



CCICED Task Force Summary Report

**Strategy and Policies on Environment and Development
in Western China**

CCICED Annual General Meeting 2012

December 12-14, 2012

Task Force Members

Co-chairs:*

- DING Zhongli, Vice President, Chinese Academy of Science (CAS); Academician of CAS; Professor
- Robyn Kruk, CEO, National Mental Health Commission, Australia; Former Secretary, Australian Government Department of Sustainability, Environment, Water, Population and Communities

Executive Co-chair:*

- LIU Jiuyuan, Professor and Former Director General, Institute of Geographic Science and Natural Resource Research (IGSNRR), CAS

Task Force Members:*

- OUYANG Zhiyun, Professor and Deputy Director General, Research Center for Eco-Environmental Sciences, CAS
- LIU Weidong, Professor, IGSNRR, CAS
- ZHANG Huiyuan, Professor and Director of Ecological Environment Department, Chinese Academy For Environmental Planning (CAEP)
- ZHOU Hongchun, Professor and Official Director of Social Development Department, Development Research Center of the State Council
- DENG Xiangzheng, Professor, IGSNRR and Center for Chinese Agricultural Policy (CCAP), CAS
- Xuemei Bai, Professor, Australian National University; Vice Chair of Scientific Committee, International Human Dimensions Program on Global Environment Change (IHDP)
- Stein Hansen, Senior Economist, Former Chair Nordic Consulting Group
- Derek Thompson, Professor, Royal Road University

Research Support Team:

- SU Ming, Professor and Vice President, Research Institute for Fiscal Science, Ministry of Finance
- HAN Fengqing, Professor, Research Institute for Fiscal Science, Ministry of Finance
- SHEN Lei, Professor, IGSNRR, CAS
- ZHEN Lin, Professor, IGSNRR, CAS
- LIU Hui, Professor, IGSNRR, CAS
- SHAO Quanqing, Professor, IGSNRR, CAS
- ZHUANG Xuliang, Professor and Section chief of Department of Ecology and Environment, Bureau of Science and Technology for Resource and Environment, CAS
- ZHENG Hua, Associate Professor, Research Center for Eco-Environmental Sciences, CAS
- LIU Guihuan, Associate Professor, CAEP
- HAO Haiguang, Associate Professor, CAEP
- JIANG Qun'ou, Lecturers, Beijing Forestry University
- ZHONG Haiyue, Ph.D Candidate, Huazhong Agricultural University
- CAI Suihua, Research Assistant, IGSNRR, CAS

Coordinators:

- DENG Xiangzheng, Professor, IGSNRR
- WANG Peishen, Former Senior Environmental Specialist World Bank

** Co-Chairs and Task Force members serve in their personal capacities.*

Abstract

China is at a Cross Roads where it must choose a path to Green Development or suffer the consequences of irrevocably damaged environmental conditions, continued regional disparities and generally poor social and economic outcomes for a substantial number of its citizens. Successive Five-year Plans and considerable fiscal expenditures have resulted in substantial but incremental improvements to some social, health and environment indicators. Chinese leadership has been apparent in tackling what is probably the greatest sustainability challenge in the world. However, the overall situation continues to be grave and deterioration has not been arrested.

If the nation is to achieve the sustainable development outcomes that it seeks it must find a way to integrate and translate national goals in order to achieve green development at the regional level. This one year Task Force studied the existing conditions and international experience in order to develop advice on a Roadmap for green development in Western China.

This is a distinct and highly diverse region that has significant national heritage values and current strategic importance for the entire nation. With 55 minority groups, many of the nation's international inland borders, significant mineral and energy resources and the source of much of the freshwater on which the nation depends, achievement of a green development model in this region is vital to the entire nation. Considerable potential exists for green development and urban expansion based on the distinct regional attributes and characteristics. It is, however, a region where environmental fragility and poverty co-exist in locations that are highly vulnerable to the impacts of climate change and loss of biodiversity. Moreover, investment and industry have been largely confined to government infrastructure programs and primary resource extraction and processing. Much past environmental damage needs to be addressed as well as prevention of future problems due to potential relocation of "black" industry from the eastern region.

The analysis focused on six policy areas that together inform many of the critical issues and define the pathway to the future. They are: (1) managing and restoring fragile ecosystems; (2) managing energy and mineral resources and pollution control; (3) improving labour quality and diversity for poverty alleviation; (4) promoting sustainable urbanization; (5) promoting green and inclusive industrial development; and (6) institutional and policy settings as facilitator and driver.

A Conceptual Framework for Green Development in western China has been produced. This is focused around the Four Capitals, i.e. Natural, Economic, Social and Human Capitals. The Framework identifies the critical interplay between Socioeconomic Development and, Environment and Resources Carrying Capacity. This interplay is described through the Challenges and Opportunities characteristic of the region and their resolution is seen in the various Policies and Interventions based on achieving the objective of an Eco-friendly, Socially Inclusive development that effectively utilises and enhances Indigenous Capacity.

A strategic overview analysis of the various challenges and opportunities associated with each of the six policy areas found considerable potential for green development as well as many issues which need to be addressed in a Roadmap for green development.

The Roadmap is a simple structure intended to demonstrate the coalescence of the wide-ranging initiatives and to give them focus and direction. It will place the government-announced goals, the Five-year Plan and the green development Framework in a single cohesive green development strategy.

The Roadmap includes four component parts:

- A set of goals which set out the overall direction for green development in Western China.
- A set of principles through which government leaders can guide work to achieve the goals.
- An integrated set of mechanisms that deliver green development outcomes for all of the policy areas.
- A monitoring and evaluation approach that enables informed adjustment to new information.

The Roadmap is not a set of prescriptive policy directions. Rather, like any map it is a guide or framework by which to assess and review existing policies, governance and planning structures and to assist in the development of further policy initiatives.

The analysis of challenges and opportunities also identified a set of seven key findings:

Key Finding 1: *Green development will not be fully achieved until government adopts a national roadmap that integrates green development with other long-term strategic and operational mechanisms.*

Key Finding 2: *Western China requires particular attention and priority by taking a roadmap approach to green development in China.*

Key Finding 3: *Specific green development goals are required for Western China.*

Key Finding 4: *Further guidance and engagement at all levels is required from senior leadership to achieve green development goals; a set of eight “principles” is presented as the basis for that guidance.*

Key Finding 5: *Integrated solutions are required to protect ecosystems, reduce poverty and expand economic opportunities to deliver green development in Western China.*

Key Finding 6: *Innovation is needed in institutional structures and approaches.*

Key Finding 7: *A new monitoring framework and evaluation approach is required for green development.*

Green development is not a goal that will be achieved in a short term. It will require long-term commitment and dedication. The Task Force identifies a limited set of eight recommended priorities on which to focus in the short term.

Recommendations

- (1) The Government of China should prepare and implement as soon as possible a green development Strategy for Western China.
- (2) Programs to deliver eco-construction and other means of protection of Western China's ecological services, ecosystems and biodiversity should be better integrated and coordinated with those for poverty reduction in provinces and at local levels as a long-term seamless set of programs with a more unified basis of delivery.
- (3) Invest substantially more in programs specifically designed to increase and improve human capital in Western China to reduce poverty, and to enable the pace and quality of green development to accelerate, especially through green infrastructure construction and servicing.
- (4) Reform financial programs and mechanisms at all levels of government to more effectively target and drive green development via sustained funding.
- (5) Make Main Functional Zoning work effectively to support decisions and actions which lead to regional balance and green development.
- (6) Develop and adopt a sustainable urbanization model, including an eco-city approach tailored specifically to the needs and interests of provinces in Western China.
- (7) Encourage new green industries that reflect the character of Western China in the key and limited development zones, especially in areas of high poverty and areas of the greatest potential.
- (8) Strengthen institutional innovation to drive long-term green development.

Key words

Western China; Green Development; Environment & Protection; Poverty Alleviation; Urbanization; Industry Transformation; Ecosystem Restoration; Pollution Control; Institutional Arrangement

Contents

1	INTRODUCTION	1
1.1	Scope of the Task Force	5
1.2	Approach	5
1.3	China’s green development – an inevitable strategic choice.....	6
1.4	China is at a crossroads of transformation	7
2	CONCEPTUAL FRAMEWORK FOR GREEN DEVELOPMENT	9
2.1	International context.....	9
2.2	Green development in China.....	9
2.3	The conceptual framework.....	10
2.3.1	<i>Core of green development in Western China</i>	<i>10</i>
2.3.2	<i>Three special features of green development in Western China.....</i>	<i>12</i>
3	CHALLENGES AND OPPORTUNITIES.....	13
3.1	Managing and restoring fragile ecosystems	14
3.2	Improving labor force quality and diversity for poverty alleviation	18
3.3	Managing energy and mineral resources and pollution control	20
3.4	Promoting green and inclusive industrial development	23
3.5	Promoting sustainable urbanization	25
3.6	Summary	33
4	KEY FINDINGS AND ROADMAP FOR WESTERN CHINA.....	33
4.1	What is a Roadmap for Green Development and why China needs one.....	33
4.2	Why a Roadmap for Green Development is needed for Western China.....	37
4.3	The Roadmap for Green Development of Western China	37
4.3.1	<i>Goal and objectives for green development in Western China</i>	<i>38</i>
4.3.2	<i>Guiding green development of Western China</i>	<i>39</i>
4.3.3	<i>Policy areas and institutional mechanisms</i>	<i>39</i>
4.3.4	<i>Monitoring and evaluation framework.....</i>	<i>41</i>
5	POLICY RECOMMENDATIONS	42

difficult inequities and barriers relate to social and human capital and the unequal access to public services and social harmony.

Table 1. The Strategic Importance of Western China – Overview

Social cohesion and national security	<ul style="list-style-type: none"> Accounting for 71.54% of the terrestrial land area of China All of 55 ethnic minority groups With a population of 360.38 million, 27.04% of the national total²
Resource and energy security	<ul style="list-style-type: none"> Accounting for 81.1% of exploitable water resources³ All of 171 types of mineral resources 132 types of mineral reserves has been proven Accounting for 67% of China’s fossil energy Accounting for 65% of China’s renewable energy sources⁴
Ecological security	<ul style="list-style-type: none"> Having 85% of China’s national nature reserve areas⁵ Having 70% of the state-level protected ecosystem and species Accounting for more than 65% of ecological service value of China⁶
Poverty alleviation	<ul style="list-style-type: none"> Accounting for 66% of China’s poverty population⁷ Poverty rate is almost 17 times that of the eastern area 95% of absolute poverty population of China are in minority nationality areas, remote areas, border areas and ecologically fragile area, and these areas are mainly in western region The illiteracy rate among adults (above the age of 15) is 5.41%, 1.33 per cent higher than the national average⁸
Urbanization	<ul style="list-style-type: none"> The western region urbanization rate is 28.70%, which is 7.52 per cent lower than the national average in 2000; after 10 years development, the urbanization rate had increased to 40.48%, which is still 9.20 per cent lower than the national average.
Industry development	<ul style="list-style-type: none"> The per capita GDP is 25% lower than the national average The output of energy and mining industry account for 63.41% of the regional output of industry. Emissions of the ‘three wastes’ per 10,000 <i>yuan</i> industrial value-added is 1.1 times more than national level
Transformation of economic structure Domestic demand playing larger role	<ul style="list-style-type: none"> W. China is a vast area, with an economy below other parts of China. There is huge potential for expanding regional domestic demand.

The CCICED Western China Task Force is focusing on developing a roadmap and policy recommendations for the green development of W. China at a time when there is significant national and international financial uncertainty and slowing growth on the global stage. China has a strong record and commitment to growth. Its growth rate has no international peer, tracking 10.7 per cent over the last decade.⁹ China has also

² NBSC (National Bureau of Statistics of China). *China Statistical Yearbook*, 2011, Beijing

³ Xiangzhi Kong, Yingchun Hu. Superiorities, *Emphases and Countermeasures on Development of Energy Industry in China’s Western Region*, Ecology and Environmental Sciences, 2012, 21(1): 94-100

⁴ NBSC and Ministry of Environmental Protection. *China Statistical Yearbook on Environment*, 2009, Beijing

⁵ Zhiyun Ouyang, Hua Zheng. *Ecological mechanisms of ecosystem services*, Acta Ecologica Sinica, 2009, (11):6183-6188

⁶ Ecological Environment Protection Research Center, Tsinghua University. *Current status and adaptive strategy of ecological environment in the western region* (in Chinese). China Development Observation, 2009 (05):29-33

⁷ NBSC. *China Statistical Yearbook*, 2010, Beijing

⁸ NBSC. *China Statistical Yearbook*, 2011, Beijing

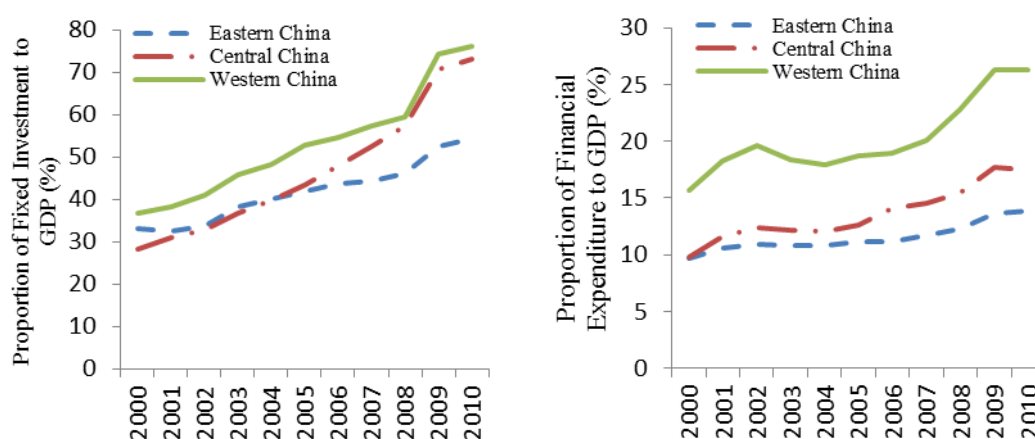
⁹ China Daily, 12 September 2012, *Toward a brighter future for the Chinese economy*

made strong commitments to share the proceeds of this growth equitably across the country and to reduce disparity at both the regional and individual level and has recognized the need to do so in a manner that is more environmentally sustainable.

The western provinces are growing rapidly. Over the last decade, the region has achieved an average growth rate of 17.20%, which is faster than the national average. Of the five regions with the highest growth rates last year – Chongqing, Tianjin, Guizhou, Sichuan and Inner Mongolia – four are located in western China.¹⁰ By contrast, the five regions with the lowest growth rates – Beijing, Shanghai, Zhejiang, Guangdong and Shandong – are all on the east coast. These regional growth variations will help to narrow the income gap between east and west in China. Per capita income in Shanghai (the highest in the country) was 9.2 times as high as that in Guizhou (the lowest) in 2005. This had fallen to five times in 2011, according to the National Bureau of Statistics (NBSC).

Several factors have contributed to better growth performance in W. China. Massive resources have been diverted to the western region, and capital accumulation in W. China has accelerated in recent years (resource-driven economic growth; see the trend of proportion of fixed investment to GDP and proportion of financial expenditure to GDP in Figure 2). Manufacturing has also relocated from the coastal areas to the inland and western regions. NBSC data show that W. China accounted for 18.8 per cent of national industrial output last year, compared with 13.9 per cent in 2000. During the same period, the six central provinces have also gained in terms of industrial-output share (from 19.1 per cent to 21.3 per cent). But the high proportion of fixed investment in GDP means the economy of W. China is highly dependent on government. It has also been suggested that manufacturing activities are shifting westward as a result of rising wages and the subsequent shortage of labour in coastal areas and relative weakness of environmental oversight mechanisms in W. China.

Figure 2. Proportion of Fixed Investment and Financial Expenditure to GDP



Source: *China Statistical Yearbook* (2001-2011).

Past growth has been achieved in “an environmentally profligate way” and “the overall situation (in China) continues to deteriorate”, and has relied on the primary

¹⁰ NBSC. *China Statistical Yearbook*, 2011, Beijing

and secondary sector while the development of the tertiary sector is too slow.¹¹ Energy consumption per unit of output (energy intensity expressed as kg/100 *yuan*) in the western region is on average much higher than that in the coastal provinces. Beijing and Guangdong recorded the lowest energy intensity (about 80 kg/100 *yuan*) in 2011 while the highest energy intensity was observed in Ningxia (five times as high as the best performer) and Qinghai (four times). Furthermore, growth in W. China has not been sufficiently translated into an increased overall standard of living for its residents. In addition, human capital has been and still is flowing to the eastern region.

