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Skills for Green Jobs in China



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First published 2018

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Skills for Green Jobs in China

ISBN 978-92-2-132907-7 (print)
978-92-2-132908-4 (web pdf)

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Abbreviations and acronyms

ACFTU	All-China Federation of Trade Unions
ALMPs	Active Labour Market Policies
APEC	Asia-Pacific Economic Cooperation
AQSIQ	General Administration of Quality Supervision, Inspection and Quarantine
CASS	Chinese Academy of Social Sciences
CBRC	China Banking Regulatory Commission
CDPF	China Disabled Persons' Federation
Cedefop	European Centre for the Development of Vocational Training
CIRC	China Insurance Regulatory Commission
CO₂	Carbon Dioxide
CSRC	China Securities Regulatory Commission
CYLC	Communist Youth League Central
EV	Electric Vehicle
GDP	Gross Domestic Product
GHG	Greenhouse Gas
ILO	International Labour Organization
INDC	Intended Nationally Determined Contribution
IRENA	International Renewable Energy Agency
IUE	Institute for Urban and Environmental Studies
MCA	Ministry of Civil Affairs
MEP	Ministry of Environmental Protection
MIIT	Ministry of Industry and Information Technology
MOA	Ministry of Agriculture
MOE	Ministry of Education
MOHRSS	Ministry of Labour and Social Security
MOST	Ministry of Science and Technology
NTCC	National Tripartite Consultative Committee
MW	Megawatt
NBS	National Bureau of Statistics
NEV	New Energy Vehicle
NDRC	National Development and Reform Commission
NRDC	Natural Resources Defense Council
NGOs	Non-governmental organizations
PBC	People's Bank of China
PM_{2.5}	Particulate Matter 2.5
PV	Photovoltaic
R&D	Research and Development
SAC	Standardization Administration of the People's Republic of China
SAIC	State Administration for Industry and Commerce
SASAC	State-owned Assets Supervision and Administration Commission of the State Council
SAT	State Administration of Taxation
TVET	Technical and Vocational Education and Training
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WDI	World Development Indicators

Abstract

This report aims to explore the progress of green skills development in China since 2010. China has prioritized green development in almost all of its leading economic sectors in the past few years. It made significant efforts to address climate change and realize ecological civilization construction. The dramatic economic and employment structure shifts create considerable demands on the provision of green skills to keep up with the green transition process. However, the lack of a comprehensive policy framework for green skills training is causing an inadequate skills response to become a challenge.

The objective of this study is to summarize the progress of China's green skills provision since 2010 and promote the necessary strategies relevant to green skills development in China. The study relies on literature and document reviews for the analysis. Some relevant case studies are also presented in the report to exhibit the trends and good practices in provision of green skills. Based on the analysis, some recommendations are included at the end of the report.

Acknowledgment

This study was conducted by Ying Zhang from the Institute for Urban and Environmental Studies Chinese Academy of Social Sciences, as a part of set of national studies on skills for green jobs conducted in some thirty countries globally. The set of studies is the result of collaboration between the ILO and the European Centre for the Development of Vocational Training (Cedefop). Overall methodological guidance was provided by Olga Strietska-Iliina (ILO Employment Policy Department, Skills and Employability Branch). Coordination of country studies and technical backstopping was provided by a team led by Catherine Saget (ILO Research Department), Tahmina Mahmud (ILO Skills and Employability Branch) and Takaaki Kizu (ILO Research Department). Moustapha Kamal Cuyee and Marek Harsdorff (ILO Enterprises Department) contributed to the studies' implementation on behalf of the ILO Green Jobs Programme. Alena Zukersteinova and Stelina Chatzichristou from Cedefop's Department for Skills and Labour Market coordinated studies among the participating EU countries. Valuable inputs were provided by the ILO colleagues: Christine Hoffmann, Laura Brewer, Maria Ilca Lima Webster, Alvaro Ramirez Bogantes, Hassan Ndahi, Fernando Vargas Zuñiga, Patrick Daru, Akiko Sakamoto, Mikhail Pouchkin, Gabriel Bordado, Julien Magnat, Kanae Tada, Tendy Gunawan, Bolotbek Orokov, Gwyneth Anne Palmos, Georginia Pascual, Badiane Cheickh and Kishore Kumar Singh. Massimiliano Leone, Ana Buzdugan (International Training Centre ILO Turin), Mariela Dyrberg and Annette Brandstätter (ILO Employment Policy Department), Solveig Boyer (ILO Green Jobs Programme) and Manuela Flamini (Edizioni Retrò s.r.l.) were responsible for editing and design.

Executive summary

Introduction

Greening initiatives in some leading economic sectors indicate that the Chinese government is making great strides in shifting the country's economic development to a more sustainable path. China's green development and green transition will inevitably affect demand for labour. New jobs demand a workforce equipped with new skills. Other workers need to be re-trained and re-skilled to adopt greener practices in their work. But the lack of a clear green skills provision mechanism and policy framework are recognized as a major bottleneck in China's green transition.

Major changes of the economy and employment shifts in the green transition

China has been showing signs of a slow-down in recent years. As a result the Chinese economic development model, traditionally driven by manufacturing, investments and exports, is currently transitioning towards a model focused on domestic consumption, services, innovation and green economy. China has set several major green development targets aiming to reduce pollutant emissions, viz.: improving drinking water sources and quality; controlling pollution caused by hazardous chemicals and dangerous wastes; improving urban environmental infrastructure operations; reversing ecological deterioration; improving nuclear safety; and enhancing environmental regulatory institutions.

Two traditional drivers, exports and investment, have driven China's rapid growth in the past three decades. Nevertheless both of these drivers are no longer as powerful. Finding an alternative engine to stimulate economic growth and reshape the Chinese economy is one of the key challenges for the country to overcome in the years to come.

At present China's environmental pressure is growing. It has to achieve the new emission reduction targets while improving economic efficiency at the same time. Thus, implementation of green transformation in

China is imperative. China has prioritized green development in almost all leading economic sectors. Efforts have been undertaken to boost energy efficiency in industry, transportation, and buildings; to develop wind, solar, and other renewable energy sources; to create a resource-saving "circular" economy; and to transform traditional sectors through the use of energy-efficient and environmentally-sound technologies.

With the economic restructuring, the employment structure of China has also experienced notable change in recent years. The green and low-carbon emerging industries will also expand new areas of employment and create many new jobs. Optimization of the employment structure in industries - the increasing share of people employed in tertiary industry and creation of new jobs in strategic emerging industries - shows the trend of green and low-carbon transformation in China. It also exhibits the results of speeding up the pace of industrial transition and the increase in labour productivity.

Key policies and regulations

China is already on the right track of a potentially earthshaking transition. The Chinese government recognizes that "greening" the economy is an emerging global aspiration and has embraced the strategic goal of boosting the country's economic growth while also enhancing environmental protection. There is already a strong policy framework in China for supporting the green economy transition.

China is also among the countries most severely affected by the adverse impacts of climate change. At same time, the total amount of China's carbon dioxide emissions dwarf those of all other countries. China has for long attached great importance to addressing climate change, making it a significant national strategy for its social and economic development and promoting green and low-carbon development as an important component of the ecological civilization process.

China's top leaders have emphasized that employment is closely connected to sustainable economic development and people's livelihoods in many different ways. Based on its own national conditions, the Chinese government has explored and drawn on international experience in its practices, gradually improving its relevant legal system, and formulating and implementing a set of proactive employment policies. China is determined to support job creation by encouraging micro and emerging businesses to grow vigorously and applying flexible social security to those sectors to protect employees' rights. Various subsidies have been introduced for the start-ups set up by college graduates and overseas returnees.

Although the environmental and climate change imperatives are already integrated into its overall development and growth strategies, skills development strategies are not at present systematically included in national climate change and green transition policies in China. The main reason for that is the weak coordination between national planning and the Ministry of Labour. Another reason is that China has for a long time focused on the quantity rather than the quality of the workforce, thus with less attention to skills training or provision vis-à-vis job creation. Thus, there is currently almost no policy specifically designed for green skills development in China.

The role of social dialogue in promoting green skills in China is dwarfed by the lack of a clear policy framework on skills development. In contrast with many western countries, the trade unions and employers' association seldom participate in the planning, design and implementation of skills development in China. It is the role of government to guarantee an environment which encourages or legislates for workplaces' involvement in negotiations.

Skills development measures for the green economy

China is attempting to clearly define what are green jobs and identify green occupations, but the efforts are quite limited compared with those in many other countries. Although there is some categorization of green occupations in China,

the explanations or descriptions of the criteria for green occupations are not so clear.

In fact the knowledge system for green skills is still under construction in China. There are various shortcomings and deficiencies in the current green skills training system, especially the **Technical and Vocational Education and Training (TVET)** system. The contributing factors to all these deficiencies are quite complex. There is no authoritative and consistent definition of which jobs are green. The lack of qualified teachers in the TVET system to provide green skills education and training and the lack of awareness of the importance of skills development both become major barriers to providing the desired green skills training from the TVET system.

China's economy faces relatively large downward pressures and some firms face difficulties in production and operation, which could lead to an insufficient level of employment. The increasing number of graduates nowadays also adds pressure to the job market. Faced with such employment pressures, appropriate proactive employment policies are urgently needed. The Chinese government has formulated a set of policies for promoting the re-employment of workers laid off from China's traditional heavy industries owing to the measures taken to phase out outdated production capacity and promote reforms from the supply side. However, no specific attention has been placed on green skills training to help these laid-off workers find new jobs.

The Chinese government encourages and guides private capital into the education sector and continuously improves relevant financial and tax policies. It is expected that the private sector will contribute more in the future and play an important role in offering the green skills training most needed.

To enhance cooperation and coherence between different departments, China has established a joint conference mechanism between various ministries to discuss the policies and measures relevant to job skills development. However, an inter-ministerial coordination mechanism on green skills provision is still lacking.

Recommendations

Establish a system to identify and anticipate green jobs or green skills

There is an urgent need for a more rigorous approach to the analysis and anticipation of demand for green jobs and related skills in China. There are already various kinds of jobs considered as green jobs in China and it should continue to create new green jobs in each industry. It also needs to speed up the process of developing green job standards by develop specialized green training and gradually improve the range of green employment and its training standards system.

Incorporate green concepts in development of skills training curricula

The current curricula in the skills training and education system should integrate more green elements. Further emphasis should also be placed on greening TVET as a catalyst for cross-sectoral planning and implementation of programmes in priority areas. It is necessary to incorporate generic green skills as an important content of teaching objectives in the current vocational skills training system. Skills training curricula should be reviewed periodically to ensure they remain up-to-date and thus able to maximize the employability of students and their adaptability to the labour market implications of green growth.

Set up a complete green skills evaluation system and green professional qualification standards

Green-collar assessment and evaluation should be developed according to green job standards so as to gradually develop green job practitioner qualifications and green skills assessment. By setting up the national vocational qualification evaluation institution, specific national green vocational qualification standards can be established based on the development and real situation of green industries. Professional qualification standards for corresponding green industries change accordingly, so it is necessary to improve the catalogue of professional qualifications. A national unified green skills

vocational qualification certificate system is urgently needed.

Enhance policy coordination and encourage social dialogue in green skills provision

Green skills development must be integrated into the wider environmental and climate change policy framework, rather than being seen as additional to or separate from other forms of skills development. The closer cooperation of different departments, different levels of governments, employers, employees, policy-makers and educational institutions will be of benefit in green skills development.

When designing green skills development policies, all social partners should be involved more closely in discussing the details. Responsibility should be shared between the government (which has primary responsibility), enterprises, the social partners, and individuals.

Encourage the private sector to invest more in green skills development

The private sector, including individuals and enterprises, should be encouraged to engage with skills development through incentives to invest in acquiring new skills or in upgrading and maintaining their existing skills.

Improve the quality of jobs and maximize the green jobs potential

During the process of offering green skills training, more attention should be placed on occupational safety and health, minimizing of waste and protection of workers' rights. All these elements may contribute to the improvement of job quality and the avoidance of occupational hazards.

