional Zoning to coordinate the relationship between ecological environmental protection and economic growth. Main Functional Zoning system is a key mechanism for planning and decision-making that protects essential ecosystems and directs development to appropriate locations. It is in its early stages of development and application and much can be learned from international experience. It currently appears to have limited application by local officials and is not well understood by key stakeholders in both the government and industry. The Main Functional Zoning needs to progress from the “strategic” level to become a vehicle to drive evidence-based planning of all the four ‘capitals’ and delivery of decisions which guide development and ecosystem protection at the local level. It also needs to be supported by appropriate data sets and trained staff and it needs to be well tied with planning for urban development, ecosystem protection and environmental impact assessments of industrial and infrastructure development. Such improvement will require cooperation among a wide range of officials at all levels and across a range of disciplines.

3.4 Monitoring and evaluation framework

Green development of the western region requires a new M & E framework (Fig. 1). A well-developed system that is based on dependable and accurate information is the key to guarantee the efficiency of M & E framework. In China there has been much work on such frameworks in recognition of the need to provide officials with accurate reporting and as part of the framework to recognise and reward officials. However, officials report has been hampered by lack of consistent, accurate, reliable, integrated and publicly verified information (Han et al., 2008). In addition, the basis for evaluation and action on green values and data is not as well recognised and developed as it is for such things as GDP. The M & E framework is an important step in developing such an approach.

The effectiveness of M & E framework lies in whether it can collect and provide the accountable information of the green development. A well-developed framework is able to identify gaps and weaknesses in service function provision, and can plan, prioritize, allocate and manage resources. In addition, it can serve to monitor the impact of development in Western China on the four ‘capitals’, measure effectiveness of treatment and report publicly on current status of key values and progress toward targets.

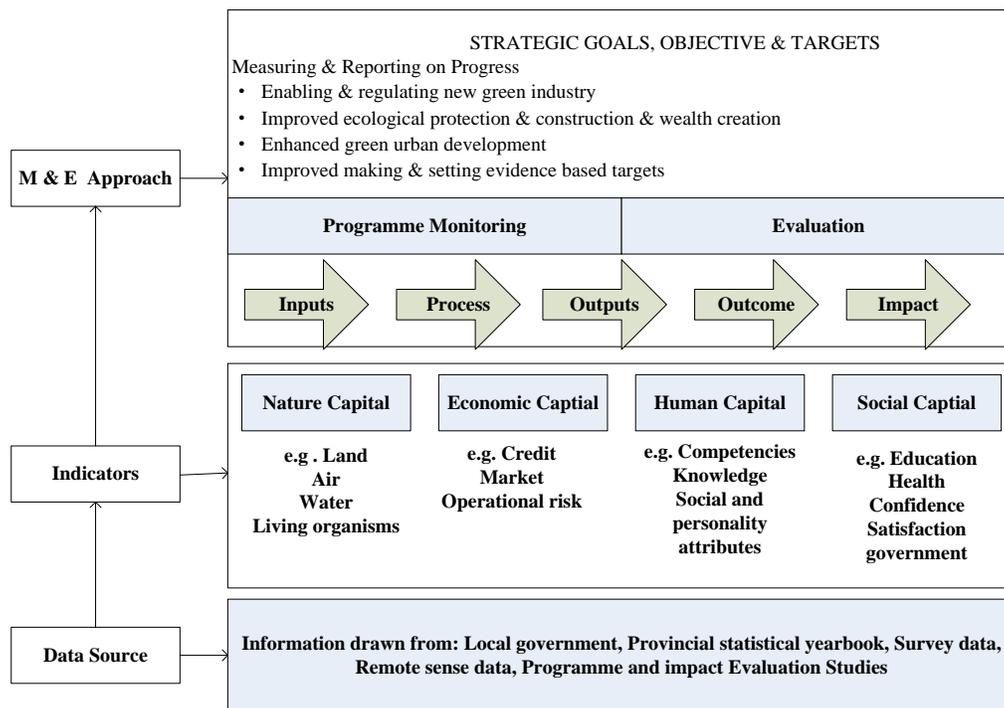


Fig. 1 Monitoring and evaluation framework

4 Policy recommendations

Consistent with the green development roadmap, the items discussed in the following parts are the most important and necessary items for short-term action that would generate significant momentum for change to a green development outcome in Western China. They require decisions and actions by the central government.

