
8. Low-carbon Growth and its Implications for the Less-developed Regions¹

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Introduction

With the Industrial Revolution, human society started a process of modern economic growth. Standards of living rose at an unprecedented pace in the countries in which was established. This growth paradigm was, however, built on high resource use, high carbon emissions and high levels of pollution. The paradigm has brought prosperity to the established industrialised countries, and motivated the rest of the world to achieve the same prosperity following the same pathway. The negative consequences associated with the old way of industrialisation include great damage to the environment, inevitably giving rise to various crises (Rockström et al. 2009).

The development paradigm of ‘pollution first and clean-up later’ established since the Industrial Revolution is no longer feasible.. A continuation of modern economic growth within that paradigm is inconsistent with the health of natural systems that are essential for the success of human society. The development paradigm must be fundamentally shifted to a new green development paradigm if climatic catastrophe is to be avoided. For all countries, including both developed and developing countries, green development is not a matter of ‘whether’, but ‘how’ to take it up. Latecomer countries to modern economic growth and poor regions can no longer achieve their economic development by taking the traditional development paradigm. Developed countries, too, are required to accelerate the shift towards green growth at a more advanced level of development.

It is therefore important to clarify from a theoretical point of view whether, as a new paradigm of development, green growth can help latecomer and poor countries or regions grow out of poverty. Various studies reach different conclusions (for example, UNEP 2011; King 2013; Dercon 2012). For green growth as a way to eradicate poverty, the narrative goes something like this: poor regions,

¹ This chapter is based on a presentation the author gave in Guizhou Province, China, in 2013. Guizhou is one of the poorest provinces in China. The idea is being developed in a more rigorous analytical framework by the author.

and the majority of their populations, depend directly on natural resources. Their livelihoods are intricately linked with exploiting fragile environments and ecosystems (Barbier 2005). Therefore, transition to a green economy can contribute to the improvement of the environment and preservation of the ecosystems, through which poverty can be eradicated. A number of sectors with green economic potential are particularly important for the poor, such as agriculture, forestry, fisheries and water management. Investing in greening these sectors, including through scaling up microfinance, is likely to benefit the poor in terms of not only increasing jobs, but also securing livelihoods that are predominantly based on ecosystem services (UNEP 2011:19–20).

If, however, the implications of green growth for poverty reduction are limited to that sense, it may help impoverished areas rise out of poverty, but is unlikely to offer them abundant prosperity. Green growth represents a fundamental shift in the development rationale and paradigm. Such involves substantial changes in the structure of production, consumption, trade content, business models, conceptions of resources, and modes of urbanisation and living. These changes can overcome the traditional development constraints impeding poor regions from achieving economic prosperity, and open new opportunities. Accordingly, the implications of green growth for poverty reduction should be investigated in the context of the fundamental shift in the development paradigm.

This chapter investigates how green growth can become a new lever to accelerate development in poor areas. We first put the issue in the context of China, and then discuss its significance for the rest of the world. In the second section, we investigate some unique advantages poor regions have for promoting green growth under new conditions. The third section explores the implications of the green growth paradigm for poor areas. The following section focuses on the policy framework of how to make green growth a lever for new development. The final section concludes.

New advantages for poor regions in promoting green growth

Fundamental changes in historical conditions for development in poor regions

According to traditional development views, poor regions restrained by geographic remoteness, inaccessibility, small markets, and lack of resources, capital, talent and technology encounter a variety of development obstacles. Such a traditional concept of development no longer applies because of the

substantial changes to two historical conditions, and the advantages and disadvantages of poor regions for development can even start to reverse to some extent.

First, the economic take-off in poor areas coincides with the fundamental changes of the development concept and paradigm worldwide. The reason developed countries and the coastal regions of China followed a path of high resource use, high carbon emissions, high levels of pollution and environmental degradation is largely because they knew no alternative path during the early stages of modern economic growth and did not have the concept of green growth in mind. Though the coastal regions of China followed the traditional path of industrialisation that had been taken by the developed countries, they suffered large environmental consequences. In contrast, poor regions, thanks to their unfortunate underdevelopment, avoided going down this traditional path and retained their beautiful natural and cultural characteristics. Today, with the rise of the green growth concept, these beautiful natural and human environments have become rare and valuable resources for economic development. Their advantages now stand out. It is possible for poor regions to take a new road by turning their vital natural and human resources into wealth.