The challenge for the CCICED Western China Task Force is not to limit growth but rather to provide a roadmap to help direct that growth: to build on increasingly strong political commitments contained in successive Five-Year Plans, and to bring environment and people (society) to the centre of economic decision making. And to ensure that future growth is not at the cost of the environment and with wealth shared unequally. This is *an environmentally sustainable development challenge [that] is arguably the most complex and difficult that any country has ever tried to confront*.¹² Nearly 80 per cent of territories in W. China are identified in the Main Functional Zoning Plan of China as either “restricted” or “prohibited development” zones (see Chapter 3, discussion of Main Functional Zoning). This acknowledges the fragility and ecosystem values of Western China, with the intention of retaining ecosystem functions during economic and social development processes. As a result of strong political focus, there have been significant investments of capital and increasingly stringent targets intended to incentivize improvements in per capita income, natural resource management, pollution reduction and GDP growth.

However, many key health, environment and social metrics for W. China have not demonstrated a rate of positive or sustainable change commensurate with the expectations of the Chinese government, key central or provincial officials, or of communities. According to 2009 estimates by the Chinese Academy of Sciences, for environmental quality to be maintained in W. China at a level similar to that in 2000, resource efficiency would need to increase by a factor of 4 to 5, and the environmental footprint per unit of GDP to decrease by 75 per cent.¹³

The case for change is clear. W. China is the custodian of the nation’s greatest prospective natural resource wealth, so is at the heart of China’s long-term growth plans. Deterioration or poorly executed use of its natural resources, including water, or well-intentioned but poorly coordinated or implemented wealth creation and social welfare interventions, could have profound negative impacts on China’s future wealth, environmental and societal health and wellbeing.

There are also clear opportunities for China as a whole in the way it determines the future nature of growth in W. China. 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,

¹¹ Asian Development Bank. *Toward an Environmentally Sustainable Future – Country Environmental Analysis of People’s Republic of China*. Philippines, 2012, p.6

¹² Asian Development Bank. *Toward an Environmentally Sustainable Future – Country Environmental Analysis of People’s Republic of China*. Philippines, 2012, p.xviii

¹³ China Academy of Science. *China sustainable development strategy report 2009 – China’s approach towards a low carbon future*, Beijing: Science Press, May, 2009

and through the priorities and means by which it delivers programs to address social and human capital inequities. Diversity within W. China also requires a rethink of relationships between the national and provincial governments in order to make growth more sustainable. There is a need to better align and leverage the shared aspirations of the central and provincial governments as they relate to economic, social or environmental considerations, rather than have these goals independently pursued in an uncoordinated, or agency/project based focus.

China needs W. China to have a green growth trajectory built on the strong policy commitments in the Five-Year Plans and applied to the next steps. The Task Force recognizes that if Western China fails to achieve such a green growth trajectory, all of China will pay the costs in the economic, environmental and societal spheres.

1.1 Scope of the Task Force

The Task Force has been established to identify major issues in the process of ecological and social economic development faced by W. China, especially for improvement in the relationship between environment protection and economic development; to propose a green development strategy adapted for western conditions of economy, population, resources and environment in the next 20 to 40 years, and to make some policy recommendations for accelerating progress towards green development in W. China.

The Task Force identified specific work objectives from its Terms of Reference as follows:

- Understand past and current Five-Year Plans, the China Western Development Strategy and applicable policy measures in order to identify potential improvements.
- Analyze development and structural needs that require immediate policy actions and/or long-term transformational institutional development and policy setting.
- Identify key drivers for regional green development opportunities in W. China.
- Set out a roadmap and provide concrete policy recommendations, which expand on existing policy directions and initiatives and translate them into practical priorities and measures for a green development strategy in Western China.

This Task Force was officially launched on August 4, 2011 and has translated these objectives into the following five tasks that are the subject of the following chapters.

Task 1: Analyze environmental features and carrying capacity.

Task 2: Assess socio-economic realities, development strategies and models.

Task 3: Review international experience on integrated regional development of environment, economy and society.

Task 4: Develop a roadmap for green development for the western region.

Task 5: Produce green development policy recommendations for W. China.

1.2 Approach

The Task Force undertook a limited desk top analysis and worked on understanding and finding solutions for six policy areas: (a) managing and restoring fragile ecosystems; (b) managing energy and mineral resources and pollution control; (c) improving labour quality and diversity for poverty alleviation; (d) promoting

sustainable urbanization; (e) promoting green and inclusive industrial development; and (f) Institutional and policy settings as facilitator and driver. In so doing the Task Force chose not to pursue specific issues such as climate change, energy development, biodiversity protection and many others.

Time constraints limited the scope and extent of the work and the number of regional consultations. The Task Force briefly visited a limited number of sites and talked with industry leaders and officials in two provinces to help its understanding of the larger issues. Two provinces with very different features and challenges were selected: *Sichuan Province* has experienced rapid industrialization and urbanization, and strong industrial transformation; while *Qinghai Province* is characterised by fragile ecology, which requires careful management to meet both regional and national ecological service needs. Both provinces have areas of high poverty and resource pressures.

The Chinese and international members met with officials from central government and the two provinces during both the research phase and during the drafting of recommendations focused on the major issues. More than 50 stakeholders from industry and different levels of government have contributed their thoughts and feedback, fundamentally influencing final recommendations of the Task Force. The Task Force also undertook a brief visit to Australia where considerable insight was gained on a number of relevant technical and governance innovations.

1.3 China's green development – an inevitable strategic choice

The core development challenge facing every jurisdiction today is how to achieve human development while maintaining essential ecosystems. China has achieved significant economic development and progress toward a truly prosperous society, but at the expense of the environment, and a widening gap between the rich and the poor. Consequently there are shifts: from “black” to “green”, from “ecological development” to “ecological construction”, and from “ecological deficit to ecological surplus”.

Box 1. China's Choice on Future Development

Premier Wen Jiabao has said: “China is determined to take a path of civilized development which ensures that production increases, people's living standards rise, and we live in a sound ecological environment.”¹⁴

“A political awareness and consensus has thus emerged that China can no longer afford a continuous ‘black’ economic growth in the face of these serious resource bottlenecks. Environmental issues and social concerns are no longer merely the negative ‘side-effects’ of China's economic growth. China now finds itself in a loop, in which resource bottlenecks, environmental degradation and social discrepancy are causing serious economic problems and preventing a continuous and sustainable economic growth. A green transformation of the Chinese economy is therefore an inevitable strategic choice that aims to curb resource utilization and ecological degradation, and at the same time improve economic efficiency as well as social inclusion and stability.”¹⁵

¹⁴ Xinhua Net. 25 April 2012. *Speech by Premier Jiabao Wen at Stockholm+40 – Partnership Forum for Sustainable Development*. http://news.xinhuanet.com/world/2012-04/25/c_123036994.htm

¹⁵ CCICED Annual General Meeting 2011. *Development Mechanism and Policy Innovation of China's Green Economy*. Beijing, 15-17 November 2011, p. 208

However, while there has been considerable investment in and some progress to improve essential environmental outcomes such as clean air, water and overall ecosystem services, many environmental and health conditions are being negatively affected, including in W. China. The challenge now is how to most effectively translate the new direction into effective action at a regional level.

1.4 China is at a crossroads of transformation

Chinese leaders have recognized that the country is now at a crossroads of transformation. Entering the 21st century, China is pursuing economic and social development under the guidance of the “Scientific Outlook on Development”, accompanied by a fundamental principle that calls for putting people first and promoting balanced and sustainable development in all areas. Making economic and social development compatible with the preservation of the natural environment has become a significant issue for China. Seeking a green, low-carbon economy, an emerging global policy agenda, has also become China’s strategic choice. This political aspiration and concrete initiatives are manifested in China’s 12th FYP.¹⁶

China faces significant transformational challenges and necessary shifts:

- **Balance:** Moving from a narrow economic model to one protecting and enhancing natural, human and economic capital.
- **Structural:** Changing from an investment-driven primary and secondary industrial model to one giving greater prominence to services and domestic consumption, while also modernizing specific employment sectors.
- **Technology:** Taking advantage of new technologies and innovations requiring human capacity building and R&D investment to enable a green industry model. “In 2011, the coastal region spent, on average, more than 2 % of their income on R&D; in the western region the figure was about 0.5 %.”¹⁷
- **Institutional:** Shifting from government-driven financial and regulatory models to a better-functioning market economy; with governmental institutions more focused on complex interrelationships of green development.

To support and realise green transformation at the national level, the regional dimension will be key for making fundamental and real changes on the ground. This is of particular importance for China given the sheer size of the country as well as the large diversity across regions. Alongside strong leadership at the top level, a multiple-level coordination as well as a genuine commitment and clear mandates at the regional level are necessary conditions for enhanced institutional capacity, for improved quality of implementation as well as for broad engagement and inclusiveness in China’s green transformation. We believe it is advisable for China to take a regional approach when preparing a national green development strategy.

In W. China the broad national challenges are further exacerbated by:

Regionally uneven development Economic development is rapid in the eastern coastal areas of China while the western region is relatively backward. It accounts for 63.34

¹⁶ Asian Development Bank. *Toward an Environmentally Sustainable Future – Country Environmental Analysis of People’s Republic of China*. Philippines, 2012, p.144

¹⁷ China Daily, 24 August 2012, *Balance of economic power shifts*.

per cent of the total poverty-stricken counties¹⁸ in China and more than half of the ecologically vulnerable counties.¹⁹ It is necessary to explore new development strategies to solve the problem of regionally unbalanced or uneven development. There is a major trend in China to promote industry transfer to the western region and accelerate its development. Without scientific guidelines and rational planning, development acceleration in the western region would put more and more pressure on its vulnerable eco-environment and increase pollution there.

Close attention to environment and development to implement the China Western Development Strategy and promote sustainable development W. China supplies significant environmental services but is an ecologically fragile area with complex climatic conditions. Ecosystem degradation trends have not been halted. The challenge is to arrest the decline in *regulatory services* while simultaneously increasing the *provisioning functions* of environment services.

Distinct environment and development strategy and policies are needed for W. China W. China plays a key role for the whole of the nation. This has been recognised in China's Main Functional Zoning, in particular by designating large areas of restricted development along with a large number of national nature reserves in the region.

Significant financial expenditure on eco-compensation and ecological construction to protect and enhance provisioning and regulating services recognise this reality but "*much environmental investment is made through special campaigns that are hastily conceived and implemented to respond to environmental incidents or emergencies. This approach is inefficient, too top down and extremely unpredictable.*"²⁰

At the heart of a green regional development agenda is a differentiated approach, taking into account region-specific development needs and constraints, and more importantly, identifying and creating context-specific green development enablers and opportunities, which bring a transformation of both mind set and practice, including:

- Indigenous capacity building and self-sustaining development.
- Refining and strengthening top-down, subsidy-based national support .
- Viewing environmental protection and ecosystem conservation as wealth generation and job creation from natural capital and environmental assets.
- Departing from concentrated and investment-driven industrial development towards a diversification of economic and employment structure.

The Task Force identified that China, and W. China in particular, needs a new conceptual framework setting the idea and practice of green development in the context of China's sustainable development, with specific goals for W. China.

¹⁸ <http://www.cpad.gov.cn/publicfiles/business/htmlfiles/FPB/fpyw/201203/175445.html>

¹⁹ Ministry of Environmental Protection of Republic of China. *The National Plan on the Ecological Fragile Zone Protection* (huan fa [2008] no.92), 2008

²⁰ Asian Development Bank. *Toward an Environmentally Sustainable Future – Country Environmental Analysis of People's Republic of China*. Philippines, 2012, p.xxi

2 CONCEPTUAL FRAMEWORK FOR GREEN DEVELOPMENT

2.1 International context

The 2008 global financial crisis accelerated concerns over development models that have relied heavily on resource depletion, leading to serious environmental pollution and ecological crisis. Green Economy (GE) was seen as a new vehicle for creating economic, social and environmental benefits, including the idea of “green growth”, a notion launched at Group of 8 and Group of 20 meetings²¹ and via the OECD²². The United Nations Environment Programme (UNEP) launched the “Green Development Initiative” together with a “Global Green New Deal” to mobilise and re-focus the global economy towards investments in clean technologies and “natural” infrastructure. National green growth initiatives were established by several OECD countries. The theme of the green economy was the key focal point of the June 2012 Rio+20 global meeting on environment and development. Nations including China endorsed the meeting outcome, a document entitled *The Future We Want*. Green transformation has garnered the attention of decision-makers in both rich and poorer nations. Much of the attention has been directed to regions suffering from poverty.

2.2 Green development in China

Harmony between human and environment is a concept embodied in China’s traditional values. Over 2000 years ago, Chinese philosophers called for maintaining “unity between nature and man” and following “the law of nature” to achieve harmony between mankind and nature. This harmony can be considered the ultimate goal in pursuing green development. And the philosophy was echoed in the sustainable development concept upon its introduction into China. Since 1996, sustainable development has been one of China’s basic national strategies.

The 2002 UNDP China Human Development Report, *Making Green Development a Choice*, provided valuable insights into the definition of Chinese green development. The report suggested that: “*Green development stresses unified and harmonious development of the economy and environment, a positive path of people-centred sustainable development.*”²³

Since then, China has adopted a number of concepts important for sustainable development, including the “people-centred” approach, scientific development concept, harmonious society, environmental-friendly and resource-saving society, and ecological civilization. More recently green economy and green development concepts have been embraced by academics and the government of China. In recent years, the CCICED has formed several task forces to conduct studies along these lines, including the 2011 Task Force on Research on the Development Mechanism and Policy Innovation of China’s Green Economy.

²¹ The Group of Twenty Annual Meeting’s Summit. *Inclusive, Green and Sustainable Recovery*. London, 2 April, 2009

²² OECD(The Organisation for Economic Cooperation and Development). *Green Growth Strategy*, November, 2010

²³ UNDP(United Nations Development Programme). *China Human Development Report 2002: Making Green Development a Choice*, Oxford University Press, 29 August, 2002

The 12th Five-Year Plan on Economic and Social Development is considered to be the first national green development plan for China. It formally adopted green development for building a resource-conserving, environment-friendly society, developing a circular economy, actively responding to climate change, and building a national disaster prevention system. One of the highlights of this plan is the concept of *net economic and social welfare maximization*, which not only means maximizing social welfare but also the minimization of the cost of economic development.²⁴ The net economic and social welfare benefit might be calculated as “Green GDP”, a metric for quantifying economic, social, human and natural capitals, and for environment pollution. However, Green GDP has not yet been fully adopted in China.

2.3 The conceptual framework

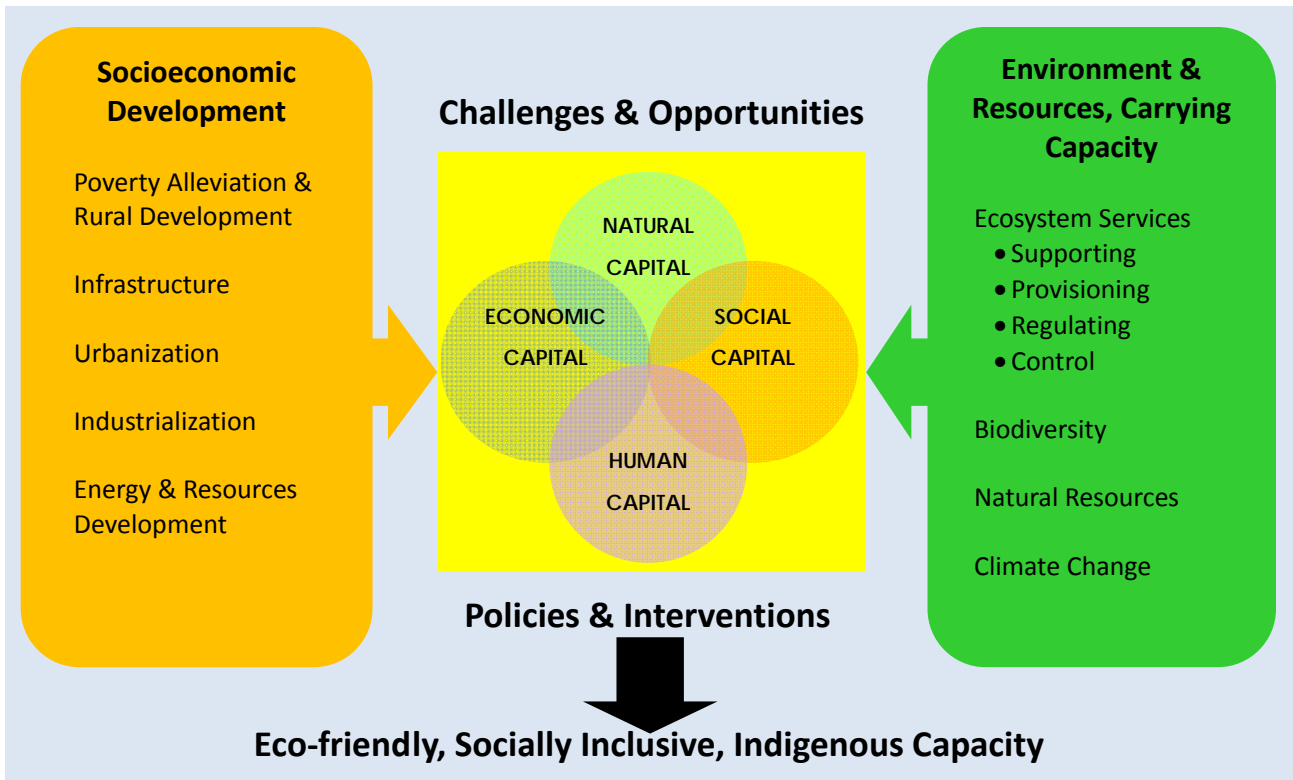
2.3.1 Core of green development in Western China

The Task Force has developed a conceptual framework for the green development of W. China, which guides the analysis and development of policy recommendations of this Task Force (see Figure 3).