To increase employment rates, policy-makers need to deliver a policy portfolio to maximize the jobs potential for green transition. China could find it more useful to focus on attracting investment in expanding labour-intensive renewable energy capacity.

1. Introduction

Since the beginning of the 21st century, and especially during the 11th and 12th Five-Year Plan periods 2006-2015, China has prioritized green development in almost all of its leading economic sectors. One of the greatest promises of China's green transition is the potential for expanded employment in industries and economic sectors that can help slow and reduce the environmental impact and contribute to the mitigation of climate change. The increasing importance of green transition will create a large demand for new skills and qualifications.

Greening initiatives in some leading economic sectors indicate that the Chinese government is making great strides in shifting the country's economic development on to a more sustainable path. As a largely top-down political system, China has set goals for nearly every aspect of sustainable development over the coming five years. With tremendous investment already approved and additional support policies being planned, the country has established a long-term green vision and will almost certainly meet or surpass its ambitious green economy goals.

China's green development and green transition will inevitably affect demand for labour. There will be continuing job losses in energy-intensive industries as China is adopting policies to phase out outdated and excessive production capacity. However, new jobs are being created in industries producing low-carbon goods and green services through cleaner production methods. Employment practices are currently changing across the board because firms are including environmental considerations in their decision-making. The transition to a green economy is creating new jobs and changing existing occupations. New jobs demand a workforce equipped with new skills. Other workers need to be re-trained and re-skilled to adopt greener practices in their work.

Labour market and skills policies that facilitate a smooth and just transition will form an essential component of green growth strategies. But the lack of a clear green skills provision mechanism

and policy framework are recognized as a major bottleneck in China's green transition.

This report presents a synopsis of the China's policy development since 2010. The following were the specific objectives of the study:

- a) Identify major challenges in the structural transformation that derive from the key drivers of change;
- b) Profile the latest greening policies, programmes, regulations and measures for economic development;
- c) Identify and analyze greening skills needs;
- d) Summarize the current status and challenges of TVET provision for green skills and other forms of green skills development such as proactive employment policies and skills training offered by the private sector in China;
- e) Provide good examples of green jobs and green skills training in China in key industries;
- f) Draw conclusions and policy recommendations for skills policies and strategies.

The study combined both qualitative and quantitative research methods. In order to obtain some quantifiable data, various national reports believed to contain relevant statistics for the study were reviewed. Although China has attempted to promote green employment and green skills training, there are still many barriers in its way. There are still many limitations on research into training mechanisms and standards. China has not yet had the right strategic skills development responses in the light of environmental degradation, climate change and the global call for greening of economies. Data on green employment and green skills are scarce and, where they exist, most have not been disaggregated by occupation to give a detailed impression of their status. Therefore, the research has relied on interviews and focus group discussions to obtain the necessary information.

2. Major changes of the economy and employment shifts in the green transition since 2009/10

2.1 Major changes in the economy

In the last few decades rapid economic growth, significant industrialization and urbanization have brought greater prosperity and higher living standards to many Chinese, but the success of China's development has had consequences, including high demand for energy and raw materials, increased pressure on ecosystems, and health consequences. China's leadership recognizes that the country will need to find a different developmental model that will allow growth without generating significant environmental pollution. Green objectives have long been a part of China's economic plan. However, it was not until the 11th Five-Year Plan (2006-2010) that China set targets for increasing consumption of renewable energy sources and reducing energy-intensity rates and pollution emissions. Total investment in treating environmental pollution has increased by 15 per cent annually and environmental investment had reached 1.33 per cent of GDP by 2009.

2011 is the beginning of China's 12th Five-Year Plan (2011-2015). China's commitment to developing a sustainable economy, emphasizing domestic consumption and putting a green economy at the heart of the planning process, is already embodied in China's 12th Five-Year Plan. In this plan China has set seven major green development targets, as follows: reducing pollutant emissions; improving drinking water sources and quality; controlling pollution caused by hazardous chemicals and dangerous wastes; improving urban environmental infrastructure operations; reversing ecological deterioration; improving nuclear safety; and enhancing environmental regulatory institutions. There are binding and anticipatory indicators for these

targets. Each indicator should be assessed each year and also by the end of the whole five-year period. It can be seen from Table 1 that all the targeted indicators were recorded by the end of 2015.

With the release of the 13th Five-Year Plan at the joint meetings of the National People's Congress and People's Political Consultative Congress in 2016, China has shown that it intends to continue and strengthen its efforts to realize the green transition and shift its energy structure from coal to cleaner energy sources. In the new plan for the following five years, which will be a pivotal period for its efforts to green its energy and economy, China has set tougher targets for reducing energy intensity and carbon intensity and stricter targets for other aspects of environmental protection. Furthermore, it is the first time in China's history that a specific Particulate Matter 2.5 (PM2.5)¹ target has been included in a Five-Year Plan. It is clear from the details of its plan that the government is determined to reduce emissions from coal-intensive industries and vehicles; to bolster cleaner and more efficient use of coal; to promote the use of electricity and natural gas in place of coal; to provide support for the wind, solar and biomass power sectors; to increase the share of clean energy; to encourage the use of waste straw as a resource; to reduce in-field burning; and to implement control measures for air pollution.

The 13th Five-Year Plan will impel China to deepen its green transition process. However, at

¹ PM2.5 refers to atmospheric particulate matter (PM) that have a diameter of less than 2.5 micrometers, particles in this category are so small that they can only be detected with an electron microscope. These particles generally come from nature as well as human activities such as transportation, burning fossil fuel, and the human activities are the major source resulting in harmful damages in the human history. PM2.5 due to its tiny body can be harmful to human body as it can carry virus as well as other harmful matters and travel a long distance before it can be inhaled by human beings.

Table 1. Completion of green development indicators in 12th Five-Year Plan

INDICATORS	INITIAL LEVEL AND TARGETS		ANNUAL GROWTH	CATEGORY	CUMULATIVE COMPLETION
	2010	2015			2015
Area of cultivated land(million hectares)	No less than 121.2		0	binding indicator	135.1
Water consumption per unit industrial added value(per cent)		-30	-6.89	binding indicator	-30.58
Effective utilization coefficient of agricultural irrigation water	0.5	0.53	0.03	anticipatory indicator	0.532
Share of non-fossil energy in primary energy consumption (per cent)	8.3	11.4	3.1	binding indicator	12
Reduce energy consumption per unit GDP (per cent)		-16	-3.4	binding indicator	-19.71
Reduce carbon emissions per unit GDP (per cent)		-17	-3.7	binding indicator	-20
Reduce total chemical oxygen demand(per cent)		-8	-1.7	binding indicator	
Reduce total sulfur dioxide emission(per cent)		-8	-1.7	binding indicator	
Reduce total ammonia emission(per cent)		-10	-2.0	binding indicator	
Reduce total nitrogen oxide emission(per cent)		-10	-2.0	binding indicator	
Forest coverage rate(per cent)	20.36	21.66	1.3	binding indicator	25
Forest stock volume(billion cubic meters)	13.7	14.3	6	binding indicator	15.1

Source: Summarized from China's 12th Five-Year Plan and Annual Statistical Bulletin.

present the fundamentals for China's economic development environment have undergone profound changes.

After witnessing nearly three decades of double-digit growth, China has been showing signs of a slowdown. According to official statistics economic growth has averaged 10.0 per cent from 1980 to 2010, but the rate dropped to an average of 7.7 per cent after 2010 (see Figure 1). In 2016 China's annual GDP growth rate was only 6.7 per cent, the slowest since 1990. Since

2015 China's GDP has grown by 6.9 per cent, the lowest level in the past 25 years. As a result of the economic slowdown, the Chinese economic development model, traditionally driven by manufacturing, investments and exports, is currently transitioning towards a model focused on domestic consumption, services, innovation and green transition.

Two traditional drivers, exports and investment, have driven China's rapid growth in the past three decades. Nevertheless, neither driver is

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any longer powerful. China's previous economic growth model, often referred as investment- or export-driven, proved highly successful but its weaknesses became more evident when the global financial crisis erupted and international trade suffered a sudden collapse. As the global leader in international trade, China is critically dependent on the state of the global economy and foreign demand for its products. In the global economic crisis the economic systems of many countries suffered, imposing a huge shock to China's trade. According to data released by the General Administration of Customs, the growth rate of exports has continued to decline since March 2010 (see Figure 2). In 2015 and 2016 China's exports experienced negative growth and the share of exports in GDP dropped to only 18.6 per cent, the lowest since the start of the new century. The weakness of exports has led to the slowdown of GDP growth. Finding an alternative engine to stimulate economic growth and reshape the Chinese economy is one of the key challenges for the country in the years to come.

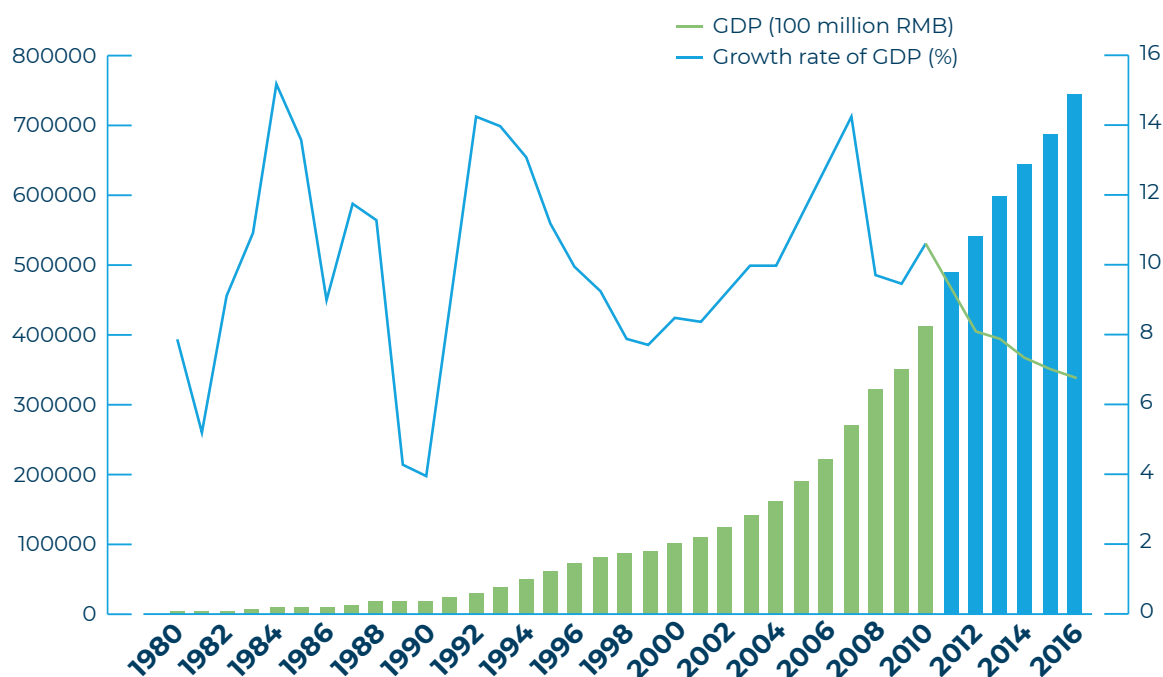
Manufacturing industries that produce investment goods are suffering from

high overcapacity rates that average between 30 and 40 per cent. At the same time manufacturing firms that produce labour-intensive goods are rapidly losing competitiveness owing to rising wages and other costs. With the continuous rises in income and wages, a shortage of effective labour supply has occurred from time to time in some areas. Since 2011 many labour-intensive enterprises have faced the common problem of "labour shortage". Some industries need to upgrade to stay competitive.

Meanwhile, with the rapid growth some important strategic resources (petroleum, iron ore, natural gas and refined copper, etc.) also face severe supply shortages. China has to import them from overseas at high cost. The rise of the cost of land, labour, capital and basic resources is causing China to move into a "high-cost" era. The rise in costs and the slowdown of economic growth have impelled China to transition to a new growth pattern.