Second, historic changes in global economic and technical conditions have created conditions for poor areas to follow a green path. All around the world, technical conditions and infrastructure linking poor areas with developed regions have undergone tremendous changes: broadband, information and communications technology (ICT), 'mega-data', freeways; high-speed railway; and advanced logistics systems. Small-scale, decentralised facilities based on renewable energy can provide electricity at costs that are as low as the large, centralised systems of the big cities. In China, more than 30 years of rapid development have hugely expanded domestic market size. China's coastal areas relied primarily on exports to Western markets as the mainland Chinese market was very small in the early years of reform and rapid growth. Now, developed areas in China can provide a sufficiently large market for poor regions to specialise in producing goods and services in which they have comparative advantage.

How changes to historical conditions have broken traditional development constraints

Changes in the two major historical conditions discussed above have removed or weakened many traditional development constraints in poor areas. Some disadvantages in poor areas have even reversed.

First, geographic remoteness in poor areas is no longer a prominent constraint on their development. Rapid development in broadband, ICT, freeways, high-speed railways, aviation, private vehicles and logistics systems have helped overcome the disadvantages of distance.

Second, the small local market in poor areas is no longer a problem. With the emergence of online shopping and convenient logistics systems, poor areas can be directly connected with advanced outside markets. In poor areas, people can also buy goods from around the world via e-commerce. Similarly, locally produced goods can easily be sold to the global market online.

Third, lack of capital is not a problem either. After 30 years of rapid development, China now generally has abundant capital. Additionally, as long as liberal financial policies are in place, microfinance is proving successful in very poor areas. Thus, capital is no longer a particular constraint. Resources are not allocated to where they are most needed due to the weaknesses in an inadequately reformed financial system and low capacity for innovation.

Fourth, human capital in poor areas is not really a big problem. New business models can, to some extent, solve this problem. For example, in franchise businesses, the franchisees don't have to be well educated. They just need to join a franchise network to access support. Thanks to ICT and mega-data, and rapid transport systems, massive use of distant talent is now possible. Professionals in Beijing, New York, London and other major cities are able to provide high-quality remote medical, educational and consulting services for any part of the world. In addition, a large number of rural migrant workers moving from poor areas to cities have been well trained through experience at work. They have important human capital for economic development in poor areas.

Finally, natural resources are not a particular problem. In the traditional development mode, tangible material resources like minerals and petroleum come to mind first and are important for development in poor areas. In the new model of green growth, poor areas have the most valuable natural environmental resources. As the traditional industrial model of 'pollution first and clean-up later' in developed areas is being left behind, the environmental advantages of poor areas rise even more prominently.

It is clear that, with new thinking and a new growth paradigm, many of the traditional restraints long hindering the development of poor areas have disappeared or have been greatly reduced. It is possible for poor areas to take a new green growth path. Moreover, unlike the developed economies the transition cost to green growth is relatively low in poor areas since they do not need to eliminate obsolete infrastructure and production capacity before switching to a green growth path.

It is therefore possible for poor regions to make the transition to green growth a lever to accelerate development. Poor regions can directly link to outside developed markets and convert their vital natural and human resources into wealth. Under a new development paradigm, some poor areas could jump into modern society within a relatively short period (World Bank and DRC 2012).

Green growth: new opportunities for poor regions

What opportunities can the green transition bring as a lever to poor regions? To recognise this, we need to understand the mechanism of economic development and know how it comes into play in the green growth paradigm.

Mechanisms of economic development

According to Yang (2003), the core of classical economics is development economics. According to Smith's theorem (1776), the division of labour is the source of economic growth; the division of labour is limited by the extent of the market; and the extent of the market depends on transport. Young (1928) further pointed out that not only does the division of labour depend on the extent of the market, but also the extent of the market depends on the division of labour. Transaction efficiency plays a decisive role in the evolution of the division of labour. Research on transaction costs offered a new perspective for understanding the division of labour (Coase 1937). Yang (2001) argued that the level of the division of labour increases with the increase of transaction efficiency, as does productivity. In particular, with an increase of transaction efficiency and the level of the division of labour, the possible ways for entrepreneurs to organise the division of labour will increasingly expand, thereby providing them with more room to make money.

Currently, one dramatic change is that transaction efficiency has increased significantly. First, information flows have become convenient. With the popularisation of ICT, mega-data, the Internet and smart phones, information flows quickly. Second, thanks to the rapid development and popularisation of high-speed transport systems, population mobility has become more convenient. Third, logistics systems have become fast. Fast, convenient and smart logistics systems have greatly enhanced transaction efficiency.