The Task Force defines the core of green development as integrated development of four “capitals”: natural, economic, social and human capital. Only when these four capitals are built up and enhanced in a well-balanced way can green development in W. China be meaningfully achieved. Only pursuing growth of economic capital while massively depleting natural capital is a mind-set that is obviously unsustainable. On the other hand, purely emphasizing protection of natural capital without developing economic capital will not achieve the ultimate objective of welfare and human development.

²⁴ Wenhui Daily, The speech made by Professor Hu Angang at Expo Forum, 17 October 2010. *Environmental Changes and Urban Responsibilities*, <http://2010.eastday.com/G/20101017/u1a812903.html>

Figure 3. Conceptual Framework for Green Development in Western China



In addition, the green development of Western China must be balanced and coordinated with other regions; that is, it must not hinder the green development of other regions, and the cooperation of other regions will promote the process of green development in Western China.

Natural capital, the fundamental or supporting basis of social and economic activities, includes every natural element playing a role in any economically productive process. It includes stocks of clean water and air, animals, plants, minerals, energy sources, forests, fisheries, all elements of biodiversity and ecosystems that support them. Compared to Eastern China, W. China has rich and diverse natural resources, forming a solid physical foundation for economic and social development not only for the region itself, but also for the rest of China.

Therefore, the most important issue for green development in W. China is to reduce over-dependence on natural resources as much as possible, and to make sure that the overall quality and quantity of natural capital is maintained at a level that can generate sustained service to support long-term economic growth and human wellbeing not only for W. China, but also throughout the country and the rest of Asia.

Economic capital, in the green development context, mainly refers to the regional economic capital stock, including infrastructure, fixed assets, technology progress and production capacity, and funds available to invest in economic, social and human development and environmental protection. It is the foundation of well-being plus social and human development. Being supported by natural capital, it can also provide necessary resources to strengthen natural capital, or to facilitate “growth of limits”.

Human capital can be interpreted as a stock of capabilities, which can yield a flow of services; that is, productive capabilities of human beings. Not only human knowledge, education, training and skills, but also useful behavioural habits as well as people's levels of energy, and physical and mental health. It is important for the green development of W. China because these capabilities drive the development process. But comparatively weak human capital in W. China, in terms of overall education, labour skills and health, will be an obstacle for achieving high development expectations in the region. Unless human capital is further enhanced, there will be a lack of indigenous capacity to drive long-term green development.

Social capital often refers to characteristics of a society that encourage cooperation among groups of people (for example, workers and managers) whose interdependent efforts are needed to achieve a common goal such as efficient production. Trust among people, mutual understanding, shared values, and socially held knowledge for social coordination of economic activity are social capital elements. Western China has a far more complex social structure than the rest of China, given the region's diverse cultural and ethnic composition. Unless the process of regional development is inclusive, it will be impossible for W. China to achieve economically strong, environmentally sound and socially equitable development. Social exclusion in Western China would add further burdens to vulnerable/disadvantaged social groups, while exacerbating poverty and severe social stability issues, with the risk of undermining the overall development of China.

The Task Force believes that green development in W. China can achieve the overall development and balance of these four capitals. A traditional development mode of pursuing maximum economic growth at the cost of the ecological environment will destroy the long-term sustainability of W. China. Under the current "Two Higher" target²⁵ for Western China (that is both the economic and the income growth rate for urban and rural residents in the western region must be higher than the national average from 2011-2015), there are significant risks that GDP-driven economic growth would be the single most important driving force for development in the region during the 12th FYP period – which inevitably would be at the cost of the ecological environment. In such a situation it is reasonable to expect that natural resources would be extracted to the greatest extent possible, industries would be fully promoted for GDP growth, and natural capital would be extensively cashed in for GDP and income generation, because meeting the "Two Higher" target is the true incentive for career development of government officials.

2.3.2 Three special features of green development in Western China

For W. China, the path towards green development requires a roadmap that can identify and address various special regional features. Green development in W. China has three core features, which must be highlighted as desired outcomes.

Eco-friendly growth pursues socio-economic growth while maintaining or improving the ecological environment. It promotes a new economy featuring low carbon and high resource efficiency practices, while developing environmentally sustainable

²⁵ NDRC. *Twelfth-Five Year Plan for Western Development*, February, 2012.

“products”. It respects finite carrying capacity of natural environment and enhances ecosystem service functions that can sustain genuine wealth and prosperity. Eco-friendly growth is particularly important for W. China due to its important ecological function and fragile ecosystems.²⁶

Indigenous capacity is one of the most urgent needs in order to generate economic growth without other forces brought in from outside. The China Western Development Strategy, implemented in 1999, obviously promoted economic growth in the western region. According to statistics, the total GDP of 12 western provinces increased from 4.54 trillion *yuan* in 1999 to 23.20 trillion *yuan* in 2011, an increase of 4.3 times.²⁷ However, the increase was mainly supported by capital inputs, not indigenous economic driving forces, such as technical advancement and regional human capital accumulation. Without large transfer payments and preferential policies of central government, economic growth of Western China can barely be maintained. Without strong indigenous development and wealth creation capacity, such a high dependence on funding and outside investment is unlikely to achieve long-term prosperity in Western China. To stimulate and sustain its green development, W. China must enhance its own economic, social, human and natural capital.

Social inclusiveness is a core features that can be realized by creating buoyant local economies, improving degraded built and natural environments, by promoting community involvement and educational opportunities, and by improving living conditions and quality of life. The most prominent and recurring challenge across all areas of social inclusiveness is to join up and balance environmental, social and economic objectives. Even with recent rapid economic development in W. China there is a growing gap of per capita income between Western and Eastern China. Poor rural communities and ethnic minorities are not adequately mainstreamed into, or proportionally benefiting from the massive economic development of the nation. About 100 million people, mostly W. China, still live below the official poverty line.²⁸ Continuing social exclusion in W. China would pose a significant risk for the nation in terms of the quality of overall green development and social stability.

3 CHALLENGES AND OPPORTUNITIES

The region presents distinct challenges and opportunities for green development, which are summarized in this chapter. We consider the issues from the perspective of six policy areas that, considered collectively, describe the green development “map” of Western China. The following discussion presents highlights from the detailed analysis contained in the *Strategy and Policies on Environment and Development in Western China – Technical Report*.

²⁶ Zhiyun Ouyang, Hua Zheng. *Ecological mechanisms of ecosystem services*, Acta Ecologica Sinica, 2009, (11):6183-6188

²⁷ NBSC, *China Statistical Yearbook*, 2000 and 2011, Beijing

²⁸ Chinese Academy of Science. *China Sustainable Development Report 2012 – China’s Sustainable Development in Shifting Global Context* (in Chinese), Beijing: Science Press, 2012

3.1 Managing and restoring fragile ecosystems

Current status

Much of the western region is ecologically important for biodiversity (for example, grasslands and wetlands), is naturally fragile (for example, the Loess Plateau) or prone to hazards (desertification, mass movements and earthquakes). Human activity over the millennia has diminished some of the values and exacerbated some of the problems. Vast areas have experienced deforestation, reduced biodiversity, soil loss and desertification. Recent human-induced phenomena like climate change are increasing the pressures and rapidly changing the nature and characteristics of critical values and resources in the region.

- **Grassland ecosystem** is the main ecosystem in W. China, with an area of about 287.44 million ha, accounting for about 42.77 per cent of the total land area of the western region. In the “Three-River” source region, grassland has been affected by human factors such as over-grazing, excessive reclamation and digging and the poor management of grassland and stockbreeding development, leading to degeneration and desertification of the natural grasslands on a large scale. Grassland degradation, especially black-soil grassland degradation, has caused serious ecological environment deterioration problems.²⁹
- **Wetland ecosystem** represents a total area of 21.47 million hectares, which accounts for about 3.2 per cent of the total land area of the western region. A large amount of wetland has disappeared as the result of negligent exploitation of land resources or has been replaced by man-made wetlands, while remaining wetland has atrophied heavily.³⁰
- **Water resource imbalance.** Abundant in the south and west (the “water tower” of China) but very scarce in the north and east of the region, this “lifeblood” of Chinese civilization is now extensively polluted in quality and restricted in quantity. The west is the essential source of water for hydroelectric power, coal washing, industry and agriculture, for residential consumption and for waste removal throughout the region and the rest of China. Climate change is an increasing threat to this vital resource since it is altering the hydrography of the glacier-fed rivers of the west and increasing the variability and intensity of both droughts and floods throughout.³¹ Lake levels have fallen, and some lakes have dried up completely. For example, Bosten Lake, in Xinjiang, the water level has decreased by 3.45 meters over the last 30 years. Moreover, this lake transformed from freshwater to saltwater in just 10 years.³² Its management is now a national challenge.

²⁹ Zhiyun Ouyang; Xiaoke Wang; Hong Miao. *A primary study on Chinese terrestrial ecosystem services and their ecological-economic values*, Acta Ecologica Sinica, 1999, (05):607-613

³⁰ Xiaoke Wang, Zhiyun Ouyang, Hong Miao. *Formation, evolution and protection of wetland ecosystems in arid region, North-western China*, Territory & Natural Resources Study, 2003, (04):52-54

³¹ Asian Development Bank. *Toward an Environmentally Sustainable Future – Country Environmental Analysis of People’s Republic of China*. Philippines, 2012, p.75

³² Zhiyun Ouyang, Tongqian Zhao, Xiaoke Wang, etc. *Ecosystem services analyses and valuation of China terrestrial surface water system*, Acta Ecologica Sinica, 2004, (10):2091-1099

- Western China, especially in the Loess Plateau, is the main area of **soil and water loss**, in 2009 totalling 3.86 million ha³³ of the 12 western region provinces.
- **Land degradation**, including desertification, rocky desertification and soil salinization, is becoming the uppermost ecological problem in W. China. For example, by the end of 2005, the rocky desertification area of Guizhou had reached 3.32 million ha, 25.6 per cent of the national total.
- **The loss of biodiversity** is another significant issue in Western China, where there are abundant wildlife species. Some species are unique to Western China, and south-western China is recognized as one of the 25 global biodiversity hotspot areas. However, many rare and endangered species in the region are losing their habitat and facing extinction. In response, China's central government has committed significant financial resources and established nature reserves (1100 in the region, comprising 85% of the national total). Main Functional Zoning identifies restricted development areas and has imposed ecological migration on many small communities. Strategic biodiversity plans have been prepared for major communities such as Chongqing.
- **Geological hazards.** A combination of natural conditions and negligent human activities has increased the occurrence and economic consequences of natural disasters in China over the past 50 years due to a combination of factors including climate change.³⁴ For example, in Xinjiang Autonomous Region, in which 15 of 22 types of geological hazards exist, relatively large-scale geological disasters occurred 50 times in 2003, but sharply increased to 321 in 2010.³⁵

The central government has, through successive FYPs, undertaken many initiatives intended to address these issues. Many of these initiatives have achieved significant progress, such as the success of the “Grain for Green” and the “Sloping Land Conversion” programs in the reforestation of 21.77 million hectares.³⁶

Challenges

Lack of integration and consistency among various initiatives is a big problem. Main Functional Zoning was proposed in the 11th FYP³⁷ as a tool of planned regional sustainable development designed to zone lands at national and provincial scales: for economic development and urbanization, and for protection of land with high ecological and food production capabilities (see Table 2). Zones are identified based on nine quantitative indicators (for example, cultivable land, ecosystem fragility and importance, economic development, natural disaster risk, etc.) and strategic choice, a qualitative consideration. Western China is predominately zoned as Restricted Development with limited Key Development areas (see Figure 4). The very large scale of the zones, lack of local government capacity and the limited policy guidance and enforcement over the application of Restricted Development, constrains the practical utility of the current system as a tool for green development. The system has

³³ Xiaoke Wang, Zhiyun Ouyang, Han Xiao, et al.. *Distribution and division of sensitivity to water-caused soil loss in China*, Acta Ecologica Sinica, 2001, (01):14-19

³⁴ Asian Development Bank. *Toward an Environmentally Sustainable Future---Country Environmental Analysis of People's Republic of China*. Philippines,2012,p.xvii

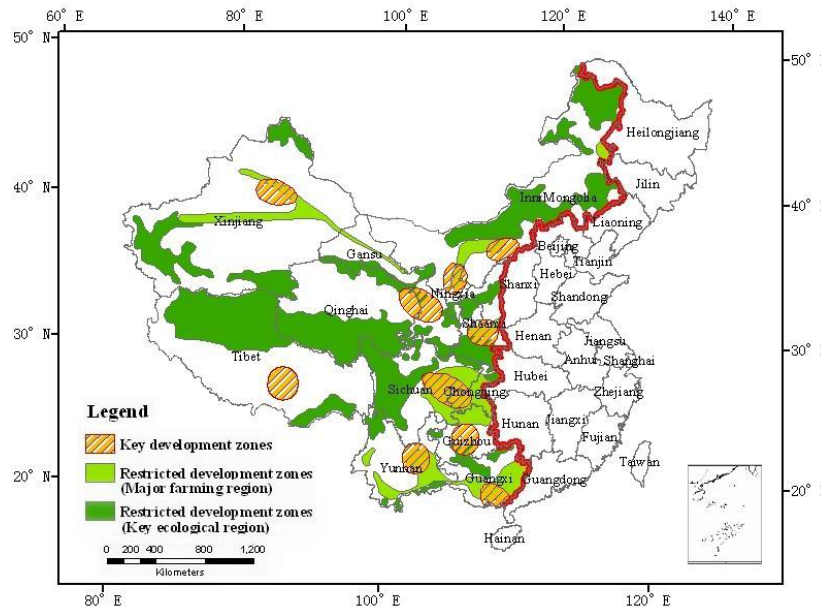
³⁵ NBSC. *China Statistical Yearbook*, 2004 and 2011, Beijing

³⁶ NDRC. *The People's Republic of China National Report on Sustainable Development*, 2012

³⁷ NDRC. *Outline of the Eleventh Five-year Plan for National Economic and Social Development of PRC*, People's Publishing House, 2006

considerable practical potential for application at the sub-provincial scale. However, to be meaningful it must explicitly link with the EIA process and urban planning and provide the necessary direction in land and natural resource use decision making.

Figure 4. Distribution of National Key Development Zones and Restricted Development Zones in Western China



Main Functional Zoning needs to be used effectively to inform and constrain all major new development decisions, and be well aligned with EIA and other planning.

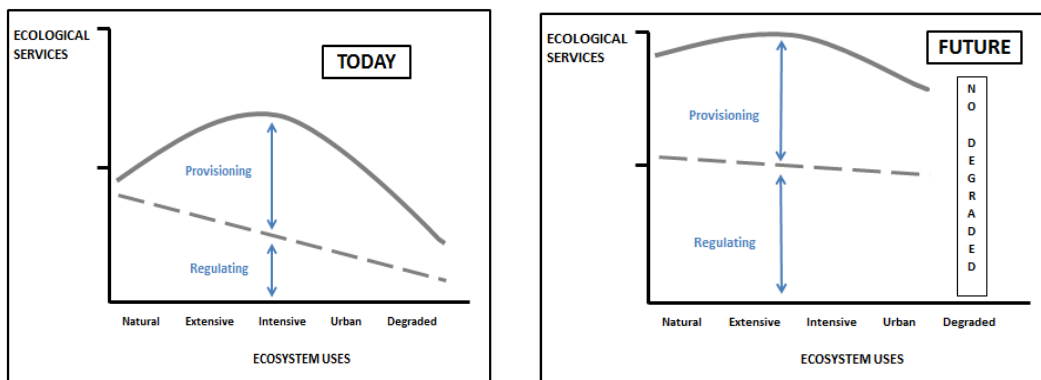
Table 2. Four Main Functional Zones in China

Zones	Features	Development Direction
Optimized Development Zone	Land exploitation intensity is already high and resource and environment bearing capacity starts to decline.	Prioritize improvement of quality and benefit of economic growth, enhance the level of participation in global distribution and competition, and maintain its role as the leader of national economic and social development
Key Development Zone	Resource and environment bearing capacity is relatively strong and economic and population concentration condition is relatively good.	Substantial infrastructure construction, improve investment and business establishment, promote development of industrial clusters, enlarge economic scale, accelerate industrialization and urbanization, undertake the industrial transfer from optimized development zone and the population transfer from restricted development zone and prohibited development zone, and gradually become the important carrier to support national economic development and high population density.
Restricted Development Zone	Resource and environment bearing capacity is relatively weak and large-scale concentrated economic and population condition is not good enough. The zone is related to ecological safety in the	Adhere to protection priority, moderate development, point development, rely on local conditions to develop characteristic industry supported by resource and environment, strengthen ecological restoration and environmental protection, guide over-concentrated population to orderly transfer and gradually become a national or regional

	country or greater region.	important ecological functional zone.
Prohibited Development Zone	Various natural reserve areas	Carry out compulsory protection, prevent interference of human factors with natural ecology and prohibit exploitation activities not conforming to the principal function of the zone.