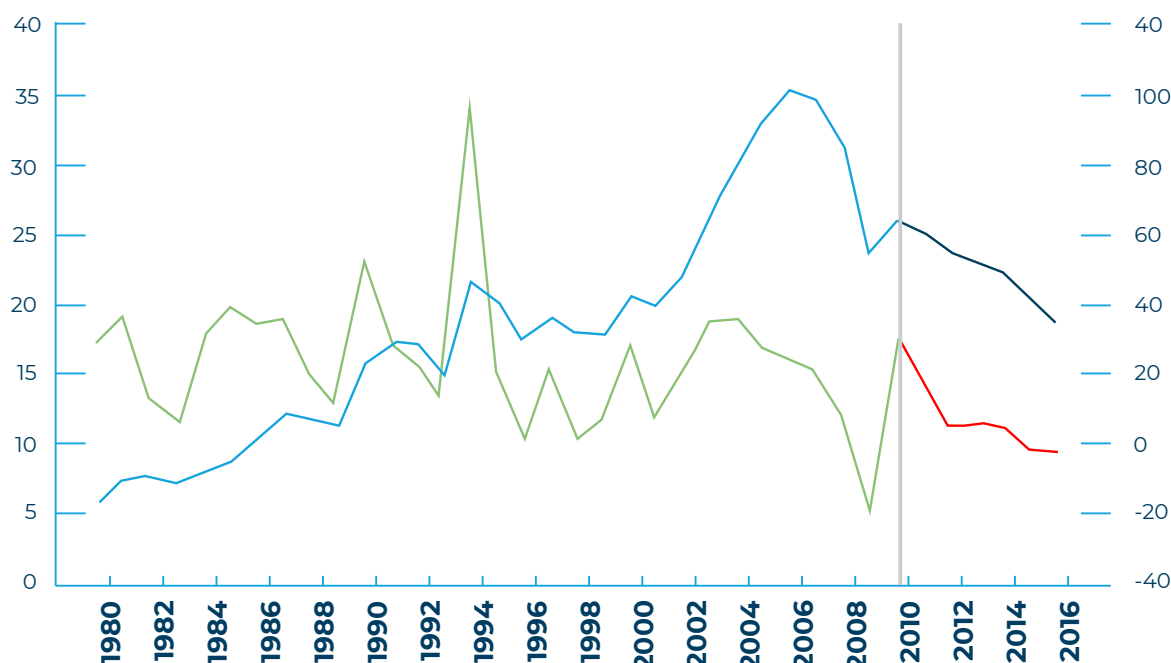
At present China's environmental pressure is growing. It has to complete the new

Figure 1. Changing trend of China's GDP growth (1980-2016)



Source: National Bureau of Statistics.

Figure 2. Changing trend of China's export (1980-2016)



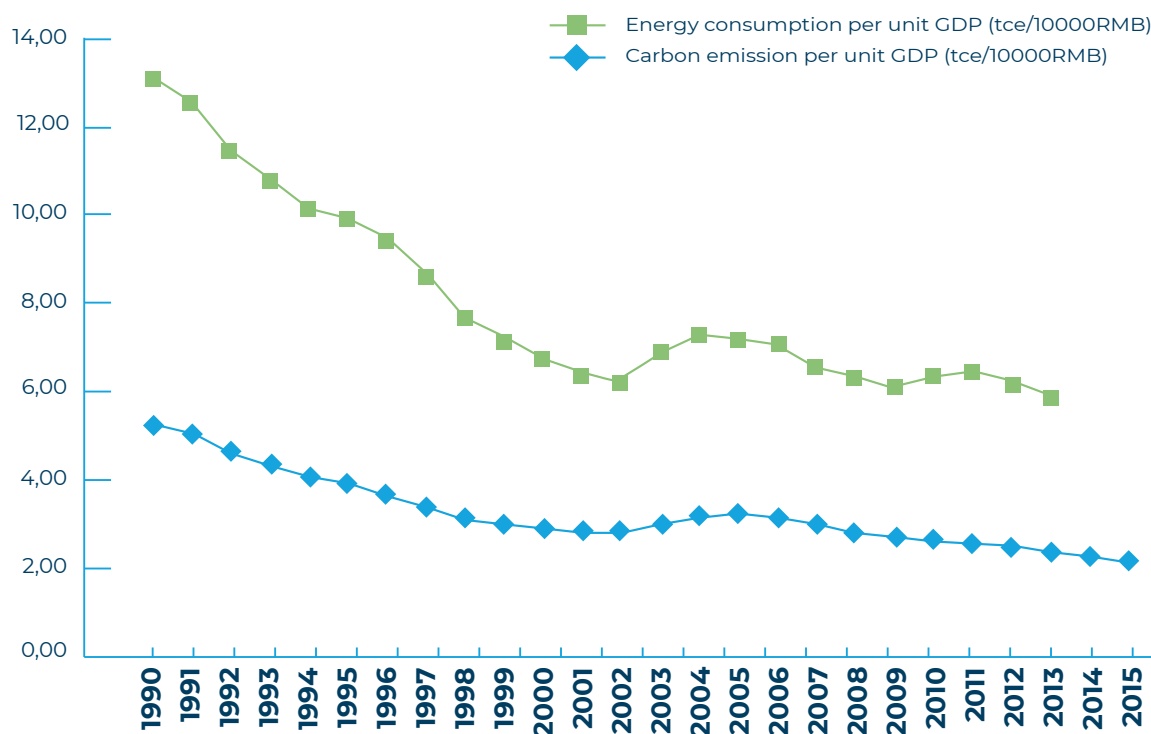
Source: National Bureau of Statistics and General Administration of Customs.

emission reduction targets, while improving economic efficiency at the same time. Thus, implementation of green transformation in China is imperative. It is widely believed that the green transition could cope with the current increasing environmental pressures and become the new engine to enable the national economy to realize sustainable and inclusive growth. The introduction of a series of major measures and the release of multiple laws, regulations and policies are constantly revealing China's resolution to transition to a green development path. With these extreme efforts, China's energy-efficiency and carbon emission intensity have exhibited a constant decreasing trend (see Figure 3). According to BP's statistics, China's energy-intensity dropped 4.5 per cent in 2014, the largest decline since 2008. It has also been shown that China's carbon dioxide emissions in 2014 only increased by 0.9 per cent, much lower than the average of 5.9 per cent over the last decade, albeit a little higher than the global average of 0.5 per cent in the same year.

China has prioritized green development in almost all leading economic sectors.

Efforts have been undertaken to boost energy efficiency in industry, transportation, and buildings; to develop wind, solar, and other renewable energy sources; to create a resource-saving "circular" economy; and to transform traditional sectors through the use of energy-efficient and environmentally-sound technologies.

Limited by energy intensity control targets and overcapacity, heavy industries including steel and building materials have to restructure themselves, resulting in even stronger downward pressure over the short term; textile, electronics, and other export-oriented sectors are also challenged by shrinking demand from emerging economies and an ever more complicated trade environment. Employment in these sectors will shrink gradually over the long term. According to an official from the Ministry of Human Resources and Social Security(MOHRSS) in 2016, China plans to lay off 1.8 million coal and steel workers as part of the government's ongoing efforts to reduce industrial overcapacity; 1.3 million of the job cuts will affect coal workers, while the steel sector will lose 500,000.

Figure 3. The decreasing trend of China's energy and carbon emission intensity (1990-2015)

Source: National Bureau of Statistics, WDI dataset.

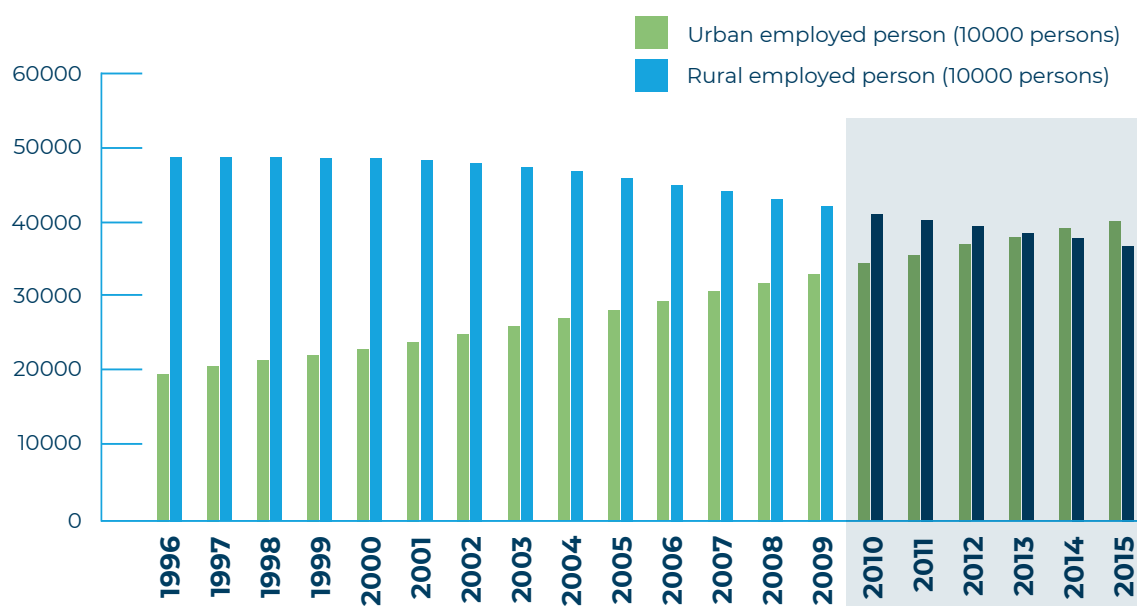
One of the greatest promises of China's green transition is the potential for expanded employment in industries and economic sectors that promise to reduce or at least slow the country's environmental impact. Often called "green jobs" but ill-defined in practice, paid positions in such industries and sectors are increasingly available to jobseekers in China. As elsewhere such opportunities are particularly important at a time of global economic uncertainty when any job is an asset. Facing severe pressure from traditional industries, the job creation opportunities in emerging green sectors become increasingly important.

2.2 Employment shifts

Employment has a vital bearing on people's livelihoods. China has a population of nearly 1.4 billion and is the most populous country in the world. In view of the fundamental interests of its people, the Chinese government attaches great importance to the issue of employment.

China's total employment continued to increase from 761 million in 2010 to 774 million in 2015, an increase of around 13 million. Of those totals, urban employment increased from 347 million in 2010 to 404 million in 2015, an average annual increase of 11.4 million, while rural employment decreased from 414 million in 2010 to 371 million in 2015 (see Figure 4). The proportion of urban employment increased from 45.6 per cent in 2010 to 52.2 per cent in 2015, an increase of 6.6 percentage points in five years, indicating that China's urbanization process is accelerating. Over the last six years the number of new jobs created in cities has remained at over ten million, accounting respectively for 12.2m, 12.7m, 13.1m, 13.22m, 13.12m and 13.14m, bringing the total to nearly 77.5 million. The urban registered unemployment rate has remained at around 4.1 per cent over the past few years, lower than the control target of five per cent set in the 12th Five-Year Plan. In the same period, according to the surveys conducted in 31 large cities and towns, it is also shown that their unemployment rates all remained around five per cent, a relatively low level.

Figure 4. Changes in the number of employees in urban and rural areas (1996-2015)



Source: National Bureau of Statistics.