Enhanced transaction efficiency promotes the evolution of the division of labour and provides a driving force for economic growth. A larger change, however, is that economic development is transferring to the green growth paradigm. An essential change in the green growth paradigm is that the

economy is being dematerialised and value added increasingly comes from information, knowledge, the environment and other intangible elements.² This contrasts with the traditional development paradigm, in which the focus is on material production and consumption. For example, as expenditure on online reading and recreation increases significantly, the corresponding services can be provided in a more dispersed, convenient and cheaper way. Services like massive online open courses (MOOC) and distance services for medical care, agriculture and production can be provided via ICT. From a Boeing 747 to an i-Phone, tangible materials take up an increasingly smaller proportion of value added, while information and technology account for an increasing proportion.

The downgrading of use and output of materials has significant implications. Since intangible products, like the environment and knowledge, are non-rival, they can be used and consumed innumerable times with almost zero marginal cost. This substantially enhances productivity in a fundamental sense. It leads to sustainable low material consumption, low-carbon emissions, and environmental protection, while the economy continues to grow. Meanwhile, as the production and consumption of dematerialised products do not particularly rely on the physical concentration of populations and goods, they in turn greatly enhance transaction efficiency and accelerate the evolution of the structure of the division of labour.

Opportunities created by green growth in poor regions

Since green growth is substantially different from traditional industrialisation established since the Industrial Revolution, many conventional development views formed under traditional industrialisation are no longer applicable. For poor regions, enormous new opportunities are emerging in green growth.

First, poor regions may undertake a different pattern of urbanisation to achieve economic prosperity. The conventional development notion treats economic development as a process of urbanisation in the form of massive population transfers from rural areas to big cities. Population concentration can greatly enhance transaction efficiency and minimise the cost of providing utilities and public services, generating the so-called agglomeration effect, economies of specialisation and economies of scale. Hence, the core value of urbanisation is to improve transaction efficiency and lower the cost of public services. Due to the rapid development of the Internet, ICT, transportation and logistics systems, however, transaction efficiency has been dramatically improved and public services can largely be provided online, so the physical

2 The dematerialisation is substantially different from the increase of the service sector's share occurring at an advanced stage of development. The change is irrelevant to development stages, but the value of intangible products and services should be fully recognised.

concentration of populations is much less important for economic development. Therefore, poor areas do not have to follow a conventional urbanisation pattern. This is especially the case since green growth in poor regions will be based substantially on their immovable natural ecology and rich local cultures and customs. Smaller towns and rural communities connected with ICT and fast transport may be an alternative path to take.

Second, with the change in the concept of resources, the advantages of poor regions are standing out, as a healthy ecological environment is an invaluable resource for green growth. The traditional industrialisation model relies on inputs of tangible material resources and neglects the value of intangible resources. Intangible resources, however, like the ecological environment and online social capital, can all be translated into wealth. For instance, expenditure on experiencing local culture has considerable value. In many poor areas, intangible local cultural and natural resources have been well conserved due to underdevelopment. Environmental resources—unlike coal and oil—are inexhaustible and non-rival, which means that, within carrying capacity, almost no marginal cost is incurred as more people enjoy the environmental services and more industries are based on it.

Third, the change in business mode brings about new opportunities for poor areas. E-commerce has stimulated enormous new business models. China's online shopping market has been growing rapidly. According to McKinsey and Company (2013), China's online shopping volume reached US\$190 billion in 2012—almost equal to that of the United States. By 2020, the trading volume of online shopping in China will reach up to US\$650 billion and surpass that of the United States, the United Kingdom, Japan, Germany and France combined. This has significant implications for economic development in poor areas. According to Smith's theorem, the division of labour is limited by the extent of the market. In the past, local markets in poor areas have been too small to support local economic development. Nowadays, with online trade, the market in poor areas has been dramatically expanded through direct links to advanced national and global markets. Moreover, consumers in poor areas can also conveniently buy goods from outside markets. The convenient transaction conditions lead to rapid expansion of market scale and provide necessary conditions for enlarging the production chain in poor areas.

Fourth, modern green agriculture in poor areas could be a high-value sector. Agriculture no longer equates with low productivity. In a traditional sense, economic development means to 'eliminate' farmers through industrialisation; however, great changes are currently occurring. Modern agriculture organised according to modern corporate systems based on a good ecological environment could be very profitable. Also, agricultural production organised according to the modern mode has become an industry integrating agriculture, processing

and services. As transaction efficiency increases greatly, the market value of agricultural products produced in remote villages with healthy ecological environments could be significantly appreciated if sold in the high-end market.