Underlying all this is the need to understand the importance of ecosystem services for meeting both provisioning and regulating functions (see Figure 5). In effect more economic goods will be demanded of ecosystems (*provisioning*) while ecological goods such as natural cleansing of water and flood control (*regulating*) also must be enhanced from these same ecosystems, a major dilemma in decision-making.

Figure 5. Ecological Provisioning and Regulating Services for China.



Source:

Modified and further interpreted from CCICED Ecosystem Task Force scenario modeling.

Opportunities

Nature-based and cultural tourism such as in and around Chengdu and Central Yunnan is a fast-growing business that employs many local people and helps develop capacity. It depends on protection and planning of natural (and cultural) features and areas in a collaborative way to engage and empower local peoples. Elsewhere, businesses in urban areas are using natural products, such as in Xining, where wool and plants from grasslands are turned into carpets and medicines in factories employing “migrants” from rural communities. However, in both examples there is the potential for “green pollution” from resource overuse and from factory wastes.

Future development in the western region depends on improved governance and efficiency in water use and pollution control in urban areas, agriculture, industry and in power production (especially for new shale gas resources). Overcoming the challenge does present opportunities for green industrial development and human development (for example, innovation and investment in environmental technologies in Chengdu and surrounding areas). Experience in similar conditions elsewhere (in Australia, western United States and Canada) demonstrates a pathway from a situation of constraint and crisis towards one of expansion and potential (see Box 2), but with considerable adjustments in institutional mechanisms.

Box 2. Adjusting water management and allocation decisions involving national and state/territory governments – an Australian case example³⁸

Challenge

Managing supply and demand for a scarce resource which crosses state boundaries in an efficient, equitable and sustainable way.

Context

- Water has been a major factor in determining mining, agricultural and urban growth
- Responsibility vested in state/territory governments that are responsible for managing water resources to yield public and private benefits.
- History of conflicts between governments about planning and allocation (conflict between upstream and downstream) and about data objectivity and transparency.

Change in practice

- National government's role progressively increased. Council of Australian Governments developed a national water reform framework with national goals and actions for water to support resilient and viable communities, healthy ecosystems and economic development.
- All governments agreed to be independently assessed on progress of water planning.
- National Water Act 2007 introduced with a key reform—having an independent authority set sustainable diversion limits across the Murray Darling Basin, replacing consensus.
- Collection of reliable and transparently reported water data by a trusted, independent statutory agency, the Bureau of Meteorology, rather than on a jurisdictional basis.
- Robust planning applied within a broader management system incorporating appropriate regulation and effective market structures, including the establishment of property rights and a national water market. Statutory water plans used as the vehicle to provide security to all water users through clearly defined entitlements to a share of water.
- Responsibility for “environmental water” vested in environmental portfolios in many jurisdictions rather than natural resource or agricultural agencies.
- Water planning based on a participatory/advisory process that allows for community input to government decision-making in water management.

Lessons Learned

- Invest in establishing objective data sources and identify an independent data custodian.
- Data and modeling are critical and needs to be accepted by all concerned.
- Jurisdictions must be able to develop planning frameworks that reflect jurisdictional diversities to drive innovation and jurisdictional engagement.
- Use a suite of tools to achieve efficient and sustainable water management.
- Engage communities in both the assessment and decision-making processes relating to changes in water management regimes and the potential need for government assistance to affected communities in addition to direct water users.
- Cooperative arrangements between the governments that manage an interconnected system break down with economic growth pressures (e.g. as water demand exceeds supply) and start to undermine the key sustainability of *all* uses of the rivers in the long term. A central authority is required, although one that can work with the states. A coalition of the willing is the best way to implement a central water plan.

The critical work for the central authority is to define the objectives in water planning and to assist in identifying trade-offs for governments based on reliable and objective information.

3.2 Improving labor force quality and diversity for poverty alleviation

Current status

Poverty in Western China is especially dominant among poorly educated people, many of whom have an ethnic minority background, living marginally above subsistence level in rural areas characterized by poor soils, vulnerable ecosystems,

³⁸ Australian Government. *National Water Commission Report Card 2011*

unpredictable climatic conditions, and poor access to markets, schools, health and agricultural extension services. As a consequence, their educational levels are low and their physical capacity to engage in the “new green economy” is limited. Many such people, labeled as floating urban populations, migrate to urban areas and remain poor.

Challenges

The Government of China has undertaken many initiatives to address these problems, e.g. significant progress towards Millennium Development Goals³⁹, and many of which continue today. However, there are many social, economic and environmental challenges that reduce the effectiveness of existing measures. Some western regions have a fragile ecological environment with development banned or restricted under the Main Functional Zoning system. Extensive cultivation by farmers and expansion of grazing areas by herdsman was interrupted by introduction of development limits on arable land and pastures. Environmental factors to a certain extent limit some economic benefits of local industrial development. Thus in ecological protection zones, residents with no other source of livelihood become the “green poor”.⁴⁰

Opportunities

Opportunities exist to reduce poverty in Western China by combining a set of actions addressing the above-mentioned constraints and creating jobs associated with environmental services, tourism and other green industry based on local characteristics, while also explicitly respecting endangered ethnic minority cultural values, and facilitating the smooth integration of these vulnerable minority groups into a rapidly changing modern society.

Towns and villages characterized by poverty need broad-based education opportunities at elementary and secondary schools, and specialized vocational and academic education at a cost and in locations that local people can afford to take advantage of. Due to language and cultural barriers, training and educational programs must be planned with sufficient duration and patience so that drop-out rates are reduced to the national average. This challenge must be explicitly expressed in curricula that maintain local language proficiency along with fluency in Mandarin, which is a necessary condition for being able to compete for better-paid jobs.

Efforts to enhance human capital should focus on how to cope with natural (soil, water, climate, etc.) constraints and opportunities, and strive to improve basic sanitation in these vulnerable areas. To facilitate this human capital enhancement program to a sustainable level, key physical infrastructure upgrading must accompany the human and institutional capital upgrading. There needs to be all-year road access to markets, credit institutions, insurance and public amenities. Teachers, extension workers and public health personnel must be able to reach towns and villages, so adequate roads must be built, with a program for their maintenance. The relevant authorities must commit to an accompanying budget. Such infrastructure provision needs to be coordinated with these other initiatives for human capital development.

³⁹ Ministry of Foreign Affairs of the People’s Republic of China, 2010. *China’s Progress towards the Millennium Development Goals 2010 Report*

⁴⁰ http://www.gmw.cn/sixiang/2012-03/25/content_3832145.htm

3.3 Managing energy and mineral resources and pollution control

Western China is rich in coal, oil, natural gas and other energy resources and is the most crucial source of strategic energy and raw materials for China's industrialization and modernization. All 171 minerals discovered in China have been found in the western region; they display the full range of mineral resources; and the symbiotic and associated minerals are rich. The potential value of 45 major mineral reserves is up to 44.9 trillion *yuan*, accounting for 50.85 per cent of the total metal reserves in China. The reserves of some rare metals in Western China rank top in China, if not the world. The abundance in natural resources and reserves provides the region with significant advantages for development.⁴¹

Table 3. National Proportion of Main Energy Reserves in Western China

Minerals	Proportion of the national total reserves (%)	Minerals	Proportion of the national total reserves (%)
Pyrite	40.5	Kaolin	29.9
Coal	46.8	Trona	96.0
Bauxite	54.6	Magnesite	0.1
Oil	14.1	Asbestos	96.9
Manganese	60.9	Primary ilmenite	97.5
Natural Gas	61.5	Phosphorus	52.1
Copper	29.3	Vanadium	75.5
Water	54.1	Iodine	92.5
Chromium	48.8	Iron	27.8
Titanium	96.7	Mirabilite	83.8
Mica	85.2	Lead	65.2
Zinc	76.1	Nickel	88.0
Mercury	91.0	Fluorspar	63.3
Rock Salt	77.1	Potassium	99.3

Source: *China Statistical Yearbook 2010*.

Current status

During the past few decades, exploitation of mineral resources and energy sources have played an important role in promoting the economic development of the whole country, especially Eastern China. Current problems in resources exploitation in the western region include large numbers of small-scale mines, dislocated resource production and consumption, and environmental pollution from mining.

At the same time, currently there is insufficient exploration of resources in Western China due to the low per-capita value of various resources, quality disparities, spatial distribution, poor mining condition and insufficient investment in exploration. Physical access is difficult in many areas, compounded by restricted availability of water and energy resources, due to competition with the dominant hydropower industry. Distance from markets, harsh natural conditions and inadequate supporting infrastructure have collectively meant that despite W. China's natural mineral advantages, these have failed to translate into economic or community gains. Overall development and utilization levels are not high, many mineral resource reserves have yet to be accessed due to insufficient investment in exploration, and mining

⁴¹ Xiuping Zhang, Lingqun Ma, Manqi Ke. *Status of Mineral Resources in China's Western Region – Problems and Countermeasures* (in Chinese). Northern Economy, 2010 (2): 37-39

enterprises face serious problems relating to poor facilities, poor management, destruction and waste of resources and environmental pollution.

Existing challenges

The challenges are linked to both accessing these resources and constraints related to natural resource scarcity, financial, infrastructure and technology matters, but also to the potentially negative impact of their extraction on ecosystems and the health and wellbeing of communities if managed poorly. The recovery rate of major minerals is generally only 30 to 50 per cent, and is 10 to 20 per cent lower in W. China than the national average. There has been a history of small mine development in the region. Due to the lack of environmental awareness and appropriate constraints, serious ecological and environmental problems have arisen due to unfettered exploitation of mineral resources causing significant community unrest and damaging the reputation of the industry both nationally and internationally. The western region has an average altitude of over 1000 meters, a fragile ecological environment, large areas of desertification, and is more vulnerable to predictable and unpredictable disasters and loss of human life associated with excessive resource exploitation. More than 70 per cent of sudden geological disasters occur in the western region. Many mining areas are in multi-ethnic districts and are subject to cross-border environmental problems and social issues relating to national unity, safety, stability and sometimes lack of benefits accruing to local communities.

Opportunities

Opportunities for Western China can be summarized as follows: (a) Through the implementation of the China Western Development Strategy and other relevant policies, special advantages have been offered to mining enterprises in Western China and deliberate action taken to reduce the number of small polluting mines. Significant benefits can flow with the further consolidation of small-scale mines to increase efficiency and reduce environmental damage, noting that they produce over half of China's mineral production. (b) A number of potentially beneficial policy and taxation initiatives are being developed but these need to be implemented more quickly to ensure that resource rents reflect environmental and other costs and stimulate local investment and innovation and promote investment in green technology and community development. (c) There is a need to more explicitly take into account broader health and socio-economic benefits and risks to communities in land use planning and decision-making and provide opportunities for public input. The government has recently announced yet to be implemented changes in this regard. (d) Current policies relating to resources tax require further adjustment. The mechanism for assessing resource development and use is imperfect and the income distribution policy of resources revenues is unclear and is currently not meeting its intended outcomes. Resource taxes are low, while in a resource-rich region, the income of local residents have not proportionally benefited. Decree of the State Council of the People's Republic of China No. 605⁴² supports a policy to steadily promote reform in resource taxes and fees, mainly to increase the rates on standard coal, oil and natural gas, with price-based approach applied for oil and gas. However, the actual

⁴² Decree of the State Council of the People's Republic of China No. 605, *The decision of the State Council on revising "the Provisional Regulations on Resource Tax of People's Republic of China"*, 2011.

implementation of this policy has not yet been evaluated. (e) Natural resource use and decision-making frameworks and information bases should be strengthened. There needs to be site-specific and regionally focused EIAs which have the capacity to address cross-border issues. (f) There needs to be more appropriate cost recovery mechanisms to address mine remediation issues and a comparatively low number of mine sites are currently being remediated. This could include expansion of initiatives such as the guarantee fund to create a more comprehensive green development fund to provide a sustainable source of funds for provincial and local governments to remediate dirty mine sites.

Box 3. Sustainable mining in Australia⁴³

As in Western China, the mining sector is a key contributor to the Australian economy. However, mining companies are acutely aware that the old models of corporate responsibility, which were based on the aim of generating the greatest possible profit for shareholders, are now changing and the broader issues of wealth distribution, community development, environmental protection, health and education and human rights are no longer able to be viewed as just the business of governments.

Sustainable development is directly linked to commercial sense, and it is fundamental to the mining sector attaining and maintaining integrity and credibility, in order to obtain permission from the community and government to continue to mine. In other words, the concept of sustainable development should underpin the nature of the interaction between the government, the community and industry as partners in the development of mining and other resources.

In Australia, the shift has seen the adoption of sustainable development programs. The Australian mining industry is well aligned to the global pursuit of sustainable development. Under the umbrella of “Enduring Value” and the former Ministerial Council on Mineral and Petroleum Resources’ strategic vision, the mining sector has been collaborating with government and community representatives to produce the Leading Practice Sustainable Development Program for the Mining Industry.

The Leading Practice Program provides practical guidance on sustainable development issues relevant to the mining industry through handbooks and workshops to assist implementation of leading practice and the shift towards sustainable development. Workshops based on sustainable development themes were conducted and handbooks used to promote leading practice sustainable development in regional and international forums; for example, a workshop on “Stewardship – Life Cycle Partnerships” was held in Beijing in November 2007.

Traditionally, environmental impact assessment is applied at project (site) level, with little or no consideration of cumulative effects over the long term and at a regional scale. This would result in the situation where an individual project is always justified, while the overall cumulative impacts often lead to environmental pollution and degradation at the regional level. Strategic Environment Assessment (SEA) is, on the other hand, a tool to identify and prepare for the potential cumulative effects upfront, so that large-scale irreversible adverse impacts can be avoided and minimized effectively. It is an analytical and participatory approach to strategic decision-making that aims to integrate environmental considerations into policies, plans and programs and evaluate their linkages to economic and social considerations. A growing number of countries, including Australia, have legislation or regulations prescribing the application of SEA. This is also of particular importance for W. China, where large-scale industrialization, urbanization and resource development are emerging.

In summary, the opportunities for green development in the mining industry require the coordinated application of a range of financial, policy and regulatory and market measures to support and provided incentives for a more acceptable type of mining

⁴³ The Department of Resources, Energy and Tourism, Australian Government, *Social Responsibility in the Mining and Metal Sector in Developing Countries*
<http://www.ret.gov.au/resources/Documents/LPSDP/DEPRES.pdf>

development and offer direct benefits to the community, province and the nation as a whole. This approach seeks to shift the emphasis away from using government funds to fix environmental problems to supporting an industry that is demonstrably committed to broad sustainability principles. Government needs to be more prescriptive in what type of development it is prepared to encourage in this area and place greater onus on developers to behave in accordance with these standards.

3.4 Promoting green and inclusive industrial development

Although major inequities persist, some progress has occurred on narrowing the gap between eastern and western China through industrial development.

Current status

From 2000 to 2010, the industrial value of W. China increased by 20.12 per cent each year, which is 2.90 per cent higher than the national average, 3.82 per cent higher than Eastern China, and 2.19 per cent higher than Central China. In addition, the ratio of industrial added value to regional GDP in W. China had increased from 33.94 per cent to 42.19 per cent, with industry playing a more important role in the economic development of W. China.⁴⁴

While State Council policies and targeted infrastructure programs have promoted the shift of industries from east to west, there are significant concerns regarding the need to ensure effective policies and management instruments are in place to avoid the region becoming an unquestioning recipient of polluting industries from other regions.