With the economic restructuring the employment structure of China has also undergone a notable change in recent years. From 2010 to 2015 the proportion of those employed in tertiary industry rose steadily from 34.6 to 42.4 per cent, that is an increase of an average of 1.3 per cent annually, with the number of employees reaching 328.4 million; the proportion of those employed in secondary industry remained at around 29 per cent, the number of employees reaching 226.9 million, while the proportion of those employed in primary industry dropped from 36.7 per cent to 28.3 per cent, decreasing by an annual average of 1.4 percentage points, with employees numbering 219.2 million (see Figure 5). China is also vigorously aiming to develop strategic emerging industries² to replace the traditional energy-intensive industries. These green and low-carbon emerging industries will also expand new areas of employment and create many new jobs. It is estimated that the share of green

jobs in these industries has gradually increased. However, owing to the difficulty of obtaining detailed sector employment data, it was not possible to make any further analysis of the structural changes in employment among the sectors. The optimization of the employment structure among industries - the increasing share of people employed in tertiary industry and the creation of new jobs in strategic emerging industries - shows the trend in green and low-carbon transformation in China. It also exhibits the results of speeding up the pace of industrial transition and the increase in labour productivity.

In recent years the number of college graduates has been expanding, breaking through six million in 2010, exceeding seven million in 2014, reaching 7.7 million in 2016. The rapid growth of college graduates shows that China's human capital investment has increased substantially, and it has accumulated a large number of talents for economic and social development. At the same time, since the speed of job upgrading and creation for college graduates is lower than the growth rate in the number of graduates, the number of jobs for graduates is still insufficient. Thus, it is difficult for some college graduates to find a desirable job immediately after graduation.

² According to China's Planning on National Strategic Emerging Industries, there are seven strategic emerging industries, including energy conservation industry, environment protection industry, emerging information industry, bio-industry, new energy industry, new energy vehicle industry, high-end equipment manufacturing industry and new materials industry.

Figure 5. Employment structure of primary, secondary and tertiary industries (2010-2015)

Source: National Bureau of Statistics.

To solve the problem China's government is adopting many measures to help graduates realize multi-channel employment. It encourages graduates to seek employment in flexible and diverse forms. The relevant policies encourage graduates to find desirable jobs through various channels, including encouraging and guiding college graduates to work at grassroots level in urban and rural areas, encouraging enterprises to create jobs suitable for college graduates, and encouraging graduates to start their own entrepreneurship. By implementing the employment promotion plan, establishing the "real name system of employment service"³ and providing the necessary training for unemployed college graduates, relevant departments try to help them find a suitable job. In 2014 the number of college students registered as self-entrepreneurs reached 615,000 thousand and MOHRSS set a target in the same year of promoting 800,000 graduates

to start entrepreneurship in four years through implementation of these measures. In recent years the employment rate for college graduates has stabilized at around 70 per cent a year, and the total employment rate was over 90 per cent at the end of 2016.

In not focusing only on the employment of college graduates, China has always paid attention to assisting the unemployed, helping them overcome the difficulties and obtain employment. At present the Chinese government is accelerating the structural reforms from the supply side. By "cutting the excessive industrial capacity, destocking, deleveraging, reducing the cost and improving the weak parts", China aims to further optimize the economic structure and realize the green economy transition, while creating more green job opportunities to accommodate new graduates and those laid off from traditional industries.

³ The real name system of employment service is developed by universities or local education departments and aim to provide service of employment guidance, business management, online application, recruitment information and skills training for college graduates.

3. Key policies and regulations

3.1 Green development policies and regulations

3.1.1 Policies at the macro-level

China is already on the right track in a potentially earthshaking transition. The Chinese government recognizes that “greening” the economy is an emerging global aspiration and has embraced the strategic goal of boosting the country’s economic growth while also enhancing environmental protection. There is already a strong policy framework in China to support the Green Economy transition.

During the 11th Five-Year Plan period, the Chinese government promulgated several planning and policy statements, including “**The National Environmental Protection 11th Five-Year Plan**”, “**The Forestry Development 11th Five-Year and Medium-and-long-term Plan**”, “**Energy Conservation Law**”, “**Clean Production Promotion Law**” and other development plans and laws. Relevant departments or agencies, such as the National Development and Reform Commission (NDRC), the Ministry of Environmental Protection (MEP) and the Ministry of Housing and Urban-Rural Development (MOHURD), also issued a series of targeted policies and regulations to set standards for air-conditioning in public buildings, to establish the technical requirements for environment-friendly small-displacement cars, and for some energy-intensive industries.

The succeeding 12th and 13th Five-Year Plans also highlight green growth and give more information on green development. Although not explicitly labelled as ‘green economy’ policies, these plans are projected to play a significant role in guiding China’s green economy transition at the macro level (see Table 2).

In 2014 the National Congress discussed the practical institutional mechanisms for the implementation of “ecological civilization”. At the

end of 2015 China issued the “**Integrated Reform Plan for Promoting Ecological Civilization**”, a comprehensive and ambitious plan for sweeping reforms of how China uses natural resources and can prevent pollution. This reform plan is designed to establish a systematic and complete institutional framework composed of eight systems (see Table 3) for promoting ecological progress with clearly-defined property rights, diversified participation, and equal focus on incentives and restraints, by 2020. The plan was prepared by around 12 relevant government departments, under the coordination of NDRC (National Development and Reform Committee).

“**The Amendment of Environmental Protection Law**”, passed by the Standing Committee in April 2014, is a massive update of the original law which came into force in 1989. The amended law imposes stricter obligations on enterprises regarding pollution prevention and control and provides for more severe penalties. It also potentially offers some basic incentives and creates new opportunities for relevant industries and enterprises. Moreover, the amended law allows public-interest environmental litigation. If implemented successfully, it will create a stronger system for environmental protection and shape China’s green economy transition in the future.

3.1.2 Specific policies

Market-based economic policies for promoting green development

A supportive system of economic instruments is critical for realizing a green transformation. A rough estimation shows that after the Eighteenth National Congress of the CPC, the relevant departments have already released nearly 200 market-based environmental and green economic policies, covering green credit, green taxes and fees, green securities, green prices, green procurement, ecological compensation, emission trade, and environmental pollution liability insurance.

Table 2. Major green development targets in the 12th and 13th Five-Year Plan

AREAS	12 TH FYP TARGETS	13 TH FYP TARGETS
Economic growth and structure	Average annual GDP growth of 7%; Service industry contributing 47% to GDP; Urbanization rate reaching 51.5%.	Average annual GDP growth of no less than 6.5%; Service industry contributing 56% to GDP; Urbanization rate reaching 60%; Average annual labour productivity no less than 6.6%.
Environment, Energy and Climate	1) Reduce energy consumption per unit GDP by 16% compared to 2010 level; 2) Reducing carbon emissions per unit GDP by 17% compared to 11th FYP target; 3) Non-fossil energy in primary energy consumption rising to 11.4%; 4) Lowering water consumption per unit of industrial added value by 30%; 5) Effective utilization coefficient of agricultural irrigation water rising to 0.53; 6) Reduce national total chemical oxygen demand, sulfur dioxide, ammonia and nitrogen oxide emissions by 8%, 8%, 10% and 10% respectively compared to 2010 levels; 7) Forest coverage rate rising to 21.66% of the land area; 8) Forest stock volume reaching 14.3 billion cubic meters; 9) Cultivated land area staying stable at 121.2 million hectares.	1) Reduce energy consumption per unit GDP by 15% compared to 2015 level; 2) Reducing carbon emissions per unit GDP by 18% compared to 12th FYP target; 3) Non-fossil energy in primary energy consumption rising to 15%; 4) Lowering water consumption per unit of GDP by 23% compared to 2015 level; 5) Reduce national total chemical oxygen demand, sulfur dioxide, ammonia and nitrogen oxide emissions by 10%, 15%, 10% and 15% respectively compared to 2010 levels; 6) Forest coverage rate rising to 23.04% of the land area; 7) Forest stock volume reaching 16.5 billion cubic meters; 8) Cultivated land area staying stable at 124.3 million hectares; 9) The air quality of all cities at the prefecture level and above must meet "good" or "excellent" standards 80 percent of the time; 10) For cities fail to meet China's annual concentration standard, they must reduce concentrations of PM2.5 by 18 percent over 5 years.
Economic competitiveness	R & D expenditure increasing to 2.2% of GDP; Strategic emerging industry accounting for 8% of GDP.	R & D expenditure increasing to 2.5% of GDP.
Social development	Average annual increase in the number of new jobs in cities and towns topping 45 million; Urban unemployment rate staying below 5%.	Average annual increase in the number of new jobs in cities and towns topping 50 million.

Source: The 12th and 13th Five-Year Plan for Economic and Social Development of the People's Republic of China.

Table 3. The institutional framework of ecological civilization policies in China

GENERAL INSTITUTION	SPECIFIC POLICIES	ESTABLISH & EXPLORE	IMPROVE & IMPLEMENT
System of property rights for natural resource assets	1) Establishing a unified system for determining and registering ownership	√	
	2) Establishing a system of property rights for natural resources within which rights and responsibilities are explicit	√	
	3) Improving the state system of management for natural resource assets		√
	4) Exploring the establishment of a system for exercising ownership rights at different levels	√	
	5) Launching trials for determining property rights for water flows and wetlands	√	
System for the development and protection of territorial space	6) Improving the functional zoning system		√
	7) Improving the regulatory system for the use of territorial space		√
	8) Establishing a national park system	√	
	9) Improving the system for regulating natural resources		√
Establishing a Planning System for Territorial Space	10) Formulating plans for territorial space	√	
	11) Integrating municipal-level (county-level) plans	√	
	12) Developing new approaches for formulating municipal-level (county-level) spatial plans	√	
Improving the Systems for Total Resource Management and Comprehensive Resource Conservation	13) Improving the systems for providing the strictest possible protection for farmland and securing the economical and intensive use of land		√
	14) Improving the system for the strictest possible management of water resources		√
	15) Establishing a system for total energy consumption management and energy conservation		√
	16) Establishing a system for protecting virgin forests	√	
	17) Establishing a system for protecting grassland	√	
	18) Establishing a system for protecting wetlands	√	
	19) Establishing a system for closing off desertified land for protection	√	
	20) Improving the system for developing and protecting marine resources		√
	21) Improving the system for managing the development and utilization of mineral resources		√
	22) Improving the system of resource recycling		√

GENERAL INSTITUTION	SPECIFIC POLICIES	ESTABLISH & EXPLORE	IMPROVE & IMPLEMENT
Improving the System for Payment-Based Resource Consumption and Compensating Conservation and Protection Efforts	23) Accelerating price reform for natural resources and their products		√
	24) Improving the payment-based system for land use		√
	25) Improving the payment-based system for mineral resource use		√
	26) Improving the payment-based system for use of sea areas and offshore islands		√
	27) Accelerating reform of resource and environmental taxes and fees		√
	28) Improving the ecological compensation system		√
	29) Improving the mechanism for utilizing ecological protection and restoration funds		√
	30) Creating a recuperation system for farmland, grasslands, rivers, and lakes	√	
Establishing an Effective System for Environmental Governance	31) Improving the pollutant emissions permit system		√
	32) Establishing a mechanism for cooperation within a region in pollution prevention and control	√	
	33) Establishing systems and mechanisms for rural environmental governance		√
	34) Improving systems for public disclosure of environmental information		√
	35) Strictly implementing compensation systems for ecological and environmental damage		√
	36) Improving the administrative system for environmental protection		√
Improving the Market System for Environmental Governance and Ecological Conservation	37) Fostering market entities for environmental governance and ecological conservation		√
	38) Promoting the trading of energy-use rights and carbon emissions rights		√
	39) Promoting the trading of pollution rights		√
	40) Promoting the trading of water rights		√
	41) Establishing a green finance system	√	
	42) Establishing a unified system for green products	√	
Improving Ecological Conservation Performance Evaluation and Accountability Systems	43) Establishing ecological conservation targets	√	
	44) Establishing monitoring and early-warning mechanisms for environmental and resource carrying capacity	√	
	45) Exploring the creation of balance sheets for natural resource assets	√	
	46) Auditing outgoing officials' management of natural resource assets	√	
	47) Establishing a lifelong accountability system for ecological and environmental damage	√	

Source: The State Council and the Central Committee (2015), "Integrated Reform Plan for Promoting Ecological Civilization", Wang and Gao (2016), "Germination, Starting and Policy Evolution of Green Development in China".