1) The government of China should prepare and implement a Green Development Strategy for Western China as soon as possible. The government should identify that green development is one of the most significant need in Western China. Green Development Overall Strategy for Western China should use the Roadmap for Green Development proposed in this report as a guide. Green development for Western China should cover comprehensive and long-term green development plan, including appropriate infrastructure, human resources investments, urbanization, industrialization, environmental pollution control, and ecological construction and services provision. Each province should have a green development implementation plan based on a broader agreed Western China Green Development Strategy, with appropriate differentiation based on its assets and development requirements. Sub-provincial level plans can then be developed within each western province.

2) Programs to each ecosystems should be better integrated and coordinated with those for poverty alleviation in provinces and in areas at local levels. Eeco-environmental conservation and poverty reduction should be also be conducted. It is clear that in Western China the problems of poverty and ecological protection are completely intertwined. There are significant new potential education, training and employment opportunities associated with eco-construction and eco-protection. Local residents should be far more involved in and responsible for these projects and for the continuing management of the projects when they are completed. It is suggested develop extensive, innovative pilot initiatives as the basis for long-term major ecological restoration and conservation. At the same time, the government should invest project funds which go direct to communities to undertake this work. Individuals should have long-term funding assurance for sustainable land management practices.

3) Substantially invest more in programs specifically designed to increase and improve human capital in Western China, and to enable the pace and quality of green development to accelerate. Green development requires a well-targeted focus on infrastructure that is critical for ecological and environmental services provision and protection. This needs to be done for both large and small communities as quickly as possible. A coordinated focus on human capital is an essential underpinning of this approach. Thus, we should improve education and training opportunities, focus especially on poor and ecologically fragile communities by coordinating investment in hard and soft infrastructure for schools (and related institutions), health services, communications and teacher training, and build human capacity for green development to take advantages of the natural and indigenous potential for such businesses.

4) Make more effective targets and promote green development via sustained funding at all levels of government. Significant financial resources from the central government have been focused on environmental management and community development in the western region. We should accelerate environmental fiscal reform by establishing a Green Development Fund, use the Royalties to Regions tax policy and promote eco-compensation contributes to Green Development of Western China. Commitment to a Green Development Fund will provide greater certainty and appropriate incentives for green development outcomes. The Green Development Fund should be used for “green development” and innovation. Funding can be directly provided by the central government, ideally supplemented by industry-based levies sending price signals concerning more effective utilization and recycling of resources. Royalties to regions can be used more explicitly to provide funds for specific small projects in the western region. Funding should be tied with and focused on

priorities agreed between the national and provincial governments on a partnership or matching basis. In addition, it is necessary to accelerate the application of environmental fiscal reforms and implement eco-compensation, gradually move away from time-limited, project-based funding toward a more programmed and predictable long-term funding mode for eco-compensation, and emphasize compensation based on better performance concerning the specific ecological services provided. Funds should go directly to farmers and villagers to support sustained results with a generational time span. Establishing a Green Development Fund as a revenue stream to drive new green industry that enables restoration and to incentivize change through funding, particularly at the community level.

5) Making Main Functional Zoning work effectively to support decisions and actions leads to regional balance and green development. Strengthening implementation in the planning of Main Functional Zoning is a benefit to ensuring regional balance and green development. Provide more detailed and specific directions concerning “restricted zones” and “key development zones” and establish zoning at a more detailed geographic scale in order to provide better information to local officials for detailed planning. Clearly identify the purpose and acceptable activities in “restricted development” zones and establish clear and measurable thresholds for development that reflect the characteristics of the zones. Adopt a monitoring system (and use high technology satellites) to be applied to all “restricted areas” to ensure compliance with regulations. At the same time, integrate planning for national nature reserves and for urban and industrial planning along with the Main Functional Zoning system.