Existing challenges

Challenges relate to: (a) dominance of capital rather than labour-intensive enterprises, providing very few employment opportunities; (b) high proportion of state-owned enterprises and low proportion of small and medium sized private enterprises resulting in a shortage of dynamic markets and high barriers to entry for local enterprises; (c) high proportion of resource exploiting heavy industries and low proportion of processing and manufacturing industries, resulting in high pollution emissions and significant environmental costs. In 2009, the proportion of energy/chemical industry and mineral development industry in the region's total industrial output was 63.41 per cent, 17.18 per cent higher than the national average. The proportion of the equipment manufacturing industry in the region's total output was 16.91 per cent, 7.69 per cent lower than the national average. Industry is in a highly resource-dependent stage, mainly relying on launching new projects and enlarging the production scale, which leads to low socio-economic benefits and high environmental resource consumption. For example, the industrial energy consumption per unit of value added is 1.09 times of the national average and industrial waste water discharged per unit of value added is 1.08 times the national average.⁴⁵

Opportunities

⁴⁴ NBSC. *China Statistical Yearbook*, 2001 and 2011, Beijing

⁴⁵ NBSC. *China Statistical Yearbook*, 2011, Beijing

The opportunity lies in the promotion of rapid green industrial development. Western China represents an important potential domestic market and may potentially assist in minimizing China's reliance on its export industry during globally difficult times. Due to the low level of existing industrial development, fewer employment opportunities and many low- and middle-income residents, the region currently has relatively sluggish consumer demand. Green development provides opportunities to address disparities and optimize potential for economic, human and environmental "capitals".

This can be achieved by the expansion of a number of existing and new initiatives. For example: (a) introducing and fostering leading enterprises and industries and actively supporting small and medium enterprises including the more sustainable use of natural resources; (b) developing specialized and competitive agriculture, including improving agricultural efficiency, rural incomes and addressing concerns of food and ecological security; (c) developing the equipment manufacturing industry, acknowledging its potential to speed up and transform industrialization; and (d) supporting the development of people-enriching industries through the use of tax policies, supporting small and growing industries, agriculture and tourism in order to take full advantage of the area's natural characteristics and strong green brand power.

To deal with these issues, some solutions have been proposed in the guidelines for western development in the new decade, issued in 2010. This includes giving full play to the region's advantages while giving priority to the energy industry, agriculture, mineral resources, deep processing industries, and modern manufacturing industry.

Most significant, however, is the need to fully utilise the human capital of Western China and improve the quality of the labour force and the overall access and quality of education and vocational training. The ageing of the population will affect workforce supply and officials and industry leaders have predicted emerging workforce shortages. Greater emphasis is required on strengthening professional training, especially secondary vocational training of practical use for local people.

A transformational change is required in the nature of industry being supported by government to operate in or relocate to Western China. A combination of market mechanisms, including appropriate pricing of natural resources; fiscal programs; and stricter regulatory and compliance mechanisms will be required. Green development funds have been effectively used internationally to assist industrial transformation, especially in towns and cities that are highly resource dependent. There are also opportunities to further promote potential industrial advantages of the western region by strengthening key areas of technological innovation, promoting environmental technology applications and by accelerating the development of a low carbon economy. These efforts will lead to transformational benefits for industry and a greater degree of environmental control and ecological protection.

Industry must be provided with efficient and outcome-oriented regulatory and compliance structures to underpin green entry criteria for development in Western China (see Box 4). Opportunities may also be explored to enable local communities to be reimbursed for participating in environmental monitoring programs.

Box 4. Potential Green Entry Standards & Criteria

Green entry standards or criteria should align with national and provincial green development targets. They must reflect the unique characteristics of the province.

They can include any or all of the following:

- Requirements to evaluate site specific and broader regional impacts and ensure appropriate mitigation strategies
- Strengthen the cost accounting and environmental threat recognition
- Stipulate acceptable emission levels
- Stipulate energy and natural resource use efficiency requirements including effective demand and supply analysis
- Stipulate recycling requirements
- Outline monitoring, auditing and public transparency requirements
- Identify biodiversity or habitat protection measures
- Require social impact appraisals and identify necessary social responsibility requirements relating to health, education, employment and infrastructure
- Stipulate workplace safety requirements

3.5 Promoting sustainable urbanization

Western China has played a critical supporting role for economic advancement in China over previous decades, by providing cheap labor and abundant natural resources, but it is now time to reap some returns.⁴⁶ The level of urbanization can be an indicator of social economic development of a region or nation, and a relative high urbanization level are quite often linked with higher levels of income, education, and job opportunities. Research shows a strong correlation between urbanization and economic growth and between urbanization level and per capita income.⁴⁷ In Western China, a historical trend shows a very strong correlation between the urbanization level and per capita GDP (Figure 6). Recent research shows there are positive correlations between urban growth and economic development in cities, with spillover effects in surrounding regions.⁴⁸ Thus, urbanization and associated changes can become a powerful driving force for socio-economic development, and provide an opportunity for poverty alleviation and human development.

In addition, urbanization has the potential to relieve eco-environmental pressures of population in Western China, both directly and indirectly. Population pressure on sensitive ecosystems through inappropriate and excessive use has been cited as the most powerful agent of ecosystem degradation in Western China,^{49,50,51} and reducing such pressure often becomes the most important task for the many ecological

⁴⁶ Liu, G., Y. Chen, et al.. *China's environmental challenges going rural and west*, Environment and Planning, 2012, A 44 (7): 1657-1660

⁴⁷ Bloom, D. E., D. Canning, et al.. *Urbanization and the Wealth of Nations*, Science, 2008, 319(5864): 772-775

⁴⁸ Bai, X., J. Chen, et al. *Landscape urbanization and economic growth in China: Positive feedbacks and sustainability dilemmas*, Environmental Science and Technology, 2012, 46(1): 132-139

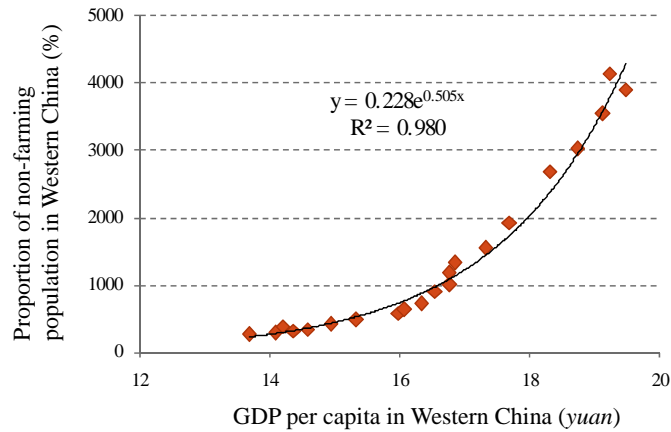
⁴⁹ Jun, W.. *Land degradation and ecological rehabilitation in karst areas of Guizhou province, South Western China*, Advances in Earth Science, 2003, 18(3): 447-453

⁵⁰ Liu, J. and J. Diamond. *China's environment in a globalizing world*, Nature, 2005, 435 (7046): 1179-1186

⁵¹ An, S., H. Li, et al. *China's natural wetlands: past problems, current status, and future challenges*, AMBIO: A Journal of the Human Environment, 2007, 36 (4): 335-342

protection programs.⁵² Cities can provide alternative forms of settlement, education and job opportunities, which can reduce direct pressure on sensitive ecosystems. Indirectly, cities can be more environmentally friendly than rural living. Given the same income level, cities show higher per capita environmental efficiency than their rural counterparts,⁵³ often due to their much higher density and efficiency of scale. Urbanization will inevitably increase the living standards of people and the resource and environmental impacts associated with income growth in Western China, in the long run, can be a more sustainable habitat form.

Figure 6. Urban Population Share and GDP per capita in Western China



Data Source: *China Statistical Yearbook*

Therefore, urbanization done well can improve all of the four “capitals”. It can serve as a powerful agent of change, as the urbanization process requires infrastructure development such as transportation systems and urban environmental infrastructure, accompanies industrial development, and brings about changing lifestyles and consumption behavior of local people. But it is not without risk, and careful attention needs to be paid to the special features in W. China. It is important to note that promoting urbanization in Western China should not aim to attract large-scale migration from outside the region, which was the case in eastern coastal regions, and probably in most other developed countries. Neither should it be about simply enhancing the urbanization level in the region. Rather, it should be promoted as an agent to provide an environmental and socially sustainable habitat form, that: (a) provides support for western development via attracting and retaining a high-quality labor force; (b) reduces population pressures on the ecosystem and environment; and (c) provides a platform for economic development and poverty alleviation. In other words, urbanization in Western China needs to be viewed and utilized as an agent for real, positive change to support the overall green development goal in the region.

Current status

In relation to urbanization, Western China can be characterized as having:

⁵² Liu, J., S. Li, et al. *Ecological and socio-economic effects of China's policies for ecosystem services*, Proceedings of the National Academy of Sciences, 2008, 105 (28): 9477

⁵³ Brown, M. A., A. Sarzynski and F. Southworth. *Shrinking the carbon footprint of metropolitan America*. Washington DC, Brooking Institute, 2008

An overall low urbanization level, but increasing rapidly, and with a strong spatial variety. By the end of 2010, the level of urbanization in Western China was 40.48 per cent, 7.02 percentage points lower than the national average, 7.2 percentage points lower than Central China, and 17.32 percentage points lower than Eastern China. Among Western provinces, the urbanization level varies greatly. At the end of 2010, the urbanization level of Inner Mongolia was 53.4 per cent, the highest among the western provinces, while the level of Tibet was just 23.8 per cent, which was the lowest among western provinces. The urbanization level gap between Inner Mongolia and Tibet was as wide as 29.6 per cent.

Few urbanized areas, with small size and low density. As of 2010, Western China had a total urban area of 36,719.3 km², 0.53 per cent of the total regional area, compared with 2.67 per cent and 6.63 per cent in Central and Eastern China respectively. Within the urban area in Western China, there are 85 cities at prefecture level and above. The average size of cities at prefecture level in the western region, 431.99 km², is almost half the average in eastern cities of 946.97 km².

A relatively weak growth engine function of cities. Many cities in Western China have a similar industrial make-up, with energy, metallurgy and chemical industries occupying the top five major industries. This often leads to over-competition among cities in the region. In 2009, the ratio of GDP in central city areas in the total GDP of the whole city was 55.3 per cent on average among western cities, while the same ratio among eastern cities was 62.5 per cent, which illustrates the lower economic growth of cities in Western China.⁵⁴

Few cities have fully fledged urban function and enough attraction to retain high-end human capital. In Guizhou Province, for example, there 111 graduates with masters or doctorate degrees and 604 skilled workers moved into the region from 1995 to 2000, while the number of well-educated people with masters or doctorate degrees and skilled workers moving out of the region was 147 and 1738 respectively.

Key constraints/challenges

Five key constraints and/or contextual issues need to be kept in mind when promoting urbanization in the western region: (a) The region has a **fragile ecosystem** that provides vital ecosystem services to the rest of the country. Under the Main Functional Zoning, designated protected or limited development areas will limit the type and pathway of urbanization. (b) The **shortage of some key resources**, such as water already is a strong constraint in some W. China cities. In 2010, the per capita water supply in western cities at prefecture level and above was 24.11 tons, less than half of eastern cities, at 49.33 tons. (c) **The geographical location** of the region, which is land locked and far away from the coastlines that play a central role in terms of economic development and urbanization. (d) The region has a **relatively low starting point**, in terms of relatively weak industrial basis, and insufficient hard and soft urban infrastructure. Although there are some exceptions such as Chongqing and Chengdu, local industries in western cities are relatively weak and underdeveloped. and (5) The region has a **rich and diverse cultural background**, with 55 ethnic

⁵⁴ NBSC. Research Report on the balanced development and the overall strength among cities in China, Beijing, 2011

minority groups. Given that urbanization often entails changes in habitat form and associated lifestyle, such cultural diversity can be a constraint in one-size-fits-all kind of urbanization, but at the same time can be a wonderful opportunity to develop vibrant, culturally harmonious cities. Urbanization should be promoted with due respect to this unique natural, economic, and social situation of the region.

Box 5. Eco-city Development in Western China⁵⁵

The concept of Eco-city means a city designed with consideration of environmental impact, inhabited by people dedicated to minimization of required inputs of energy, water and food, and waste output of heat, air pollution, and water pollution, also “low-carbon”. Eco-city construction in China started in 1986 with the goal of building an eco-city in Yichun, Jiangxi province. By February 2011, among 287 prefectural-level cities in China, 259 cities declared their goal of building eco-city (or low-carbon city). Tianjin Eco-city is a fascinating 30 km² development designed to showcase the best new green technologies and to serve as a model for future developing Chinese cities.⁵⁶

Influenced by the national trend on building Eco-city, governments in Western China also are active in promoting the construction of eco-cities. A number of eco-city efforts have been advocated in the western region recently, such as Beichuan County, characterized by low-carbon and post-disaster reconstruction; Turpan, characterized by an eco-city appraisal index system, saving water and energy, ecological protection and historical culture reserve; Chenggong County, characterized by effective urban land use, low-carbon urban planning and urban ecosystems.

Unique opportunities

Western China has unique opportunities in terms of promoting urbanization. First, the central government’s determination to develop the region can be the “wind under the wing” for the region, as high-level political attention and well-designed and coordinated government policy can provide a favorable environment and window of opportunity for sustainable urban development. Second, the relatively low current level of urbanization means there is little “minus” or historical legacy and associated need to retrofit, which can be costly. It also means there is an opportunity to embrace state-of-the-art sustainable development concepts, technologies and practices, including building codes, infrastructure, planning approaches, public transportation systems, low-carbon and eco-city building, taking the construction of the eco-city in Western China as an example (see Box 5). Third, some important strengths and advantages are under-explored: for example, the area’s natural beauty, for building tourist-industry based cities; border regions, for developing small but vibrant trade towns and cities; cities and towns linked with resource and mining industries. Fourth, as urban air and water pollution in eastern cities generates increasing concerns, relatively clean air and water in some secondary cities in the western region can be attractive to well-educated “human capital”.

Box 6. “Five Golden Flowers”, a rural-urban integrative development in Sansheng County, Jingjiang District, Chengdu⁵⁷

To break up the dual structures of urban and rural areas and improve the rural environment, the

⁵⁵ Annual Report of the project of *the Construction of the Eco-city Appraisal Index System and the Evaluation on Typical Eco-city*, Chinese Society for Urban Studies

⁵⁶ http://www.huffingtonpost.com/2011/01/13/tianjin-eco-city_n_806972.html#s221860

⁵⁷ http://www.sdpc.gov.cn/tzgg/zhptggsd/t20070619_142124.htm

government of Chengdu has invested in five villages in Sansheng county since 2003 to build five tailored eco-tourism areas. These projects not only make full use of geographical location advantages but also fit well with current urban residents’ desire to experience rural life. Initiatives have been undertaken through joint investment by the local government and farmers, land transaction, industrial support and institutional guarantees. The Huaxiangnongju project features bonsai, cut flower and tourism industries; Xinfumeilin has plum flower culture and industry; Jiangjiacaidi transformed traditional planting into a new venture; Donglijuyua focused on cultivating chrysanthemum and its relative industries; and Hetangyuese built an art village. In 2006, these eco-tourism areas, labeled the “Five Golden Flowers”, were included among the national AAAA grade scenic spots.



Before 2003, Sansheng was among the poorest suburban counties of Chengdu, but because of the construction of the “Five Golden Flowers”, the socio-economic situation of these five villages has improved significantly. From 2002-2006, the total tax revenue increased from 0.5 million *yuan* in 2002 to 12 million *yuan* in 2006, rural net income increased from 3500 *yuan* in 2002 to 8015 *yuan* in 2006, while the average land price of surrounding areas increased from 0.5 million *yuan* per *mu* to 3.5 million *yuan* per *mu*.⁵⁸ This successful experience shows how citizens’ lives can be transformed without land grabs, demolitions and moving people’s houses.

3.6 Institutional and policy settings as facilitator and driver

Effective policy guidance and institutional arrangements are essential to make the urgent changes required to achieve a green development outcome.

Current status

The current situation with regard to green development policy has been described as chaotic. Although many well-intentioned and effective initiatives exist, others interact to produce unexpected, counter-active, sub-optimal or even unproductive results.