Table 4. Number of economic policies used for promoting green development (1980-2015)

CATEGORIES	SINCE 2011 TO 2015	2000-2010	SINCE 1980 TO NOW
Environmental credit system	5	5	10
Comprehensive catalogue of environmental protection industry	7	9	16
Environmental fiscal policies	50	27	78
Green taxes and fees policies	33	34	67
Green credit policies	5	14	19
Environmental pollution liability insurance	2	2	4
Green security policies	1	3	4
Green price policies	31	12	44
Environmental trade	6	3	9
Ecological compensation	11	6	17
Pollutant emission trade	4	1	5
Other environmental economic policies	12	-	12
Total	167	116	285

Source: Wang and Gao (2016), *Germination, Starting and Policy Evolution of Green Development in China*.

Table 5. Major policies of green finance in China since 2007

TIME	POLICY	DEPARTMENT
2007	Guiding Proposal for Improving and Strengthening the Financial Services for Energy Saving and Environmental Protection Sectors	PBC
2007	Guiding Proposal on Environmental Liability Insurance	China Insurance Regulatory Commission (CIRC)
2007	Proposal on Implementing Environmental Laws and Regulations and Reducing Loan Risks	SEPA(now MEP), PBC and CBRC
2012	Guidelines for Green Credit	CBRC
2013	Evaluation Method for Corporate Environmental Credits (Trial)	MEP
2015	Guidance on Energy-Saving Credit	CBRC
2016	Guidance on Building Green Finance System	PBC, Ministry of Finance, MEP, NDRC, CIRC, CBRC and China Securities Regulatory Commission (CSRC)
2017	Development Plan on Building Financial Industry Standardization System (2016-2020)	PBC, CIRC, CBRC, CSRC and Standardization Administration of the People's Republic of China (SAC)

Source: Summarized from related documents.

These policies cover almost all aspects of socio-economic activities. The policies guide or adjust economic activities in mining, production, and in the circulation or consumption process, independently or jointly. They become an important part of the green policy system. Table 4 shows the increased trend in green development economic policies since 1980.

In recent years attention has turned to the role of financial institutions and markets in supporting environmental protection and green transformation. China is attempting to find more ways of encouraging banks and private capital to invest in green finance projects, and endeavour to move money from high-polluting to low-polluting sectors. Green finance has matured significantly over the past decade in China. A set of green finance policies could have their origins in collaboration between MEP and various financial institutions. China has already begun to develop legal and institutional

frameworks to support green finance strategies. Potential institutions such as the China Ecological Development Bank, proposed by groups including the People's Bank of China and the UNEP, aim to support green finance. Table 5 summarizes the various policies issued since 2007 by the MEP, NDRC, the People's Bank of China (PBC) and the China Banking Regulatory Commission (CBRC). With these efforts China is now taking the lead in developing an integrated finance policy package to promote an ambitious shift towards a green economy. In the sale of green bonds in the first seven months of 2016, for example, China's bond issues hit about \$18 billion, about 40 per cent of the world total during the period.⁴ The rapid development of the financial sector not only stimulates growth of green industries, but also creates great demand for skilled experts and employment in the financial sectors.

Table 6. Major policies for green industry development

TIME	POLICY	DEPARTMENT
2010	Decisions on Accelerating, Nurturing and Developing Strategic Emerging Industries	State Council
2011	National Plan of Groundwater Pollution Control(2011-2020)	State Council
2012	12 th Five-Year Plan of Energy Saving and Environmental Protection Industry	MEP
2012	12 th Five-Year Plan of the National Strategic Emerging Industries	State Council
2013	Guiding Proposals on Developing the Environmental Services Industry	MEP
2013	Proposals on Accelerating the Development of the Energy Saving and Environmental Protection Industry	State Council
2014	Temporary Managing Principles of Piloting the Environmental Services Industry	MEP
2015	2015 Special Action Implementation Plan of Industrial Green Development	MIIT
2015	Made in China 2025	State Council
2016	Implementation Plan of Green Manufacturing Engineering(2016-2020)	MIIT
2016	Industrial Green Development Plan(2016-2020)	MIIT
2017	Industrial Energy Conservation and Green Standardization Action Plan(2016-2019)	MIIT

Source: Summarized from related documents.

⁴ http://english.gov.cn/policies/policy_watch/2016/09/07/content_281475435708560.htm.

Green industrial policies

As a major manufacturing country one of the important tasks for China is to promote green production and manufacturing and clean up its traditional energy-intensive industries. Green industrial policy, as discussed in this paper, refers to government attempts to accelerate the development of cleaner industrial production.

China's green industry is a quite comprehensive sector and now encompasses water treatment, air pollution, equipment manufacture, energy monitoring, environmental protection products, clean products, environmental protection services, waste recycling products and ecological conservation services. The current green industrial policy system consists of laws, regulations, technical guidance and capacity-building.

Early at the beginning of this century China started to issue a series of planning and guidance documents to encourage green industry to grow and set specific targets for green economy and low-carbon development in its Five-Year Plans and other relevant industrial planning measures. In 2002 NDRC and SEPA (now MEP) issued **"Cleaner Production Promotion Law"** and the **"Clean Production Audit Interim Measures"**. Thereafter certain relevant departments, including the Ministry of Industry and Information Technology of the People's Republic of China (MIIT), implemented more measures. In Table 6 are listed other major policies for green industry development in recent years. The green and environmental industry has grown significantly, driven by the strong support for these policies and measures. For example, in 2014 the output value of the energy-saving and environmental protection industry reached 3.7 trillion RMB, an increase of 85 per cent over 2010. It was estimated by NDRC that the output value of the industry would amount to 4.5 trillion RMB by the end of 2015, with an average annual growth rate during the 12th FYP of more than 20 per cent, much higher than in the traditional industries and the GDP growth rate.⁵

Green building policies

China is the world's largest construction market; half of all new buildings constructed annually worldwide are located in China. With recent skyrocketing growth in new building floorspace driven by urbanization and sustained economic growth, the building sector's share of total energy consumption and other material consumption has been on the rise. China began to pay attention to building energy efficiency as early as the 1980s and successively developed relevant energy-saving standards and energy-saving targets. Subsequently the focus of the policy objectives began gradually to shift to green building. To improve the energy efficiency of building China has adopted a series of policy instruments including energy-efficiency building codes and standards, building of energy rating systems and labels, and financial incentives. Various laws and regulations, such as **"Construction Law"**, **"Urban and Rural Planning Law"** and **"Energy Conservation Law"**, were introduced. MOHURD formulated and published the **"Green Building Action Plan"** and **"12th Five-Year Plan on Green Building and Green Eco-District Development"** in 2013, which stipulated more strict requirements for green residential buildings and put forward a series of green building development objectives. The plans mentioned that the ratio of green building in new buildings should be effectively raised; by the end of 2015 20 per cent of new urban buildings were to have met the green building standards, and by 2020 green buildings should account for more than 30 per cent of new buildings. At the same time a set of relevant policies was introduced, comprising the construction of energy-saving buildings, reform of heating systems and wider application of energy standards.

As a promising sector, green building and construction will create desirable new jobs across the design, engineering, manufacturing and construction processes. Green construction is the practice of erecting buildings and using processes that are environmentally responsible and resource-efficient. Green buildings limit their environmental impact by conserving as much energy and water as possible and are constructed of recycled or renewable materials

5 <http://www.hbzhan.com/news/detail/105410.html>.

so as to achieve maximum resource efficiency. Creating these new buildings requires skilled workers - such as architects, construction managers, and carpenters - with knowledge of new design and construction techniques.

Green transportation policies

China's transportation sector is also undergoing a significant transformation. As the average wealth of Chinese citizens increases, the former "kingdom of bicycles" is experiencing a swell of motorization. In 2009 China overtook the United States to become the world's largest automotive market, home to some 170 million vehicles.⁶ By March 2017 the total number of vehicles in China had reached 300 million. In some mega-cities, to control the number of motor vehicles the local government applies many measures, including using a lottery system for obtaining licence plates. Although these extreme measures slow down the increasing speed of China's vehicle growth, it is still believed that the number of motor vehicles will continue to expand during the following few years.

China's rising interest in green transportation is in large part a response to the environmental problems associated with the country's rapid transition to a "car-and-truck" economy. Air pollution routinely cloaks many Chinese cities. Thus, clean emission standards will be critical for alleviating air pollution as well as promoting green transportation. The MEP has gradually tightened nation-wide emission standards for vehicles during the last decade. Beijing, Shanghai and other large cities implemented the "National V" emission standard (fifth-stage emission limits of gas fuel ignition engines and automobiles) in 2013, a rough equivalent of the older "Euro 5" emission standard. According to the plan, the "National V" standard should be introduced nationwide from 2017, including in rural areas. China will soon implement much tougher emissions standards. The new and tougher standards will also be implemented first in major cities such as Beijing and Shanghai, and then spread to other areas in stages from 2018.

In October 2014 the NDRC announced that vehicles not meeting the standard would be taken off the roads in major cities by the end of 2015, and nationally by the end of 2017. In addition the Ministry of Transport and the Ministry of Finance jointly set up special funds for energy-saving and for reducing transportation emissions.

The Chinese government reaffirmed their priority of promoting new energy vehicles in its 13th Five-Year Plan. The Central Committee of the Communist Party of China approved the document that emphasizes boosting of technological innovations in the manufacturing of new energy vehicles and promoting the use of electric cars, plug-in hybrids and fuel cell vehicles, included in its latest Five-Year Plan.

In April 2016 the Traffic Management Bureau of the Ministry of Public Security announced the introduction of new green licence plates to identify new energy vehicles, as opposed to the country's standard blue plates. The objective of the special plates is to facilitate police enforcement of the preferential policies that some local authorities apply to cleaner cars to help cut emissions and ease traffic.

3.2 Policies on climate change

As a developing country with a population of nearly 1.4 billion, China is among the countries most severely affected by the adverse impacts of climate change. At the same time, the total level of China's carbon dioxide emissions dwarfs those of all other countries. From time to time China has been berated for its contribution to global climate changes in recent years; however, it has for long attached great importance to addressing climate change, making it a significant national strategy for its social and economic development and promoting green and low-carbon development as important components of the ecological civilization process. Under the 2009 Copenhagen Accord China committed itself to reducing its emissions intensity from 2005 levels by 40-45 per cent by 2020. Since then

⁶ "Year in Review: China's Ascent to Top of Global Auto Market," *China Daily*, 26 April 2010; Chinese Ministry of Environmental Protection, *China Vehicle Emission Control Annual Report 2010* (Beijing: November 2010), at www.vecc-mep.org.cn/index/20101110nianbao.pdf.

China has actively adopted measures in various fields to tackle climate change and has achieved remarkable outcomes. In November 2014 the Chinese government pledged two new targets: a peak in carbon emissions and an increase in the share of non-fossil energy sources to 20 per cent of the total by 2030. China later included these two goals in its Intended Nationally Determined Contribution (INDC) submitted to the Secretariat of United Nations Framework Convention on Climate Change (UNFCCC), along with a goal of reducing carbon intensity by 60-65 per cent below 2005 levels by 2030.

To achieve these goals China has enacted and implemented a series of policies including the **“National Programme on Climate Change”**, the **“Work Plan for Controlling Greenhouse Gas Emissions during the 12th Five-Year Plan Period”**, the **“Comprehensive Work Plan for Energy Conservation and Emission Reduction for the 12th Five Year Plan Period”**, the **“12th Five Year Plan for Energy Conservation and Emission Reduction”**, the **“2014-2015 Action Plan for Energy Conservation, Emission Reduction and Low-Carbon Development”**, and the **“National Plan on Climate Change (2014-2020)”**. China has accelerated the adjustment of its industry and energy structures and invested great efforts in improving energy efficiency, lowering carbon emissions and enhancing the ecosystem. Furthermore, China has initiated carbon emission trading pilots in seven provinces and cities and low-carbon development pilots in 42 provinces and cities with a view to exploring a new mode of low-carbon development consistent with its prevailing national circumstances. Here some of the key policies on climate change will be highlighted, including establishment of a carbon emissions trading system, development of renewable energy, capping of coal consumption, and expansion of low-carbon pilots and demonstration.