6) Develop and adopt a sustainable urbanization mode, including an eco-city approach tailored specifically to the needs. Adopt a differentiated and tailored urbanization policy, which is coordinated with implementation of the Main Function Zoning Plan. Develop a long-term, green, eco-city development strategy in accordance with local assets. As rapidly as possible, move beyond the existing pilot level initiatives to make the eco-city approach widely accepted. Invest in soft infrastructure to enhance the livability and attractiveness of cities in the western region. Invest in building a number of medium-sized, attractive and highly livable cities that provide a state-of-the-art physical and cultural living environment, with higher education institutes and R&D centers that can eventually become regional innovation and incubation hubs. Take an integrated urban-rural development approach enhancing urban-rural mutual support and co-development.

7) Encourage new green industries that reflect the character of Western China in the key and restricted development zones. It is important to encourage new industry and green development based on the indigenous characteristics and values of the region. Through specific funding and incentive programs, assist and encourage the development of “green development industrial parks” where there is demonstrated potential. Identify a list of green potential development situations throughout Western China. Set a “green entry standard” for all industrial development, particularly in the restricted development zones, to ensure that polluting industries do not re-locate into the western region from elsewhere in China. Expand existing foreign investment channels while ensuring that any foreign direct investment (FDI) complies with China’s standards for environmental and social quality, and if necessary, go beyond these standards.

8) Strengthen institutional innovation to drive long-term green development. Innovations in improved approaches to vertical and horizontal coordination and cooperation appear to be essential aspects of a transformative change towards green development. Adopt the principles in the road map and an implementation process to complete the Green Development Strategy for Western China with appropriate targets and milestones. Focus performance management for green development on senior local officials and shift to a broader outcome focus in assessing public officials. Establish a neutral monitoring and reporting function in a central agency of government and commit to public scrutiny and reporting. Establish in each province a coordinating function/committee of senior officials mandated to strengthen coordination of initiatives for green development (for example, all green infrastructure, human development, compliance and enforcement).

In a word, if China is to continue its successful development path while simultaneously correcting past damage to environmental services and enhancing those same services, it will have mastered the most challenging set of circumstances encountered by any nation in history. In Western China where the task is more daunting because this region is so ecologically fragile, many of the people are so poor and are representatives of minority groups because their traditional heritage is so important. Only by setting out and implementing a new integrated long-term strategy with a clear roadmap will this task be possible. Western China is the right region to begin the journey.

Acknowledgments: This research is finally supported by the “Strategy and Policies on Environment and Development in Western China” project of “China Council for International Cooperation on Environment and Development (CCICED)”. The authors are grateful to the international team of this project for providing valuable materials and comments.

References

- CCICED, 2011. Developmental mechanism and policy innovation of China's green economy.
<http://www.cciced.net/enciced/policyresearch/report/>
- Dai Y X, 2009. The Necessity and Governance Model of Developing Low Carbon City in China, *China Population, Resources and Environment*, 19(3):12-17 (in Chinese)
- Han G Y, Olsson M, Hallding K, et al., 2012. China's Carbon Emission Trading: An Overview of Current Development. In: *FORES Study 2012:1*; Stockholm Environment Institute and Forum for Reforms, Entrepreneurship and Sustainability (FORES), Stockholm.
- He J K, 2011. Energy Development and Addressing Climate Change in China. *China Population, Resources and Environment*, 21(10):40-48 (in Chinese).
- Ouyang Z Y, Zhao J J, Gui Z H, et al., 2009. Evaluation of Green Development in Cities of China. *China Population, Resources and Environment*, 19(5):11-15 (in Chinese).
- Wen Jiabao's speech in Stockholm 40 Partnership Forum for sustainable development, Xinhuanet.com, 2010-4-25.
http://news.xinhuanet.com/world/2012-04/25/c_123036994.htm.
- Zhang Q F, Crooks R., 2012. Toward an Environmentally Sustainable Future: Country Environmental Analysis of the People's Republic of China.
<http://www.adb.org/publications/toward-environmentally-sustainable-future-country-environmental-analysis-prc>