Key constraints/challenges

In order to achieve a cohesive green development approach and outcomes in Western China it is necessary to transform the development model, to make integrated changes in national and provincial policy and practices, and to ensure real enforcement of regulatory frameworks. For example this requires a shift to increased coordination. Central government ministries and programs now interact sporadically. Financial

⁵⁸ Chengdu Municipal Government. *The Report on the urban- rural integrative development in Jingjiang District, Wenjiang District and Shuangliu County* (in Chinese), 2007

support is significant (estimated to exceed \$US90 billion nationally in 2009),⁵⁹ but funding is often short-term, project and issue-driven, with complex and specific eligibility rules that present formidable hurdles for poor, remote communities lacking human resource capacity. It also requires market mechanisms to incentivize investment in, for example, pollution prevention and ecosystem restoration and appropriate pricing of natural resources

Cautiously gearing towards the development target “Two Higher” This target, set in the 12th FYP for Western Development, creates contradictions. However, 77 per cent of the western region is in zones that are “development restricted” or “forbidden” under the National Main Functional Zoning. Large-scale, high-intensity industrialization and urbanization activities are limited in “restricted” areas, and any kind of industrialization and urbanization development is prohibited in “forbidden” areas. The pressure to achieve socio-economic development objectives requiring higher than average economic and income growth rates places great pressure on local officials to enable development that may conflict with the Main Functional Zoning intent. Guidance is required on how to reconcile the incompatible targets, and improvements to the Main Functional Zoning approach.

Weak policy monitoring mechanism The current western development system is still a “top-down” management system, reflecting traditional Chinese practice. The China Western Development Strategy was established by the State Council in January 2000, with Premier Zhu Rongji as team leader of the leading group and Vice-Premier Wen Jiabao as deputy head. Local government departments set up specialized agencies within the National Development and Reform Commission (NDRC) system; relevant departments added units to support the West Development Strategy; and the National Natural Science Foundation Committee also directed talent and funds to support the program. This “top-down” management system probably led to regulation failures since not all departments involved are effectively connected with each other.

Added to these issues are the challenges of: inadequate, inaccurate or misleading information to enable adequate policy analysis;⁶⁰ a lack of mechanisms to effectively engage citizens in the involved communities; and a revenue-and-rewards system for local government officials that drive them to make short-term decisions that will improve GDP results.

Imperfect financial and fiscal mechanisms Since the implementation of the Western Development Strategy, central government funding for Western China was directed by a series of state policies. A large amount of this financial assistance was provided through direct investment, transfer payments, ecological protection and construction projects, and tax preferences. These financial priorities played an active role in promoting growth, increasing tax revenues at the regional level, creating and offering job opportunities, and accelerating industrial restructuring. However, problems in current financial arrangements hinder potential green development:

- The amount of financial support is not matched to the level of responsibility for environment protection, meaning regions taking more responsibility for

⁵⁹ Asian Development Bank. *Toward an Environmentally Sustainable Future – Country Environmental Analysis of People’s Republic of China*. Philippines, 2012, p.81

⁶⁰ Asian Development Bank. *Toward an Environmentally Sustainable Future – Country Environmental Analysis of People’s Republic of China*. Philippines, 2012

environmental protection did not get greater correspondingly larger amounts of funding from central government. This problem is undoubtedly the main cause of the difficulty identifying responsibilities for ecological system protection.

- The transfer payment system aimed at balancing regional financial levels has not been fully established.
- Preferential tax policies need to be further perfected, in particular concerning: (a) Current preferential tax policy only covers a small range of industries. In addition, the tax exemption threshold is too high, which does not benefit many enterprises. (b) Preferential tax policy does not really support the industries currently encouraged by government (there is a list of industries to be encouraged in China). (c) Preferential tax, as a double-edged sword, can also lead to revenue loss for local government, causing fiscal difficulties. (d) The tax revenue division between central and local government adopts a universal tax revenue ratio, which results in a situation where poor regions have less tax revenue, and thus get less money back from central government.
- A long-term and stable funding channel for western ecological protection and social development has not yet been set up, resulting in an important bottleneck restricting on-going development in Western China.
- Current policies relating to eco-compensation are poorly articulated and need to progress from concept to implementation.
- Access to natural resources needs to be based on appropriate pricing policies and encourage efficient resource use by both government and private operators.

Opportunities

The distinctive characteristics of the western region need to be reflected in its institutions. The human and natural capacity limits that are not well recognized in national programs should be addressed. Poverty eradication can be achieved by expanding the focus away from short-term solutions that mainly favor GDP enhancement, which not only may not resolve many of the underlying cultural and environmental issues and drivers, but may actually further worsen the situation. Programs to improve accessibility and healthcare can be better coordinated with those aimed at loss of biodiversity and increased water supply and waste disposal issues (to avoid the experience such as in Qinghai Province, where the Task Force visited a new hospital that had no water and few services). There is a need to adapt to the cultural, language and other needs of distinct minorities living in poor communities.

The impact of significant financial transfer payments on the opportunities to secure progress in environmental management and development of green business made under the 11th and 12th FYPs could be greatly enhanced by an effective eco-compensation program transferring benefits directly to rural residents in a predictable way. The NDRC *“has been made responsible for developing a national ‘eco-compensation’ policy framework, and it is expected that the 12th Five-Year Plan will incorporate this and possibly also a draft law”*, however, *“much work remains to be done... and leadership is required in working with lower level governments to*

develop pilots and eventually scale this up to landscape and regional levels”.⁶¹ The very critical Main Functional Zoning approach is not yet fully integrated either with the eco-compensation approach or with decisions by all levels of government.

The opportunities are significant. China has a long history of focusing on the west and there is a sophisticated and effective planning infrastructure with great potential to change. All officials the Task Force met are dedicated and focused. They need a well-articulated, integrated, consistent and strategic framework within which to work.

Box 7. International case: Zoning and land use planning to improve decision making for prosperity and environmental services, British Columbia, Canada⁶²

Challenge

To make timely decisions while improving the outcomes, consistency, predictability and public acceptability of the resulting resource management and development actions.

Context

- An economy dependent on resources (energy, mines, forests, agriculture) and high-quality environmental services (water, biodiversity) for enabling societal wealth and prosperity.
- Great geographical diversity and very high-quality natural resources facing increasing capacity pressures.
- A history of conflict over decisions.
- Increasing societal pressure for timely decisions which enable resource development but protect environment.
- An increasingly complex and unpredictable decision context due to competing demands, the effects of globalization and the uncertain consequences of shifts like climate change.

Change in practice

- Integrated and improved science-based information systems and increased transparency.
- Extensive engagement of diverse interests (stakeholders) in decision-making and management.
- Development of comprehensive and intricate land use zoning system through public consultation.
- Environmental assessment involves full public disclosure and is a separate agency.
- Establishment of neutral and legal bodies to review and report on implementation activity.
- Full engagement of minority peoples as equal partners.

Lessons Learned

- Zoning systems have limitations in highly complex and diverse environments especially when faced with requirement for constant adjustment and adaptation to changing contexts.
- New decision-making tools and approaches evolved from the first stage of planning.
- Development of well-coordinated and integrated accountabilities among management agencies and officials is essential to delivering effective and responsive decisions.
- Improved, integrated and transparent information systems are essential.
- Sustaining social license approaches becomes equally important as formal legislation and policy structures.
- Cumulative effects tools and risk assessment approaches are required to inform most effective decision-making in public interest.
- The approach must be enabled to evolve and adjust to change.

Applicability to W. China:

This region faces many of the same challenges but at far greater level of complexity. China can learn from this provincial experience and avoid many years of false starts.

⁶¹ Asian Development Bank. *Toward an Environmentally Sustainable Future---Country Environmental Analysis of People's Republic of China*. Philippines, 2012, p.121-122

⁶² External Briefing Advice to British Columbia Government, Derek Thompson & Associates, 2012

3.6 Summary

This is a highly complex region of inter-connected values and issues that require sophisticated management approaches. Despite significant investments and changes already undertaken, severe impacts on the natural environment are already being experienced and some environmental services are at or near a point of severe ecological—and health-related disruptions. Nonetheless, there are also significant opportunities in this region of enormous natural resource wealth and cultural diversity. What is required is a well-articulated, integrated, consistent and strategic framework and approach involving all levels of government.

4 KEY FINDINGS AND ROADMAP FOR WESTERN CHINA

The Task Force has concluded that for China to advance its green development agenda in order to achieve the Five-Year Plan goals and objectives, a roadmap is required to help, guide, structure and demonstrate the overall directions over the next 20 years. We presents a case that such a roadmap is most urgently required first in Western China because of the risks incurred if green development is not achieved there, and because of the potential benefits if this approach is successful. Finally the Task Force has outlined a very initial set of ideas to demonstrate the possibilities of the approach and to enable further discussion.

4.1 What is a Roadmap for Green Development and why China needs one

The roadmap for green development is a simple structure intended to demonstrate the coalescence of wide-ranging initiatives, and to give them focus and direction. It will place the government-announced goals, the FYPs and the Green Development Framework outlined in Chapter 2 into a single cohesive green development strategy. The roadmap includes four components:

- A set of goals that set out the direction for green development.
- A set of principles that can guide work to achieve the goals.
- An integrated set of mechanisms that can deliver green development outcomes for all of the six policy areas.
- A monitoring and evaluation approach that enables informed adjustment to new information.

It is not a set of prescriptive policy directions. Rather, like any map it is a guide or framework by which to assess and review existing policies, governance and planning structures and to assist in the development of further policy initiatives.

Key finding 1: Green development will not be fully achieved until government adopts a national approach that integrates green development into a roadmap with the other long-term strategic and operational mechanisms.

Despite very significant commitments of financial and other resources and many substantial and positive changes, the rate of change toward improved environmental outcomes is too slow: *“While some improvements in several indicators are made each year, the situation in general is not yet under control, and it is unlikely that truly comprehensive improvements in ambient environmental quality will be achieved until*

2030.”⁶³ The Task Force agrees with the ADB’s assessment that a “*strategic shift in the approach to environmental management will be required*”.⁶⁴

The Task Force considers this essential for the following reasons:

(a) *The Five-Year Plans lack a comprehensive and integrated articulation of a green development approach.* The Five-Year Plans clearly provide a major building block to a green development trajectory in Western China. However, they are not sufficient to fully achieve green development in Western China or China as a whole. Effective planning for green development requires guidance, as well as better tools to help officials resolve the fundamental contradictions between the current strategies and the new green approach in an integrated, practical and business-like manner. China needs a national green development strategy supported by a sustainable and appropriately coordinated investment plan at central and provincial levels (including Western China) that will deliver the goal of “balanced, coordinated and sustainable development”. Green development under existing policy settings and delivery mechanisms will be very difficult to implement, or at worst unachievable.

(b) *The scope of the targets needs to be more comprehensive to equally encompass all development goals and provide clarity on contrasting priorities.* The Task Force has concluded that the goals and targets in the 12th Five-Year Plan (see Box 8) are essential components of a green development approach for the nation and that those identified for Western China are also key components. As Box 9 demonstrates, these existing directions have been complemented over the past two years by further policy announcements and commitments of significant national funding and initiatives explicitly for Western China. But all such initiatives do not appear well integrated into a comprehensive framework that addresses the four fundamental goals of enhancing capital for green development.

Box 8. Goals set in the 12th Five-Year Plan for Western Regions⁶⁵

Ecological environment: Forest coverage 19%, forest stock increase by 330 million m³, grassland ecological deterioration trend halted, soil erosion.

Eco-compensation: Establish eco-compensation fiscal transfer system from province to lower levels; study the establishment of deposit system for resource extraction industries; gradually establish inter-regional eco-compensation system; speed up research for eco-compensation regulation.

Energy saving and emission reduction: Strictly enforce the total emission control for main pollutants – energy consumption per unit of GDP in provinces of Western China other than Tibet to decrease by 15%, COD emission reduction by 4.5%, SO₂ by 3.5%, NH₃-N by 6.8%, NO_x by 3.4% compared with 2010; pilot circular economy and low-carbon areas/sectors; control the repeated construction of high-energy consumption and high-emission enterprises; phase out production capacity of resource-wasting, environmental-polluting and non-compliance with safety codes.

Disaster prevention and reduction: Establish direction system of monitoring, warning and emergency system in province-city-county-country level.

Economic development: Economic growth rate higher than national average; system of characteristic

⁶³ Asian Development Bank. *Toward an Environmentally Sustainable Future – Country Environmental Analysis of People’s Republic of China*. Philippines, 2012, p.125

⁶⁴ Asian Development Bank. *Toward an Environmentally Sustainable Future – Country Environmental Analysis of People’s Republic of China*. Philippines, 2012, p.126

⁶⁵ NDRC,. *The 12th Five-Year Plan for Western Regions*, 2010

industry preliminary formed; inclusive development capacity improved significantly.

Standard of living improvement: Income growth rate for urban and rural residents higher than national average; urban economic house coverage over 20%; registered urban unemployment rate controlled lower than 5%; poverty population significantly reduced.

Public service enhanced: Gaps with national level gradually reduced in terms of compulsory education, medical care, cultural and social security; nine-year compulsory education sustained above 90%; urban and rural basic medical insurance participation increase by 3%; new rural pension and urban resident pension scheme achieve full coverage.

Infrastructure improvement: Comprehensive transport network preliminary formed; two-hour transit zones formed for key city clusters; paved roads access to townships and road access to villages basically achieved; additional 15,000km railway constructed; road transport and information communication facilities further improved; water conservation facilities enhanced; additional 120,000t/d municipal waste treatment capacity achieved.

Industrial structural optimization: Population for primary industry decreased, and comprehensive agricultural production capacity increased; secondary industry competitiveness greatly enhanced; tertiary industry greatly developed with increased employment opportunities; promote renewable and new energy sources.

Urbanization: Urbanization rate over 45%; enhance management to improve quality of urbanization.

Integrated urbanization and rural development: Enhance the leading and powerhouse function of central cities; nurture medium and small cities; speed up urban infrastructure construction; integrate urban and rural development.

The Task Force noted that the 12th FYP presents a number of contradictory directions, which officials have difficulty in resolving in the absence of effective mechanisms and processes to guide, monitor, assess and adapt decision-making. Thus progress will continue to be erratic and the goals for green development may not be achieved.

(c) Greatly improved coordination and innovation is needed. Transformational institutional innovation will be required to drive green development. It is widely acknowledged that the lack of (horizontal and vertical) coordination between ministries and programs in China requires significant reforms.⁶⁶ Internationally major governments have adopted greater coordination to more effectively tackle the challenge of complexity and uncertainty. While approaches differ in jurisdictions, underpinning rationales normally relate to reducing waste, increasing efficiency and improving outcomes. This must include a redefinition of the relationship between all levels of government. The Premier's articulation of a need for greater coordination is strongly endorsed by the Task Force, which recognizes that mechanisms to be adopted in China must fit China's needs. Government also needs more experimentation with performance-based, market-driven approaches while continuing to modernize and enhance traditional regulatory compliance and enforcement actions.

⁶⁶ Asian Development Bank. *Toward an Environmentally Sustainable Future – Country Environmental Analysis of People's Republic of China*. Philippines, 2012, p.123

Box 9. Recent Policy Announcements and Commitments

The Technical Guide Rule of Environmental Impact Assessment (EIA) was delivered, which provided general principles, working guidelines, approaches and requirements of EIA on construction programs. In addition, the standards for coal selecting program was delivered, which provides references for evaluation of coal selecting programs and the EIA on coal resources exploration activities.

The Regional Biodiversity Evaluation Criterion was published. Applicable to regional biodiversity evaluation at county level, the criterion was set up to regulate biodiversity evaluation, taking account of national and regional biodiversity status, spatial distribution and variation trends, while identifying national and regional key biodiversity protection areas, and improving general biodiversity protection management.

The Coding Rule for Pollution Sources was introduced to process information and interchanges on national environmental pollution sources management, to promote environmental pollution prevention and control, improve environmental quality, and realize the standardization of pollution source identification.

Environmental Monitoring Measures were established to oversight the environmental monitoring system managed by the Ministry of Environmental Protection and carried by local environmental protection authorities at county level, and environmental supervisory agencies at all levels. The measures aim to establish a sound coordinated working mechanism providing necessary guidelines for environmental supervisory agencies.

The State Council recently issued '**Several Opinions on Further Promoting the West Development Strategy**', which included: (1) promote ecological construction and environmental protection to realize the improvement of the ecosystem and increase farmers' income; (2) continue to speed up key construction projects in infrastructure; (3) further enhance rural infrastructure construction to improve the rural living conditions; (4) take forceful measures to adjust the industrial structure and actively develop and advantage industries that are characteristic of the region; (5) actively promote the development of key development zones and accelerate the growth of regional economic hubs; (6) strengthen the development of science, education, culture, health and other social undertakings to promote the harmonious development of economy and society; (7) deepen economic institutional innovation; (8) expand the funding channel; (9) strengthen the building of talent team; and (10) speed up the process of legal construction.