3.2.1 Establishing a carbon emissions trading system

China initiated trading markets for various pollutants in 2008. In 2009 the Tianjin Climate Exchange established China's first carbon cap-and-trade scheme. Later, in October 2011, China

announced it intended to establish seven pilot carbon trading systems in five municipalities and two provinces across the country. The pilots cover between 35 per cent and 60 per cent of emissions within their respective jurisdictions. The coverage includes more 1,900 emission-control enterprises and units and setting a carbon emissions quota totalling about 1.2 billion tons. Pilot areas reinforced compliance monitoring and enforcement, the compliance rate hitting 96 per cent and 98 per cent in 2014 and 2015 respectively. As of the end of August 2015 the seven pilot provinces and cities saw accumulated transactions of local quotas up to about 40.2 metric tons, with a turnover of about 1.2 billion Yuan, while the accumulated auction quota reached about 16.6 metric tons, with a turnover of about 800 million Yuan (China's Policies and Actions on Climate Change, 2015). A nationwide carbon market is expected to be launched in 2017. If launched, its market volume will exceed that of the European Union's emission trading system.

3.2.2 Developing renewable energy

Renewable energy is a critical component of China's green economy policies. China has developed a renewable energy industry that was virtually non-existent decades earlier. The **“Renewable Energy Law”** issued in 2005 could be seen as a turning point in China's renewable energy development process. Before that, specific policies on renewable energy were quite rare. However, many relevant measures, programmes and policies emerged after the introduction of the law. The government started investing heavily in renewable energy sources. Most of the policies and investment focus on wind power and photovoltaic energy, while lower-incentive measures and investment are applied to biomass and marine energy sources. The major reason is that the development cost of wind power and photovoltaic power generation is relatively low, the technology is relatively mature, and the scope of application is relatively wide compared with other renewable sources. As of now the policy and regulation system for renewable energy development is basically established and it is expected that no such intensive policies will be created in the near

future. The major tasks in the future will only concern revision or improvement to existing policies.

The 12th Five-Year Plan set a clear target of increasing non-fossil energy use to 11.4 per cent of total energy use by 2015. The 13th Five-Year Plan sets an even more ambitious target of 15 per cent by 2020. Increasing the share of renewable energy sources, particularly wind and solar power, would contribute significantly to emission reductions and play a vital role in greening China's energy supply. According to the draft of **"Development Plan for Emerging New Energy Industry"**, China aims to invest some five trillion yuan (\$770 billion) in new energy-related sectors between 2011 and 2020. Of this total some 2-3 trillion yuan (\$308-462 billion) will be in investments in renewable energy, excluding hydropower (Pan, et. al 2011).

3.2.3 Capping coal consumption

The use of coal is one of the major sources of GHG. Coal consumption is responsible for about 80 per cent of CO₂ emissions from the energy sector, and over 64 per cent of greenhouse gas emissions. In addition, coal mining and use damages the environment and public health. Coal use and combustion also contributed to 63 per cent of primary PM2.5 emissions and 51-61 per cent of pollutants serving as chemical precursors.

Concerned about the worsening coal overcapacity crisis and the environmental damage wrought by coal consumption, China is making great efforts to curb its growth. A coal cap is the cornerstone of China's safe, green, efficient and low-carbon development. Since September 2013 China's State Council has released a series of documents and policies that support a coal consumption cap, particularly the **"Air Pollution Prevention and Reduction Action Plan"** and the **"Energy Development Strategy Action Plan (2014-2020)"**. The former requires establishment of long-term coal cap targets at national level, and assignment of supervisory responsibilities for those targets. Around 21 provinces and autonomous regions and more than 30 cities have set different targets for coal consumption reduction. On this

foundation China could design and implement coal consumption caps at national and local levels, as well as in coal-intensive sectors. The Chinese government is also trying to slow down the approval of new coal-fired power plants in the light of overcapacities.

Research on the employment effect of China's national policies to control coal consumption shows that there will be more and better employment opportunities generated in China's power sector and related industries if such policies are implemented. To achieve the coal consumption cap policies, the renewables, clean energy and energy efficiency industries will create many more new jobs than those lost in the traditional coal mining and coal-intensive industries. More important still, most of the newly-created jobs are decent jobs with better working environments and higher technical skills, replacing low-quality unstable equivalents. While coal cap policies will have significant negative impacts on the coal-fired power industry and coal mining industries, the job opportunities in alternative energy – wind, solar, hydro, nuclear, and biomass – will continue to increase. Capping coal consumption will also bring huge investments into clean energy development, benefiting service sectors such as finance, consulting, insurance, the commercial weather service, environmental protection, education, and the media. The expansion of these service sectors is expected to drive significant indirect job growth, providing citizens in urban and rural areas with more and better jobs. According to research conducted by the Natural Resources Defense Council (NRDC), the Institute for Urban and Environmental Studies, and the Chinese Academy of Social Sciences (IUE, CASS) under different coal scenarios, there will be significant employment gaps in power sectors. Coal cap policies will impose negative impacts on the coal power sector, reduce the number of direct and indirect jobs in the power generation and relevant equipment manufacturing sectors, while creating more job opportunities in the hydro power, wind power, nuclear power and biomass power sectors. Under the scenario given in the study, by 2050 413,000 direct jobs and 3.58 million indirect jobs will be created in the power sector. Details of the employment impacts of the coal cap policy

Table 7. The employment impacts of coal cap policy on power sector

POWER SECTORS	EMPLOYMENT EFFECTS IN DIFFERENT SECTORS (10000 PERSONS)	2020	2030	2050
Coal Power	Direct job created in power generation sector	-5.3	-16.3	-13.3
	Indirect job created in power generation sector	-57.6	-177.9	-144.4
	Direct job created in equipment manufacturing	-8.2	-25.5	-21.7
	Indirect job created in equipment manufacturing	-56.3	-176.5	-149.6
Hydro Power	Direct job created in power generation sector	0	1.7	1.4
	Indirect job created in power generation sector	0	19	15.7
	Direct job created in equipment manufacturing	0	2.3	1.1
	Indirect job created in equipment manufacturing	0	16.1	7.7
Nuclear Power	Direct job created in power generation sector	0	1.6	4.1
	Indirect job created in power generation sector	0	17.7	44.1
	Direct job created in equipment manufacturing	0	11.2	12.7
	Indirect job created in equipment manufacturing	0	77	87.5
Wind Power	Direct job created in power generation sector	4	10.7	13.4
	Indirect job created in power generation sector	43.8	116.8	146.1
	Direct job created in equipment manufacturing	14.5	28.1	14.1
	Indirect job created in equipment manufacturing	100.1	194	97.2
Solar Power	Direct job created in power generation sector	1.5	4.6	15
	Indirect job created in power generation sector	16.3	49.7	163.4
	Direct job created in equipment manufacturing	12.7	18.7	14.4
	Indirect job created in equipment manufacturing	87.9	129.4	99.7
Biomass Power	Direct job created in power generation sector	0	0	1
	Indirect job created in power generation sector	0	0	10.9
	Direct job created in equipment manufacturing	0	0	1.8
	Indirect job created in equipment manufacturing	0	0	12.7
Total	Total direct employment	15.6	29	41.3
	Total indirect employment	93.9	172.5	358.1

Sources: NRDC and IUE (2014), *Employment Effects of China's Coal Cap Policies*.

on the power sector can be viewed in Table 7. The study also projects that by 2020 the energy efficiency services required to meet a national coal cap in the building, iron and steel, and cement sectors will create 300,000, 450,000, and 390,000 new jobs respectively, bringing hundreds of thousands of direct new jobs and millions of indirect jobs to the market.

3.2.4 Expanding low-carbon pilots and demonstration

In recent years, through pilot projects and demonstrations China has been proactive in probing ways of promoting low-carbon development. From 2010 low-carbon pilot programmes were started in some provinces

and cities. These pilot provinces or cities made significant efforts to establish and explore the peak-target-forced mechanism, improved the GHG emissions statistics and management system, established the target-oriented responsibility system to achieve GHG emission control targets, built the low-carbon industrial system, actively promoted low-carbon green lifestyles and consumption patterns, and reinforced low-carbon development capabilities and support. All the pilot provinces and cities have clearly put forward peak targets or are studying the issue, and the peak year proposed by most pilot provinces and cities is 2025 or before, which is earlier than the commitment in China's INDC.

China has also launched the carbon emissions trading pilot. The pilot regions constantly improved the rules on quota allocation, GHG emissions accounting and verification, and so forth. Aiming to implement the national carbon market, NDRC issued “**Interim Measures on Carbon Emission Permit Trading**” in 2014 to regulate the development and operation of the carbon emissions trading market, drafted “**Regulations on National Carbon Emissions Permit Trading (Draft)**”, and built and put into operation the national carbon emission trading registration system.

The government has also continuously promoted low-carbon industrial parks, low-carbon communities, low-carbon business and low-carbon transport pilot programmes in order to explore low-carbon development pathways and patterns at different levels and in different areas.

3.3 Employment policies

China's top leaders have emphasized that employment is closely connected to sustainable economic development and people's livelihoods. Based on its own national conditions, the Chinese government has explored and drawn on international experiences in its practices, gradually improved its related legal system, and formulated and implemented a set of proactive employment policies. China is determined to support job creation by encouraging micro and

emerging businesses to grow vigorously and is applying flexible social security to those sectors to protect employees' rights. Various subsidies have been introduced to the start-ups set up by college graduates and overseas returnees.

3.3.1 Proactive employment policy

In order to protect workers' right to employment and actively promote employment, the government has enacted “**Labour Law of the People's Republic of China**”, and other relevant laws and regulations. It has established the employment principle of “workers finding their own jobs, employment through market regulation and employment promoted by the government”, and formulated and implemented a set of proactive employment policies. The Chinese government has persisted in promoting employment by way of developing the economy, adjusting the economic structure, deepening reform, coordinating urban and rural economic development, and improving the social security system. It has adopted various effective measures and done everything possible to increase job opportunities, expand the scope of employment, and keep the unemployment rate within a socially tolerable range.

Developing the economy, adjusting the economic structure

The Chinese government has always regarded promotion of employment as a strategic task for socio-economic development. It has adhered to the principle of expanding domestic demand, exercising a stable fiscal and monetary policy, actively adjusting the economic structure, enhancing expansion of employment through developing the economy, encouraging development of individual and private economy to expand employment, and vigorously developing tertiary industry to create employment opportunities.

To create more jobs the Chinese government consistently takes development of the service industry as a major element in expansion of employment and encourages development of community services, catering, commercial and trade circulation, tourism and so forth for the purpose of creating more job opportunities in

these industries.

Currently, the government is trying to create more jobs by developing sectors such as advanced manufacturing, modern logistics, healthcare and elderly care and encourage labour-intensive companies to move to central and western regions and the northeast area where jobs are needed.

The government has paid great attention to exploiting its advantage in labour resources, and has actively developed labour-intensive industries and enterprises which have relative advantages and of which the products are in demand, particularly private and self-employed businesses and medium and small enterprises with large employment capacity. These industries, businesses and enterprises have accounted for about 80 per cent of new employment in urban areas.

Delivering fiscal, taxation, and financial policies

Through using supportive policies of reducing and exempting taxes and administrative charges, extending small security-backed loans, providing interest subsidies, and offering social insurance subsidies and along with subsidies for the jobs newly created, the government helps the unemployed create self-employment or set up their own businesses, and encourages small and medium enterprises to absorb the unemployed. In addition, central and local governments set up special funds to support and help urban and rural labourers to find employment and receive proper training.

Along with reducing and exempting taxes and administrative charges, small security-backed loans and loans at discounted interest rates should be available when unemployed labourers acquire the necessary qualifications.