Fifth, in the new development paradigm, farmers' labour activities might produce extra value added. For example, from the traditional perspective, farmers' work in paddy fields only produces rice. Nonetheless, the farmers' labour activities also produce scenery and experience that could be a big attraction to tourists. This is an example of how the resources that would previously have been neglected can be fully utilised in a new growth paradigm that is based more on non-material resources.

Sixth, the new patterns of economic development make it easier for poor areas to take a new industrialisation path. Unlike the traditional industrial mode of large-scale production, the third industrial revolution represented by three-dimensional manufacturing is a distributed and customised mode of production, in which more knowledge is compressed into less material resources. In China, some poor regions see the transfer old industries from the coastal areas as a big opportunity; however, this so-called opportunity is still on the traditional industrialisation path. Poor areas and countries should not depend on such industries and repeat the old model of 'pollution first and clean-up later'. They should go along a new manufacturing path by seizing the opportunity of the latest industrial revolution to outperform developed areas.

Seventh, it is possible for poor regions to overcome the barriers to development by taking advantage of ICT. For instance, the MOOC and online medical and educational services make it possible for poor regions to share the high-quality educational and medical services of the developed areas. The online provision of services goes beyond the limitations of time and space, and professionals do not have to travel to the poor regions in person to provide their services. Therefore, the lack of talent, education, medical care and so on in poor areas can be overcome in a different way by taking advantage of ICT.

Eighth, new energy resources have enormous potential in poor regions. This is particularly the case in China, since new energy resources including solar, wind and hydro-electric energy are richest in poor areas. In particular, the new distributed energy mode with feed-in-tariffs can provide a stable revenue source for individual farming households. With rapid development of new energy technologies, the cost of new energy resources is declining quickly. According to the *2011 Renewable Energy Report* of the United Nations (IPCC, 2011), new energy resources are expected to meet 80 per cent of global energy demands by 2050, and therefore are economically feasible.

Ninth, ecological and environmental protection in poor regions can become a new source of revenue. The following examples explain how. Some have argued that to shut down a polluting factory would decrease GDP; however, the output of a polluting factory may lead to greater losses for the surrounding area. Therefore, closing the factory or forcing it to clean up might actually improve output and the welfare of the whole society. Furthermore, environmental protection may enable the economy to jump to a more competitive structure for the division of labour. Take ecosystem services payments as an example. Ecological protection is of great value because it brings about: 1) increase in value of agricultural products, such as food, fibre and fuel; 2) ecological regulating services (such as pollinating crops, purifying water and stabilising climate); 3) cultural services (many industries can be developed based on a healthy ecological environment); and 4) ecological support services (Vincent 2012). For the ecological regulating services, if the upstream environment of a system is well protected, losses downstream will be greatly reduced, and its output will increase. The ecological services provided by the upstream environment cannot, however, be sold directly in the market, so provision of ecological services has little returns from the market. In this situation, it is difficult to have a ‘win-win’ outcome between the upstream and downstream, so the upstream adopts behaviour such as destroying forests to obtain short-term income. Consequently, ecological deterioration continues and a ‘lose-lose’ structure becomes reality. In this case, the Government must step in to identify the beneficiaries of ecological services in the downstream areas and charge them, and pay for upstream protection through transfer payments. This makes environmental services provision a self-interested behaviour and lead to a ‘win-win’ situation.

Tenth, regional cooperation to reduce carbon emissions can bring about considerable benefits for poor regions. Carbon emission entitlements are increasingly becoming a scarce resource. Once a country sets a goal for carbon emissions reduction, or an emissions cap, emissions entitlements become valuable. If carbon emission entitlements are allocated among all areas on a per capita principle, poor areas with low per capita emissions can benefit by selling carbon emission entitlements to developed areas, while taking a new low-carbon development path.

Finally, for poor areas, in addition to the revenues they can receive from ecological services, the most promising source of growth is to develop industries based on their high-quality environment. In a poor area, various services taking advantage of a healthy natural environment—such as an international convention centre, resorts, recreation, medical treatment, sports, health care, education, summer camps, music festivals, cultural creativity, and so on—can be developed in a relatively short period by taking advantage of ICT.