(d) Improved information and continuous transparent monitoring and evaluation must drive further adaptation. Decision-makers at the central and regional level and in communities lack reliable, relevant and accessible data on the quantity, quality and use of key aspects of all four "capitals". These data are critical to ensuring that any changes to the stocks of capital are reflected and used to inform decisions on the quantity, quality and use of any particular stock at all levels of program delivery. There are many reasons why data are not available, such as cost, accessibility and scale issues associated with the large size and diversity of China. However, the result is that decision-makers and communities lack an accurate and balanced picture of whether "quality growth" is actually being achieved in a harmonious way, as the FYP directs, and whether green development is, in fact, occurring. International experience suggests that a wider range of sustainability indicators is required to inform sustainable decisions and planning. The following are some situations where information is currently inadequate:

- Renewable and non-renewable natural resource stock or carrying capacity data and an assessment of the impacts of use on the resource base. For example, extraction of mineral and fossil fuel resources as a proportion of total stocks.

- Natural resource management, biodiversity and ecosystem health-related targets specific to the western region in addition to China as a whole.
- Regional data to support the effective implementation of the Main Functional Zoning supported in the Five-Year Plan.
- Data and associated information management systems to monitor progress in the achievement of an integrated set of green development targets in both central and other levels of government.
- Accurate state of human health data relative to environmental quality indicators.

4.2 Why a Roadmap for Green Development is needed for Western China

Key finding 2: Western China requires particular attention and should be a priority for application of the roadmap approach to green development in China.

The roadmap approach clearly has potential application for China as a whole. However, recognizing the resource and human capital constraints, a risk/reward based approach suggests that the most immediate pressing needs and opportunities lie in Western China. Without adoption of a roadmap there is considerable risk of repeating old mistakes, but with higher negative consequences to a valuable but fragile natural environment and indigenous cultures, both of which are central to improved green outcomes. The rate of new development raises the level of risk considerably if it is not effectively targeted toward a green development model that effectively deals with regional disparities, resolves past problems and delivers new green growth.

Western China is very distinct and presents a situation where all of the challenges for green development and many of the opportunities co-exist. Most importantly the critical environmental challenges present a significant risk for the whole of China while Western China's natural resource wealth is becoming an increasingly important underpinning of the national economy.

The money and effort already invested in Western China forms a valuable investment base for green development but some problems remain stubbornly unresolved, not only because they are so large and complex but also because the solution to such challenges lies in the strategic and coordinated approach that underlies the roadmap concept. Moreover, many of the opportunities for a green pathway remain as unrealised potential requiring a new approach, not a continuation of past practice.

Finally, there is an opportunity here to “test” new approaches in a situation where change is a recognised necessity and to do so before all of the “new” government and business initiatives begin or are so far advanced that they cannot be re-directed. It is an opportunity at a scale to be found nowhere else in China today and it is one that will not be available again if the challenge is not addressed soon.

4.3 The Roadmap for Green Development of Western China

The following observations about the application of the roadmap approach to Western China serve as an illustration of the approach and as examples of the potential contents. It 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 4. The Green Development Roadmap for Western China

Destination	Guidance	Routes & paths	Methods	Position Locator
Goals & Objectives	Principles	Policy Foci	Governance Mechanism	Monitoring & Evaluation Framework
<p>*Overall goal (green development in western China)</p> <ul style="list-style-type: none"> • Indigenous capacity • Eco-friendly growth • Social inclusiveness <p>*Objectives for</p> <ul style="list-style-type: none"> • Ecosystem protection & management • Mineral and energy management & pollution control • Poverty reduction & labor quality promotion • Sustainable urbanization • Industry transformation • Economic growth & social equality 	<p>*Government leadership</p> <p>*Regional differentiation</p> <p>*Interdependence & coordination</p> <p>*Shared targets & accountability</p> <p>*Informed decisions</p> <p>*Long term</p> <p>*Market and non-market signals and mechanisms combination</p>	<p>*Improved ecological protection & construction & wealth creation</p> <p>*Green energy and mineral exploitation & pollution control</p> <p>*Enabling & regulating new green industry</p> <p>*Enhanced green urban development</p> <p>*Improved institutions</p>	<p>*Government regulation (central/provincial/local)</p> <ul style="list-style-type: none"> • Plans • Legislation & regulation • Tax & fiscal transfers <p>*Market adjustment</p> <ul style="list-style-type: none"> • Carbon market • Emission market <p>*Natural resource pricing reform</p> <p>*Legal system</p>	<p>* Environment assessment</p> <p>* Monitoring and evaluation matrix targeting at each policy focus area</p> <p>* Life-time monitoring mechanism charged by the third party</p> <p>* Public participation</p> <p>* Evaluation on four ‘capitals’</p> <ul style="list-style-type: none"> • natural • economic • social • human

4.3.1 Goal and objectives for green development in Western China

Key finding 3: Specific goals are required for green development of Western China.

Developing specific goals for achievement of “balanced, coordinated and sustainable development” in Western China is a task for government, but the Task Force considers they should be founded in protection and enhancement of the “four capitals” by delivering:

- Goal 1: Eco-friendly growth
- Goal 2: Social inclusiveness
- Goal 3: Indigenous capacity

4.3.2 Guiding green development of Western China

Key finding 4: Further guidance and engagement at all levels is required from senior leadership to achieve green development goals.

When the Task Force met with a range of officials in Beijing and the two provinces (Sichuan and Qinghai) they noted that the Five-Year Plan goals are not always effectively “translated” into practical guidance for officials at the various levels of government. These officials identified a number of conditions and commitments needed to achieve green development in Western China, presented here as a set of eight principles: (see Annex 1 for full listing)

- Government leadership at most senior levels
- Regional differentiation of the issues and solutions
- Interdependent and coordinated mechanisms
- Shared targets and accountability
- Local and accountable actions where appropriate (subsidiarity)
- Integrated and accessible information to enable better informed decisions
- Decision-making mechanisms focused on long-term outcomes
- Market and non-market signals and mechanisms

4.3.3 Policy areas and institutional mechanisms

Key finding 5: Integrated solutions are required to protect ecosystems, reduce poverty and expand economic opportunities to deliver green development in Western China.

(a) Prosperity and ecosystem protection through focus on infrastructure, employment and investment in human capital. Effective solutions to poverty require coordination of infrastructure provision (roads, schools, healthcare, communications and environmental services) with improved educational programs and provision of employment. Since many of the most poverty-stricken communities are situated in locations of greatest ecological fragility where eco-compensation and eco-construction programs are required, and where there is significant potential for both nature-based and culturally focused tourism, there is significant potential to develop long-term programs which deliver joint benefits.

(b) Industrial transformation based on regional assets to expand employment and prevent the spread of polluting industry. W. 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, establishment of thresholds for waste emissions inside the restricted development zones.

(c) Sustainable urbanization to provide attractive functional new centres for growth. Adopt a differentiated and tailored urbanization policy that is coordinated with the implementation of the Main Functional Zoning. Urban development should strive to be a vehicle for achieving Main Functional Zoning within its larger regional context, rather than undermining it.

Enhance urban infrastructure investment as a preventative measure against the negative environmental impacts of urbanization. Given the strategic importance of the western region in terms of water resources in China, and given the relatively low development and financial capacity for the region to build costly urban infrastructure from the beginning, it is essential to develop an effective and efficient financial mechanism to install urban environmental infrastructure upfront, rather than waiting for the cities to obtain financial power to do so.

Develop a long-term, green, eco-city development strategy as follows: building standards and regulations need to be established and implemented; a compact urban development model needs to be adopted to avoid 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 technologies, 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-value-adding industries, eventually hubs for regional innovation and incubation.

Adopt a systems 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.

Key finding 6: Innovation is needed in institutional structures and approaches

(a) The Main Functional Zoning challenge The 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 experience internationally. 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 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 into planning for urban development, ecosystem protection and environmental impact assessments of industrial and infrastructure developments. Such improvements will require cooperation among a wide range of officials at all levels and across a range of disciplines.

(b) Financial mechanisms and infrastructure development These are critical “investment programs” made by central government but they are often characterized as being uncoordinated, short-term, crisis- or issue-driven responses to needs and pressures. They are the key strategic tools which can be employed by government to drive green development and innovation, but that will require adoption of integrated goals and putting in place or re-invigorating a central organizational “architecture” to oversee the delivery of a concerted program.

(c) Market institutions This is the other key mechanism. Green development requires innovation and entrepreneurial solutions to problems and approaches that go beyond the traditional “command and control” measures of regulatory agencies. China clearly intends to employ market approaches. However, the nation lacks much of the necessary architecture that is essential for a fully functioning marketplace. Experimentation and a long-term plan will be required, one that is driven from a central agency.⁶⁷

(d) Independent monitoring and assessment systems Green development will require creative adaptation as well as new integrative approaches. Effective adaptation requires publicly verified monitoring and assessment. Without accurate and transparent information and a neutral publicly accountable entity this initiative will fail to produce the necessary results.

4.3.4 Monitoring and evaluation framework

Key finding 7: New monitoring framework and evaluation approach required for green development.

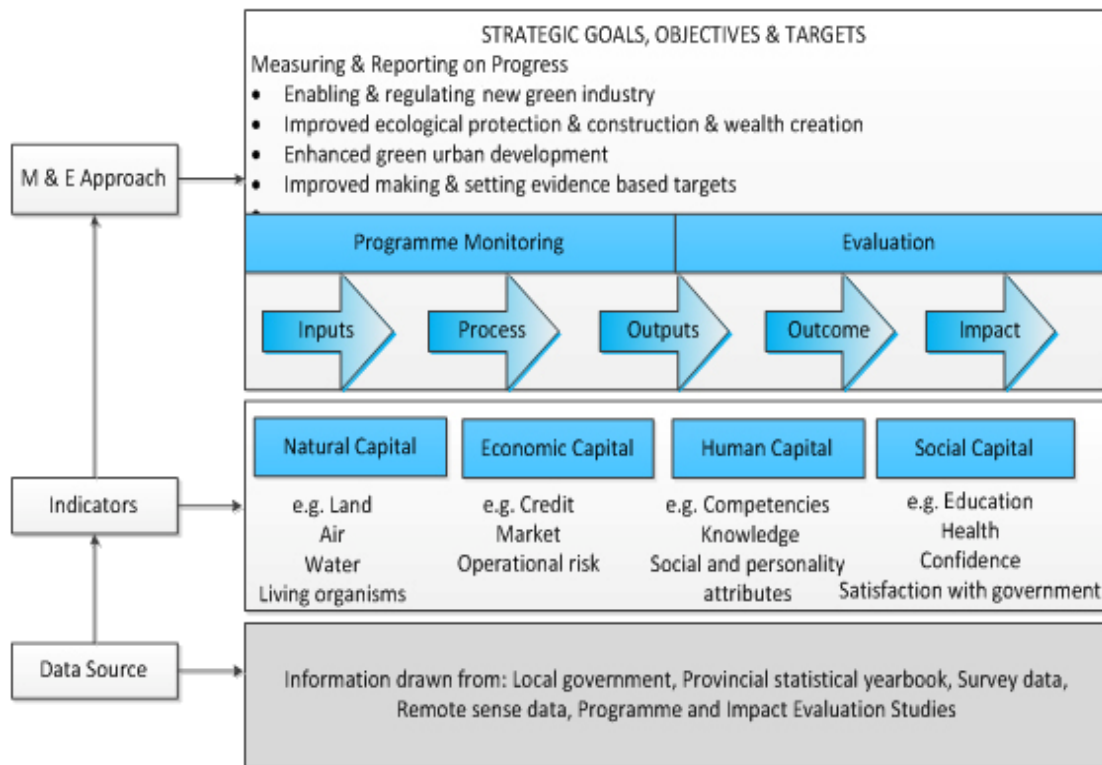
All successful change initiatives require continuous adjustment. This can only be successful if there is a well-developed system that is based on dependable and accurate information that can be used to continuously monitor, report and evaluate progress. In China there has been much work on such systems in recognition of the need to provide officials with accurate reporting and as part of the system to recognise and reward officials. However, officials report that it has been hampered by lack of consistent, accurate, reliable, integrated and publicly verified information. 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 Monitoring and Evaluation Framework is a first step in developing such an approach.

The objectives of the Monitoring and Evaluation Framework are to collect and provide accountable information that will be used to:

- Track progress on implementation of all components of the green development
- Identify gaps and weaknesses in service function provision
- Plan, prioritize, allocate and manage resources
- Monitor the impact of development in Western China on four kinds of “capitals”
- Measure effectiveness of treatment
- Report publicly on current status of key values and progress toward targets.

⁶⁷ Han, G., M. Olsson, K. Hallding, et al. *China's Carbon Emission Trading: An Overview of Current Development*, January, 2012

Figure 7. Monitoring and Evaluation Framework



5 POLICY RECOMMENDATIONS

Consistent with the Task Force key findings and the proposed Green Development Roadmap, the following pages present those items which in the opinion of the Task Force 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 decision and action by the central government.

(1) The Government of China should prepare and implement as soon as possible a Green Development Strategy for Western China.

The Task Force has identified that there is significant need and potential in Western China for green development. However, despite various government announcements and the many initiatives underway in Western China, there is no comprehensive strategy in place that will deliver green development there. A business-as-usual approach will fail. Indeed such an approach endangers the achievement of some of the 12th Five-Year Plan objectives and will limit what might be accomplished in later five-year plans, since various objectives still operate at cross-purposes or are not optimized. Consequently the potential to achieve a different development model and outcomes reflecting the particular assets of Western China will be reduced. The Green Development Strategy should consider the following matters:

- Use the Roadmap for Green Development proposed in this report as a guide.
- The need for a single comprehensive and long-term green development plan (to 2030) covering 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 needs. Sub-provincial level plans can then be developed within each western province.
- Ongoing investment and revenue sources to sustain this approach should be identified and set in place.

(2) Programs to deliver eco-construction and other means of protection of Western China's ecological services, ecosystems and biodiversity should be better integrated and coordinated with those for poverty reduction in provinces and at local levels as a long-term seamless set of programs with a more unified basis of delivery.

It is clear that in Western China (as in other parts of the world) the problems of poverty and ecological protection are completely intertwined and that a solution to the one involves also finding a solution to the other. There are significant new potential education, training and employment opportunities associated with eco-construction and eco-protection. However, current programs are short-term relative to needs and not particularly well coordinated. Local people need to be far more involved in and responsible for these projects and for the continuing management of the projects when they are completed. A more unified program should include the following:

- Develop extensive, innovative pilot initiatives as the basis for long-term major ecological restoration and conservation.
- Central government to lay out and direct the program, and provide funding, guidelines and monitoring.
- Funds should go direct to communities to undertake this work where possible.
- Individuals should have long-term funding assurance for sustainable land management practices.
- Grasslands protection should be given high priority for this approach.
- Funding priority should go to evidenced-based programs.

(3) Invest substantially more in programs specifically designed to increase and improve human capital in Western China to reduce poverty, and to enable the pace and quality of green development to accelerate, especially through green infrastructure construction and servicing.

All studies of successful poverty alleviation indicate that an effective approach is through investment in infrastructure (transportation, communications and education), which China is now undertaking. However, green development requires a well-targeted focus on infrastructure critical for ecological and environmental services provision and protection (for example, water and waste, environmental monitoring stations, tourism services, grassland protection schemes). This needs to be done for both large and smaller communities as quickly as possible. A coordinated focus on human capital is an essential underpinning of this approach, including the following:

- Improve education and training opportunities, focused especially in poor and ecologically fragile communities by coordinating investment in hard and soft

infrastructure for schools (and related institutions), health services, communications and teacher training.

- Build human capacity for green development by targeting opportunities to take advantage of the natural and indigenous potential for such businesses.
- Provide micro-credit and enable cooperatives to develop the capacity of women to improve their own, their families' and their communities' wellbeing.
- Fund local eco-protection, management and environmental engineering programs and training through long-term sustainable initiatives in rural areas.

(4) Reform financial programs and mechanisms at all levels of government to more effectively target and drive green development via sustained funding.

Significant central government financial resources have been and are continuing to be focused on environmental management and community development in the western region. However, the current approach of episodic and uncoordinated funding from a multiplicity of sources is resulting in sub-optimal results. Moreover, the complexity of the system presents difficulty for the poorest communities with the lowest capacities to take full advantage of the available funds. These are, however, the very communities that most need certain types of funding. Three key initiatives should be to establish a *Green Development Fund*, use the *Royalties to Regions* tax policy to support local green initiatives, and to accelerate environmental fiscal reform. In addition, there are other high priority needs for action on improved financial mechanisms that could be undertaken by central and local governments.