There are also policies to encourage enterprises to absorb labour. Especially for small processing enterprises in the services, commercial and trading sectors, labour employment service enterprises, and small processing entities in neighbourhoods and communities, there are available tax reductions and exemptions,

and social insurance subsidies within certain specified qualifications and terms, when they recruit vulnerable urban people in the prescribed numbers.

Assisting laid-off persons back into the workforce

In recent years, to cut overcapacity in some traditional industries it is expected that millions of workers will be laid off, especially in the coal and steel industries. Most of those laid-off workers are of around 40-50 years of age and had been considered as having difficulties finding re-employment. Thus, the Chinese government has again formulated a set of policies for promoting the re-employment of laid-off persons by vigorously creating job opportunities, improving reemployment services, increasing financial inputs for reemployment, strengthening skills training for re-employment, and actively helping laid-off and unemployed persons change their attitudes to employment.

The government has also mobilized resources from all sources to establish re-employment service centres in state-owned enterprises which have laid-off workers, in order to provide basic subsistence allowances and pay old age and Medicare insurance premiums on their behalf, and provide them with job consultancy, employment information service offers, and vocational training opportunities free of charge. For those large and medium state-owned enterprises, they are encouraged to make arrangements in various ways for their surplus workers by way of separating the main production from the subsidiary occupations and through restructuring of the latter. An enterprise that has completed restructuring and set up economic entities to absorb its surplus workers in a certain ratio can be exempted from enterprise income tax for a certain period.

For laid-off persons who set up their own businesses, small security-backed loans are available, and the relevant taxes and administrative charges are exempted for three years for these businesses. The government has established a security fund for such loans, and provides loans at discounted rates of interest. Various service enterprises and commercial

and trading enterprises are provided with social insurance subsidies by the government if they employ laid-off workers from state-owned enterprises for newly-created posts. To encourage them to recruit more laid-off workers, small enterprises in services, commercial and trading enterprises and labour employment service enterprises as well as small enterprise entities of a processing nature in neighbourhoods and communities, can enjoy relevant tax reductions and exemptions for three years if formerly laid-off workers make up a certain percentage of their new recruits each year.

In addition the government has invested in the development of public posts through re-employment assistance to help the most disadvantaged find jobs.

3.3.2 Social security policies

The central government promulgated China's social security law but local authorities administer these laws. For example, employer and employee contribution rates and caps for each benefit vary according to the local jurisdiction and are subject to annual changes and reforms. Contribution to China's social security system is mandatory for Chinese employees and their employers.

Self-employed individuals, part-time employees who do not participate in the social security schemes through their employers, and unemployed individuals can participate in the pension and medical insurance schemes on a merely voluntary basis.

China's social security system consists of five types of insurance: pension, medical, unemployment, work-related injury and maternity insurance. Employers and employees must pay monthly premiums into three of the funds (pensions, medical expenses, unemployment) while employers are additionally required to make contributions to the last two (work-related injuries and maternity). The rates for each insurance differ from province to province and are subject to caps.

3.3.3 Policies to improve the quality of the workforce

China has introduced a system under which due account is taken of both school diplomas and professional qualification certificates, attempting in various ways to promote various kinds of educational and training programmes to improve the capacity of people of working age to obtain employment, start a business or adapt to occupational changes.

Various education programmes

China has made great efforts to make primary and middle school education available to everyone. From middle school education there are various vocational senior schools, senior schools for adults, ordinary polytechnic schools, polytechnic schools for adults, and technical schools. In 2016 there were 10,900 schools of secondary vocational education (including vocational senior middle schools, ordinary polytechnic schools, polytechnic schools for adults, and technical schools) with an enrolment of 16.0 million students.

In 2016 there were 37.0 million students in institutions of higher learning, with the gross enrolment rate reaching 42.7 per cent. There are 93,400 vocational technical schools across the country with the number of working staff reaching around 450,800.

Vocational training system

Vocational training in China includes pre-employment training, training for people transferred to new occupations, apprentice training and on-the-job training, covering elementary, intermediary, and advanced vocational qualification training for technicians and other types of training to help people adapt to different job requirements. By developing higher vocational institutions, advanced technical schools, secondary polytechnic schools, technical schools, employment training centres, non-governmental vocational training institutions and employees' training centres, the State endeavours to develop an all-round and multi-level national system of vocational education and training and strengthen training for the new

urban workforce, laid-off workers, rural migrant workers and on-the-job employees.

Technical schools are comprehensive vocational training bases mainly engaged in training skilled workers, while offering different types of long- or short-term training programmes. Employment training centres are bases for training new workforces and laid-off people, mainly offering teaching in practical skills and helping trainees adapt to different job requirements.

Workforce preparation system

China has adopted the workforce preparation system, and established and implemented the system of training new workforces prior to employment. Thus, a vocational training network covering both urban and rural areas has been put in place, making it possible for most of the new urban workers to receive work preparation training, and for new rural labourers, and especially for non-agricultural labourers and rural migrant workers in towns and cities, gradually to be included in the work preparation training programme.

Labour skills training

China carried out a widespread skills-enhancement action in 2002 by implementing a “Plan for Strengthening Vocational Training to Improve Employment Qualifications” and a “National Project for Training Highly Skilled Personnel”. All these programmes and projects were aimed at rapid cultivation of a large number of skilled workers, especially those with advanced skills, so as to improve the employment qualifications, work competence and job-switching capacity of the workforce as a whole. In this process emphasis was laid on training in new techniques, materials, technology and equipment to meet the urgent needs of enterprises for people with specialized skills and techniques, multi-skilled talents, and people with both the needed knowledge and skills for the development of new and high technology. In addition the Chinese government has also made re-employment training a regular requirement to help laid-off workers find new jobs.

Vocational qualification certificate system

Since China adopted the vocational qualification certificate system in 1994, relevant laws and regulations as well as a work system have been established for its application. China has basically set up a vocational qualification training system at five levels - from elementary-, intermediate- and advanced-grade skilled workers to technicians and senior technicians - that corresponds to the State's vocational qualification standards and forms an important part of a life-long learning system for workers.

China has also held forms of skills competition at national, provincial and city levels. The government, trade unions and enterprises work in close cooperation to hold vocational skill competitions within particular trades or enterprises to enhance the vocational skills of workers and staff members.

3.3.4 New policies on promote vocational education

In its 13th Five-Year Plan China clearly points out that it will “perfect the modern vocational education system, strengthen the basic capacity building of the vocational education, promote the transformation of qualified undergraduate universities to application-oriented, promote the integration of teaching and production, school enterprise cooperation application talents and technical skills training mode, promote vocational school teachers and enterprises technical personnel two-way communication, promote the match of professional settings, curriculum content, teaching methods with production practice”.

In December 2016 Premier Li Keqiang issued important instructions on China's vocational education. He pointed out that accelerating development of modern vocational education is of great significance in bringing into full play the advantages of human resources, and enhancing the overall competitiveness of the real economy. In the document the premier affirmed that remarkable achievements have been made in recent years in the reform and development of vocational education with joint efforts from all sides. Regarding the 13th Five-Year Plan, it is

expected that more innovation is created in the vocational education system and that a large number of professional skills, along with the artisan spirit and talents of high-quality workers, should be cultivated by all sources.

These documents and instructions show China's determination to cultivate more labourers with professional skills. However, not many policies or programmes are accompanied by implementation details. There is also no clear identification of which skills are urgently needed at present; neither is there any clear official statement on how to develop green skills for potential labourers. The lack of systematic policies or regulations on green skills in China has given rise to the fragmented policy framework on promoting and provision of green skills in practice.

3.4 Policy coherence and coordination

China has always attached extreme importance to employment issues and emphasized it in many other policies. Besides the basic goal of addressing climate change and encouraging the growth of emerging green industries, the Chinese government also hopes the policies and measures could cultivate new industries and create new jobs to replace those phased out during the process of ongoing industrial and other reforms. Strong and sustainable development of green economy in coordination of competitive markets is deemed the best way of securing broad employment opportunities. To achieve desirable results, coherence and coordination between the relevant contributors is particular important. The aim of policy coherence and coordination is to strengthen mutually reinforcing policies among different departments. The creation of green jobs and provision of green skills calls for the coherent application nationally of a range of economic, environmental and climate change policies.

Each year, after releasing the **"Report on the Work of the Government"**, China's State Council further prepares a report on **"Opinions on the**

Division of Work for Report on the Work of the Government". The report describes the division and coordination of the targets between different departments. Employment is always one of the key issues in the work of the government every year. In 2017, for example, the second of the two reports mentioned above elaborates the key task of employment as including "increase employment training, and strengthen the support for flexible employment and new employment patterns". To achieve the goals, the "Opinions" report appoints MOHRSS to take the lead, and requires NDRC, Ministry of Education (MOE), Ministry of Science and Technology (MOST), MIIT, Ministry of Civil Affairs (MCA), Ministry of Finance (MOF), Ministry of Agriculture (MOA), PBC, State-owned Assets Supervision and Administration Commission of the State Council (SASAC), the State Administration of Taxation (SAT), State Administration for Industry and Commerce (SAIC), NBS, the All-China Federation of Trade Unions (ACFTU), Communist Youth League Central (CYLC), and China Disabled Persons' Federation (CDPF) to provide support and divide the responsibilities clearly. Between them there is an inter-ministerial employment policy working mechanism established to strengthen the coordination and organization of national employment policy-making. The members of the inter-ministerial coordination system at national level include not only the relevant ministries, workers and employers, but also local governments. The employment policies are rooted and implemented at local level. The inter-departmental coordination system at local level has the same function as at national level. It plays a pivotal role in the whole coordination system, and is crucial to implementing, monitoring and evaluating employment policies.

Although the environmental and climate change imperatives are already integrated into its overall development and growth strategies, skills development strategies are not at present systematically included in national climate change and green transition policies in China. The main reason is the weak coordination between national planning and the labour ministry. Another reason is that China has for a long time focused on the size rather than the quality of the workforce, and thus less attention

is placed on skills training or provision vis-à-vis job creation. Thus, there is currently almost no policy specifically designed for green skills development in China.

Generally speaking the focus on green skills development in China is still at its initial stage. The lack of a systematic and comprehensive policy framework on green skills identification and promotion gave rise to the missing policy coherence and coordination between departments or sectors. From other countries' successful experience, green skills development and environmental policies come together, but China needs to work more in this area to improve policy coordination for green skills at the planning, design and implementation stages.

3.5 Role of social dialogue

In China labour relationships changed significantly through the process of transition from a planned economy to a market economy. The relationship between the two sides of labour relations was gradually established and became more and more clear. Early in 1990 China approved ILO Convention on **Tripartite Consultation (International Labour Standards)**, **1976, No. 144**, and treats the tripartite mechanism as important in helping China embed the new labour relationship into the market economy environment. The first tripartite institutions were developed in China as part of the system of mediation and arbitration for individual and collective labour disputes, which was first introduced in 1986 and was provided with a legal foundation in the "**Labour Law of the People's Republic of China**". In 2001 the National Tripartite Consultative Committee (NTCC) to coordinate labour relationships was formally established and instructions were sent to all provincial governments to establish their own TCCs by the end of 2002. At local level there are local (tripartite) Labour Disputes Arbitration Committees to help solve labour disputes in almost all provinces.

Tripartite consultative bodies are rapidly being established throughout China in the hope that tripartite consultation can forestall or resolve the

growing number of labour disputes that are not resolved through the formal dispute procedures. However, the terms of reference of the tripartite bodies are too narrow. Moreover, independent representation of the interests of the three parties is absent. Thus, the role of the social dialogue and tripartite mechanism in China cannot totally meet ILO standards, even though the appearance of the tripartite mechanism can be viewed as an important development in reshaping Chinese labour relations.