Mechanisms and policymaking for green growth

Challenges to the existing development model in China

Green growth poses quite a big challenge to China's long-established government-led development model. Green growth is largely decentralised and highly market-based, like the ICT industry or distributed renewable energy. The traditional Chinese growth model, however, especially the rapid development of some underdeveloped central and western regions in recent years, mostly depends on investment from the large enterprises owned by the Central Government. Though GDP in these poor areas has been quickly increased, it has resulted in enormous environmental damage, and ordinary people's incomes have not risen proportionately.

Over the past three decades, as a catch-up economy, China has been mainly copying the development path of Western countries. Green growth, however, must rely on innovation. When there's a target ahead, it is relatively easy for the Government to copy in decision-making. However, for green development, China has nothing to copy since green development is new in all countries. Only strongly innovative countries will become leaders in green growth.

How to achieve green growth in poor areas

The basic idea to make the green growth path a lever for promoting development in poor areas is to turn vital ecological qualities into wealth, by taking advantage of modern technologies and new business models. The following 'three pillars plus five policies' framework is particularly essential.

Pillar 1: Imposing a strict policy of environmental protection

The natural environment is a big assets for economic development in poor areas. The Government should implement the most stringent policies of environmental protection and emission mitigation. Strong government action on the environment is a requirement for the market to function well and for the improvement of the welfare of the whole society.

Pillar 2: Building up green infrastructure

The Government should vigorously build up green infrastructure in poor areas, which will create the conditions to convert the natural resources into wealth. Efforts should focus on the development of Internet access, ICT, fast transportation, logistics systems and renewable energy in poor regions.

Pillar 3: Establishing an effective mechanism to 'turn green into wealth'

In addition to the above conditions, the Government and the market must play their respective roles. Specifically, the Government can focus on the following five policies.

First, governments can use the new model to directly provide high-quality public goods and services to poor areas. For instance, by taking advantage of ICT, the Central Government can, at very low cost, easily provide poor areas with high-quality education, health care, manufacturing services, and access to online talent and other resources as public goods, so as to overcome the hurdles poor areas face in their development.

Second, the Government should introduce urban market forces into poor areas by deepening structural reforms. In particular, the Government should attract urban capital and talent to poor areas through land reform. Poor areas are unlikely to achieve economic take-off by relying on poorly educated local farmers. It is essential to completely lift the barriers separating urban and rural areas so as to facilitate the free flow of capital, talent and other resources from urban to rural areas. If rural land system can be reformed to allow urban residents to settle in rural areas, it would awaken the huge sleeping wealth in poor areas.

Third, strict environmental policies should be implemented on a market basis. This includes: 1) establishing and further improving ecosystem services payments; and 2) setting up a diversified system of emission reduction, including an emissions trading scheme.

Fourth, policies should be developed governing capacity-building and fostering green industries, including fiscal and tax reforms. At present, the deficiencies in fiscal and tax systems are an important factor preventing poor areas from taking the green growth path. Under such a system, local governments have a strong incentive to introduce high-pollution industrial projects with high output so as to quickly raise taxes and improve their capability for public service provision.

Finally, the Government should undertake some regional pilot projects for green growth. China has initiated a new round of comprehensive programs for deepening reform. Such institutional reforms will provide huge benefits for China's economic development. The eighteenth CPC National Congress proposed the concept of an ecological civilisation. China could set up a number of special ecological civilisation zones in which to experiment with some major relevant reforms.

Concluding remarks

To sum up, it is no longer feasible for poor regions to rise out of poverty and further achieve prosperity through the traditional development path that the industrialised countries took after the Industrial Revolution. All economies, including poor, rapidly developing and developed countries, need to take a new path of green growth. Green growth represents a development paradigm shift and could become a new lever to promote development in poor areas.

Poor areas possess unique advantages for green growth. Due to 'underdevelopment', most of these areas retain vital ecological and cultural advantages that become important, scarce resources for economic development. Especially with the support of the Internet, ICT, online shopping, and fast transport and logistics systems, this advantage becomes outstanding, and most of the traditional development constraints facing poor areas in the past are being overcome, and more and more opportunities are emerging.

Though this chapter focuses on the opportunities that green growth may bring for poor areas in the context of China, most of the ongoing changes under the new paradigm of green growth are universal. Its principle is applicable for economic development in the least-developed countries. Poor areas have their unique advantages to grow their economies in the green growth paradigm. If this exploration turns out to be successful in some areas, it would be a great contribution with global significance for other places in the world, including underdeveloped African countries. The paradigm the developed countries established from the Industrial Revolution can enable only a small portion of people on the planet to enjoy prosperity. The new path of green growth aims to bring about shared prosperity for the whole world.

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