Green Development Fund

Given the strong historical reliance on government investment for growth, it is apparent that future growth in Western China will be strongly influenced by the availability of sustainable revenue sources. Commitment to a Green Development Fund will provide greater certainty and appropriate incentives for green development outcomes. The Green Development Fund should encourage “green development” and innovation at the provincial and local levels and ideally provide opportunities for some direct benefits to flow to communities. It may be targeted at both the macro and the micro levels: supporting appropriate “green industry” at the provincial or local level; and providing direct incentives at the local level to start up new ventures capitalizing on the region’s unique features; or undertaking activities to improve the management of ecosystem health. Funding can be directly provided by central government, ideally supplemented by industry-based levies sending price signals concerning more effective utilization and recycling of resources; (waste levies or pollution levies, or increased resource rents are examples).

Royalties to regions

Tax policy can be used more explicitly to provide funds for specific small projects in the western regions. Regions currently receive insufficient direct benefits from resource extraction industries, while bearing the associated direct costs of remediation. The government has publicly announced it intends to use a resource rent tax and other financial measures to progress broader economic, environmental and social measures. These measures need to be implemented as a matter of urgency. Funding should be tied and focused on priorities agreed between the national and provincial governments

on a partnership or matching basis, ideally in accordance with a provincial green development strategy that includes job creation and skills development.

Accelerate the application of environmental fiscal reforms, such as eco-compensation

Eco-compensation needs to move from being a concept to a policy tool that drives green development. The central government needs to prescribe the operating terms for an equitable eco-compensation system at level of the individual, the community and the province. The system should acknowledge the value of ecosystem services provided by Western China but also reimburse the individual rural residents on a long term basis for undertaking desired resource stewardship responsibilities. Clear definitions need to be determined regarding the level of general transfer payments to provinces rather than an ongoing reliance on more short-lived grant programs. Government at central and local levels should undertake the following actions:

- Gradually move away from time-limited, project-based funding toward a more programmed and predictable long-term funding model for eco-compensation, and focus 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.
- Establish a Green Development Fund as a revenue stream to drive new green industry, to enable restoration and to incentivize change through funding, particularly at the community level.
- Require strategic environmental impact assessments (EIA) for all major projects to ensure green development concerns are addressed. Fund the development of an appropriate risk assessment model for use by provinces.
- Encourage integration or improved coordination of financial programs to avoid duplication and competition for resources, and set differentiated targets for program performance in various regions.
- Target additional support to specific green industries and businesses that have natural advantages in Western China or potential to become such: for example, services to or innovations in environmental technologies related to resource industries and environmental management, agriculture and food processing; eco-tourism business and services; production of traditional medicines, cultural industries, woolen carpet production, tourism and recreational businesses, such as the “agri-tainment” complex (farm-based tourism) near Chengdu.
- Apply the recently announced resource tax to specifically promote green development initiatives in the new “royalties-to-regions” program as proposed by the Task Force. That would ensure the flow of benefits from the resource tax back to the communities as a dedicated fund targeted at specific programs.
- Encourage foreign investment in energy, environmental protection, infrastructure and mineral resources, including research and development.
- Extend the user-pay principle to all mining and resource development. Require this industry to actively contribute to community development needs above and beyond job creation. This would include healthcare programs, education and trade schools and programs, eco-restoration works and tourism opportunities to provide tangible returns to the local level
- Provide financial support to encourage transition from existing non-sustainable industrial and pollutant-generating practices, with a special focus on SMEs.

- Establish a Green Infrastructure Fund and ensure that regular (current and future) infrastructure expenditure is consistent with green principles. The aim should be to ensure that existing infrastructure spending reflects green development priorities and is also carried out in accordance with green development principles. This will allow the government to utilize a significant amount of its existing budget as supporting green development rather than requiring new funding. This is also intended to lead to better planning and coordination of infrastructure and can be used to leverage provincial spending.

5. Make Main Functional Zoning work effectively to support decisions and actions which lead to regional balance and green development.

Main Functional Zoning is a relatively recent but critical concept and initiative to guide ecosystem protection, industrial development and urbanization in China. In Western China, where developments interact intimately with key ecosystem functions, zoning is essential to guide officials to make decisions based on ecosystem knowledge and green principles which underlie the Main Functional Zones. However, the current system is still under-developed and not always taken into account in decision-making. The Main Functional Zoning is at such a macro scale that it lacks clear boundaries at the appropriate level of detail. It requires urgent attention to improve implementation in planning, development supervision and enforcement to improve its performance. Otherwise the Main Functional Zoning may fall into disuse and prove to be a hindrance rather than a benefit to ensuring regional balance and green development. Central government should improve the Main Functional Zoning system and its approach:

- 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.
- Identify eco-functional conservation areas, values and ecological services that must be protected, including more focus on biodiversity and critical habitat identification and protection. Such areas are within the restricted and key development zones, but outside designated nature reserves or “no-development” areas. They are critical corridors or sensitive areas requiring special management.
- Integrate planning for national nature reserves and for urban and industrial planning along with the Main Functional Zoning system.
- 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.
- Strengthen the regulatory regime for the mining industry, including eco-compensation, and increase supervision of existing mining enterprises.
- Adopt a monitoring system (and use high technology satellites) to be applied to all “restricted areas” to ensure compliance with regulations.
- Strengthen enforcement capacity by enlisting local community support. Build the capacity of enforcement staff. Local government accountable for non-compliance.
- Improve the coordination of EIA with the Main Functional Zoning and include risk assessment, cumulative impacts and social impact assessment into EIA decisions, especially within restricted development zones.
- Improve natural resource data concerning ecological values and potential, to support decisions in the Main Functional Zones.

- Commit to state-of-natural resources auditing to be used to monitor progress and achievements in the application of decisions in Main Functional Zones.
- Improve granularity (geographic scale/detail) of the data and planning approach to address regional and local green development (including land, water use, biodiversity and resources issues).
- Give priority to progressing a sustainable water planning and allocation framework and appropriate natural resource pricing to support green development.

6. Develop and adopt a sustainable urbanization model, including an eco-city approach tailored specifically to the needs and interests of provinces in Western China.

Urbanization is an important conduit to ensure the green development of the western region. New urban areas can act as a focus for investment, innovation and the development of new opportunities. They can also be a magnet to attract people from poor and fragile rural areas and provide them with improved opportunities. However, done poorly, urbanization can concentrate and increase pollution, diminish the quality of life for residents and add to the regional burden of environmental problems. Government should do the following:

- Adopt a differentiated and tailored urbanization policy, which is coordinated with implementation of the Main Function Zoning Plan.
- Enhance urban infrastructure investment as a preventative measure against negative environmental impacts of urbanization.
- 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. Draw upon the experience of existing eco-cities in China and other parts of the world.
- Invest in soft infrastructure to enhance the livability and attractiveness of western region cities. 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 as is found around Chengdu. Urban environment and development related planning, management and policy should maximize positive spillover effects of urbanization, and minimize negative resource, environmental or social impact in peri-urban areas.
- Ensure building and workplace safety issues are given a high priority.

7. Encourage new green industries that reflect the character of Western China in the key and limited development zones, especially in areas of high poverty and areas of the greatest potential.

There is significant unrealized potential for green development focused on the particular characteristics of Western China. Much of the current industrial development in the region is focused on a narrow band of industry offering relatively low levels of employment and which do not sufficiently provide opportunities based on the special character of the region. It is important to encourage new industry and green development based on the indigenous characteristics and values of the region. There is also considerable pressure and negative potential for “brown” industry to

re-locate in Western China from the east and to spread poor practices into a region of greater ecological fragility. Government should do the following:

- Assist and encourage through specific funding and incentive programs the development of “green development industrial parks” where there is demonstrated potential.
- Identify a list of green potential development situations throughout Western China. For example, in Xining consider the potential to enhance existing initiatives using products from the grasslands to expand and enhance employment of rural residents while protecting the grasslands.
- Set a “green entry standard” for all industrial development, particularly in the restricted development zones, to ensure that polluting industry does 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, where appropriate, go beyond these standards.

8. Strengthen institutional innovation to drive long-term green development.

External assessments and statements by China’s senior leaders all recognize that innovations in the organization and management of institutions will be an essential part of achieving green development. This is particularly relevant in Western China, where the capacity of governments at the provincial and local levels is often limited and resources are stretched over vast areas. Innovations in improved approaches to vertical and horizontal coordination and cooperation appear to be essential aspects of a transformative change towards green development. Government should do the following:

- Adopt the principles proposed in the road map and commission an implementation process to complete the Green Development Strategy for Western China with appropriate targets and milestones.
- Strengthen/reinvigorate the Western Development Office and require all ministries to coordinate through this office initiatives for infrastructure and human capital development intended to enhance green development.
- 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).
- Enhance and promote the roll out of the Ministry of Environmental Protection program to establish strengthened regional centers, and better coordinate it with similar initiatives by other ministries.
- Undertake in each province a set of pilots to transfer management responsibility and accountability for eco-construction programs to specific communities with appropriate resourcing.
- Coordinate and integrate fiscal programs to deliver the Green Infrastructure Program as identified in other recommendations.

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 that task is more daunting because this region is so environmentally fragile, many of the people are so poor and are representatives of minority groups for whom 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.

Annex 1. Principles for Green Development in Western China

Government leadership at most senior levels

Leadership and strategic planning by government is the political foundation for the green transformation, requiring a beyond-GDP mentality, not only at the national but also regional and local levels. Leadership is required in policy-making and governance mechanisms; by setting an appropriate regulatory framework, sending clear price signals and establishing an effective incentive structure.

Regional differentiation of the issues and solutions

One set of standards and approaches between central agencies and various regions or within the regions does not recognise and effectively adapt to discrete and significantly different characteristics of these various entities and the problems faced by Western China. The inadequacy of one-size-fits-all policy must be acknowledged and regional differentiation of the issues and solutions must be fully considered.

Interdependent and coordinated mechanisms

Interdependent and well-coordinated mechanisms should be strengthened to recognise interconnectedness among issues and to facilitate joint problem-solving including with the existing policies. Planning (cross-regional, sectional and jurisdictional) is required to be sufficiently broad in its focus to bring about alignment (rather than competition or cost/burden shifting).

Shared targets and accountability

Integration and coordination is improved where there are shared targets that acknowledge regional diversity and interdependence between regions in China and with clear lines of accountability.

Local and accountable (subsidiarity) where appropriate

Enable, empower and fund effective delivery of services and accountability at the provincial and local levels where appropriate. Local governments, which have been granted partial executive and financial power, should take responsibility for and be assessed on their delivery of green development.

Integrated and accessible information to enable better-informed decisions

Establish an integrated and accessible information system to improve the reliability, accuracy and integration of environment and resources data and improve the flow between departments. The information system should be independent, and this system must be accessible to not only governments at all levels but also the public. Only in this way it is possible to adopt an evidence-based approach to natural resource and land use planning and decision-making.

Decision making mechanisms focused on long-term outcomes

Acknowledge the long-term nature of the challenges and the need for sustainable growth measures to be pursued, and adopt a timeline stretching out to 2030. Decisions should balance improvement of long-term outcomes against current pressures.

Use of both market and non-market signals and mechanisms

Acknowledge the complementary roles of governments and the markets in driving reform. Market signals and mechanisms are more functional in increasing economic efficiency gains, while non-market methods such as executive intervention are more efficient in the field of environment protection.

Annex 2. Summary of the Feedback from Stakeholders

Regional differentiation and distinctiveness. Stakeholders pointed out that one set of standards and approaches between central agencies and various regions or within the regions may well not recognise and effectively adapt to discrete and significantly different characteristics of these various entities and the problems faced.

Principle of subsidiarity. Enable, empower and fund effective delivery of services at the local level where appropriate.

Coordination mechanism. A new approach is required to recognise the interconnectedness of many of the issues involved and to enable officials to work together to solve problems and deal with existing policies.

Integration. Highly related to coordination but taking the further step of formally aligning various functions and services to ensure accountable delivery of programs that will both protect natural values AND provide for social and economic advancement.

Build more effectively on the western region as a significant conservation area for natural values. This requires recognition in policy and in funding that the region has special values and characteristics, which mean that it will not be able to maximise industrial or other outputs and will therefore forgo some revenue opportunities. This in turn necessitates recognition of the particular costs involved, while the regional agencies may well not have sufficient funds to offset under current financial policies.

Use Main Functional Zoning more effectively. There was clear agreement that this is a significant tool but also many concerns that it has yet to be proven to be effective in enabling and supporting the decision-making process.

Improve the environmental assessment process. It was indicated that the natural values and constraints in certain parts of the region are of such importance and fragility that there is a need to “raise the bar” and to ensure that cumulative impacts are considered in decision-making. This was argued especially in terms of placing effective and justified constraints on the mining industry.

Comprehensive and specific plan for energy resources. These are of such a scale and have such significant implications for green development that a separate plan is required.

Poverty reduction is the focal point for this work. The Task Force needs to make it very clear that green development is ultimately about development that benefits the advancement of poor people and communities; and does so with no long-term harm to productivity of the natural environment.

Improve the performance evaluation process for individuals and programs. There needs to be an alternative to GDP that is formally recognised and backed up by an improved and fully integrated monitoring and evaluation approach, trusted and respected by all.

Costs and impacts of development need to be recognised, fully accounted for and properly offset. This applies particularly to all resource industries.

Eco-compensation mechanism needs to be formalised. There was particular concern that this needs to recognise the foregone profit (or simple loss) for individuals when they are asked on behalf of the entire nation to give up their historic occupation or place of residence.

Plans for financial transfers to the region needs to be fully integrated. This means that the flow of money needs to better and more directly relate to the demonstrated needs of the various government entities. At present, the feeling is there is little formal acknowledgement of these interrelationships.

Ethnic minority regions need a differentiated policy and practice. This would acknowledge the reality that these regions have very different cultures and very different approaches to, and opportunities to attain, increased prosperity.

Annex 3. ACKNOWLEDGEMENTS

We appreciate the China Council for International Cooperation on Environment and Development (CCICED) for leadership and guidance on this Task Force study and its provision of financial support for the project. This support from CCICED made possible the discussions, communication, and studies involving experts from China and around the world, which have served as the essential foundation for this work.

We would like to express our heartfelt thanks to the Chief Advisers of the CCICED Advisory Committee, Professor Shen Guofang and Dr. Arthur Hanson; the leader of the Chief Advisers' Support Team, Dr. Ren Yong; Assistant Secretary of MEP/FECO, Dr. Fang Li; the CCICED Secretariat (Beijing); and the International Support Office (Vancouver) for providing advice, information, organization, and support. We would also like to extend our cordial thanks to the CCICED. Moreover, we would like to express our thanks to Dr. Arthur Hanson especially for his involvement in the whole process of research and his invaluable guidance on formulating the final report.

As part of the research process, two field trips were carried out by the Task Force, one in Qinghai and Sichuan province, as a survey of typical areas in Western China, and the other in Australia, as an international experience research tour.

The typical areas survey included visits to: Jinhe Tibetan Medicine Company; the carpet factory of the Tibetan Sheep Group; Qinghai Museum; Kumbum Monastery; Changhong Group Company (a pilot of energy saving and emission reduction in production); Shuangliu County (a pilot of the "circular economy" model); Jingjiang District and Dujiangyan District of Chengdu (pilots of integrated urban-rural development). The surveys also included Qinghai Lake and Dujiangyan; and consultations with local officials in Qinghai and Sichuan provinces. These visits were for the most part organized by the Department of Environmental Protection of Qinghai Province and the Department of Environmental Protection of Sichuan Province, to which our special thanks are extended. We would like to specially thank Rukun Yang, Director-General of the Department of Environmental Protection of Qinghai Province, Qiang Zhou, Deputy Director-General of the Department of Environmental Protection of Qinghai Province, and Rong Yang, Deputy Chief of Pollution Control Division in the Department of Environmental Protection of Sichuan Province, all of whom provided invaluable help during the survey.

The international research tour included visits in Australia to Sydney Olympic Park; Kakadu National Park, the Ranger uranium mine (operated by ERA), the NSW Office of Environment and Heritage, the Supervising Scientist, Department of Sustainability, Environment, Water and Communities, and the Department of Resources, Energy and Tourism and consultations with traditional owners. These visits and briefings took place with the financial support and assistance of Australia's Environment Department, to which our special thanks are extended. We would also like to express our sincere thanks to the traditional owners of Kakadu for their hospitality and briefings regarding the broader cultural and land management issues in a co-management model. Our special thanks go to all those participating in the briefings, which gave us the benefit of significant international experience.

The Task Force team is also grateful to the representatives who attended our stakeholder consultation meeting to provide comments and advice on policy recommendations, from the following departments: National Development and Reform Commission, Ministry of Environmental Protection, Ministry of Finance, Ministry of Land and Resource, the State Council Leading Group Office of Poverty Alleviation and Development, Ministry of Housing and Urban-Rural Development, Department of Environmental Protection of Qinghai Province and Department of Environmental Protection of Sichuan Province. We would also like to express our thanks to the many experts who attended our meetings to provide presentations and advice on their fields of expertise.