In China labour unions are not as powerful as their western equivalents. Thus, formal social dialogue is rarely used on issues of green skills provision. But in recent years China's traditional energy-intensive industries such as iron and steel, cement or coal mining, have experienced great pressure to lay off unnecessary workers or employers owing to the strict targets of controlling pollution emissions or eliminating the backward or excessive production capacities of these sectors. In order to resettle laid-off workers, local government and employers' representatives will try to negotiate job placement details. Provision of training in new skills for some laid-off workers is one of the options in such negotiations. Though not called social dialogue, these negotiations could encourage some workers to ask employers for green skills retraining through a similar mechanism.

The role of social dialogue in promoting green skills in China is held back by the lack of a clear policy framework on skills development. Unlike many western countries, the trade unions and employers' associations seldom participate in the planning, design and implementation of skills development in China, since it is the role of government to guarantee an environment which encourages or legislates for works involvement in workplace negotiations. To change the current situation and to make social dialogue play an active role in promoting skills development, China's government should make efforts to create a space for employers' associations and workers to become active participants in skills identification, development and negotiation. The most important task of government is to establish mechanisms and infrastructure to ensure that social dialogue can work effectively.

4. Skills development measures for the green economy

4.1 Skills need identification/anticipation

China is attempting to clearly define green jobs and identify those green occupations. Currently green jobs in China can be generally categorized in three groups: direct green jobs, indirect green jobs and transformational green jobs. Direct green jobs concern work that could bring about direct environmental benefits, such as work in afforestation, pollution treatment and environmental protection areas. Indirect green jobs consist of those jobs closely related to green production, green circulation, green consumption and green life, including the manufacture of solar products, energy-efficient building materials and so forth. Transformational green jobs are created through greening of traditional non-green jobs by applying new technologies to treat pollution or increase energy efficiency, thus the coverage of such green jobs is even broader compared with that of the first two categories.

From 2010 MOHRSS, General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) and the National Bureau of Statistics (NBS) of China started to revise the “**Dictionary of Occupations in China**” issued early in 1999. The revision work lasted almost five years and was approved and promulgated in 2015. Compared with the previous version, one of the remarkable changes is that the green occupation labels have been included in the new dictionary. Based on the experiences of other countries, the dictionary labelled several professions featuring “environmentally friendly, low-carbon and circular” characteristics as green occupations. This is China’s first attempt to make such an occupational classification. In the 2015 edition of the Dictionary, 17 green occupations were marked and labelled with the Chinese phonetic alphabet initial “L” logo (see annex for the complete list of green occupations), accounting for 8.5 per cent of all specified

occupations in the Dictionary. According to the new Dictionary, these green professional activities include environmental monitoring, protection and management; improving the ecological environment; production of solar, wind, biomass and other new energy sources; and provision of large-capacity, high-efficiency transportation and activities in other production areas such as waste recovery and utilization. Service activities such as scientific research, technology research and development, planning and design of social activities are also considered green professions according to the Dictionary. However, the Dictionary does not give any information or description in detail regarding the criterion for an occupation to be considered as green. It also admits in the amendment note that the occupations labeled L as green are only some of the green occupations, that is those with a high degree of social acceptance and significant characteristics as green jobs.

The right skills for green jobs are the prerequisite for making the transition to a greener economy. Whether the green occupations are newly created or are based on exiting jobs, they all require relevant skills for workers. Although there are no specific official documents to identify which skills are green in China, one relies on the Dictionary’s categorization and summary of the specific skills needed in these green occupations. Green skills, also known as sustainable development skills, relate to the technology, knowledge, attitudes and values provided by labour to promote sustainable and green development. Green skills could be the technical skills needed by specific green jobs or the generic skills that could minimize the use of resources, utilize energy and other resources efficiently, reduce GHG emissions, recycle the used products or protect the environment. According to China’s Dictionary of all occupations, the activities of the green occupations could be broadly classified into eight categories, including eco-agriculture, green

Table 8. Overview of the skills needed in green jobs

ACTIVITIES OF GREEN OCCUPATIONS	SKILLS NEEDED	REPRESENTATIVE GREEN JOBS
Eco-agriculture	Skills to protect or improve the agriculture environment, to increase the utilization efficiency of resources and energy in agriculture sector	Agricultural and forestry supervisor, agricultural inspector
Green manufacturing	Skills to increase the utilization efficiency of non-renewable resources and energy in manufacture sector, to minimize the environment impacts from manufacturing activities	Wind turbine manufacturer, equipment operators
Green energy	Skills to produce and utilize renewable resources and clean energies, to	Renewable energy management, research and training, engineering, power technology, solar power generation, wind power generation
Green building and construction	Skills to increase the utilization efficiency of non-renewable resources and energy in building sectors, to designs and construct green buildings	Eco-design for the building, construction labourers, building retrofitting workers, electricians, roofers, building inspectors
Green transportation	Skills to develop electronic vehicles, to construct high efficient public transportation	E-vehicle manufacturer, high-rail construction worker, metro and e-vehicle bus driver
Waste recycling	Skills to increase the recycling rate of non-renewable resources	Recycling and waste management
Environment protection and pollution treatment	Skills to control and treat pollution, to protect or improve the environment	Waste management, coal washing and preparation, desulfurization and denitrification equipment manufacturing
Green services	Skills to help realize energy conservation, to provide training to needed sectors, to develop green finance instruments, to provide consultancy	Research and training, energy conservation services, financial consultant

Sources: summarized by the authors.

manufacturing, green energy, green building and construction, green transportation, waste recycling, environmental protection and pollution treatment, and green services. The specific technical skills needed for these occupations and representative green jobs are listed in Table 8.

Some green jobs focus on researching and developing advanced green technologies; skills needs for these green jobs are quite rigorous, requiring workers or practitioners to master professional knowledge. In China, some colleges and universities have started to attach importance to these green areas, including environmental sciences and engineering, urban and rural planning, chemical engineering

and technology, management science and engineering, landscape architecture and so forth, and have attempted to establish the targeted education system for these jobs. However, there are numerous other green jobs which do not need well-educated college graduates, but only those with specific professional skills. Most of these green jobs entail manufacturing and service work in green areas. For example, jobs manufacturing desulphurization equipment or wind turbines, often considered green jobs, do not require significant extra skills compared with other equipment production jobs. Thus, the skills requirement for different kinds of green jobs are quite distinct.

4.2 TVET provision for new green occupation and for greening established jobs / occupations

Skills development relates to the process of equipping the current and future labour force with knowledge and competencies appropriate for the work. The TVET system is in the forefront of skills development in China. Vocational training, recognized nationally and developed by industry, still plays a critical role in provision of green skills. While the qualifications provided by universities or other professional institutions could also contribute to identifying and providing green skills, vocational training is expected to be the most important source of gearing up the labour force for green jobs. The main reason is that the majority of green jobs or occupations do not need university- or college-educated workers. Such vocational training could be offered by professional vocational training schools, private training institutions, certain official organizations related to specific industries or sectors, or within the green enterprises. However, currently green skills provision and development is still not systematically incorporated into the professional education and TVET system. The complete green skills training curriculum has not yet been established. However, in many vocational training institutions green skills training is embedded in its teaching standards or requirements.

In recent years the TVET system in China has made great progress in promoting green and sustainable development. Great efforts have been made to add environmental protection subjects in some vocational schools, develop new courses related to green skills, recruit people who intend to engage in green jobs in society, and engage in short-term green skills training. Nevertheless, generally speaking most vocational colleges in China do not pay enough attention to the development of green skills. There is no overall design in the TVET for green skills. Thus, there is an urgent need for China to draw up a plan or establish the appropriate green skills education and training system based on its own situation as well as the successful experiences

of other countries. Through China's green transition process, many occupations will face great challenges; several occupations may even have to be eliminated. Other promising green occupations will have to upgrade according to the new needs. The trend in such changes sets new requirements for China's TVET system to make adjustments that comply with the needs of the real situation.

Besides the technical skills for specific green jobs, there are also some generic green skills which are not strictly confined to green jobs or green occupations but also could apply to other work. According to China's vocational training guidance or teaching standards, there are some generic skills which could be considered as green skills, including awareness of energy and environmental conservation, the capacity to help achieve sustainable development, attention to cost and efficiency, and mastery of security knowledge and the capability of green operations.

In fact, the knowledge system for green skills is still under development in China. There are various shortcomings and deficiencies in current green skills training systems. First, the supply of green-skilled personnel is insufficient, and it is therefore difficult to meet the needs of green industry development, given the gap between the demand for and supply of green-skilled persons. Take wind power generation as an example: based on a projection by China's State Grid, the cumulative labour demand for skilled workers and professional talents in relevant sectors will reach 1.5 million, but the supply of labour at that time is far from sufficient (Bao, 2016). Some expert projects that the gap is around 400,000.⁷ The second problem is that the current structure of green employment is highly inappropriate. For many green jobs, there are more novices than skilled workers; there are many basic types of work, but the skilled talents are insufficient; there are many skilled workers in production sectors but few in service sectors; there are many technical workers but few management employees. Since many of the relevant green professions or occupations have

⁷ http://www.chinadaily.com.cn/hqgj/zxqxb/2013-08-04/content_9761653.html.

only been made independent of other disciplines in recent years, exploration of professional education for these green occupations has only just started. The lack of market relevance in training provision, together with the ambiguity of the requirements for green job workers in the labour market, have led to the current inappropriate structure of green employment. Besides, there are still misunderstandings about the education and training of green skills or green job workers. Many people equate the green industry with the environmental protection industry and equate green talents with environmental protection talents. Too much emphasis has been put on education and training for highly-qualified green talents, while the role of vocational training does not receive equal attention. Furthermore, owing to the lack of systematic and comprehensive planning, the training system is far from appropriate. Many of China's colleges and universities have not established the targeted curricula for green occupations or sustainable development. Some of the educational concepts and perspectives of the training institutions are relatively deficient. Many relevant courses only focus on protection of the ecological environment, while lacking practical skills training and education. Many colleges and universities do not deliberately design a system of green skills training, but copy others' experiences. There is no systematic planning and coordination to connect relevant green courses with other departments. Finally, but importantly, the evaluation system of students' green quality needs to be strengthened and improved. The green skills evaluation system is an important way of providing students with the necessary guidance and incentives to participate in green skills training, and the lack of positive incentives and guidance does not guarantee the effectiveness of such green skills education and training.

In modern society every citizen is required to have an awareness of environmental protection and resource conservation. "Green skills" should be viewed as a basic requirement for everyone. At present the teaching objective of TVET system includes equipping students with a basic moral conscience, social abilities, professional abilities and problem-solving abilities. However, green

skills relevant to sustainable development are not included.

The contributory factors to all these deficiencies are quite complex. Although China has gradually realized the importance of green jobs, there is no authoritative and consistent definition of which jobs are green. In many developed countries there are many well-defined green jobs. However, as mentioned before, the identification of green jobs is still far from perfect in China, especially within the TVET system. The label of green occupations in the "Dictionary of Occupations in China" is quite general with no detailed description as to why these occupations are considered green. It is necessary to clearly identify green jobs or occupations systematically from a TVET perspective, and incorporate them into the major directory of vocational and professional education. The task includes not only making upgrades and adjustment to existing occupations, but also incorporating some new green jobs. In order to better satisfy the needs of green jobs and green skills, the major directory in the TVET system should be upgraded and adjusted scientifically. Professional development orientation should be guided by green economic development, and new green priorities. Professional development orientation should be guided by green economic development, and new green priorities needed to be added in time to ensure that the TVET system is connected with current social-economic needs.

Another contributing factor is the lack of qualified teachers in the TVET system to provide green skills education and training. Good teachers are critical to the quality of green skills provision by the TVET system. Faculties' mastery of green skills is directly related to the final impacts of education and training. The provision of green skills requires a team of experienced teachers with green skills within TVET. However, since many green skills are required by some emerging industries, not all the teachers in the current TVET system have mastered the latest knowledge and technologies relevant to green skills.

In addition, there has for a long time been a lack of awareness of the importance of skills

development in China, especially its importance in the process of transition to a green economy. Currently China has not supported relevant research in exploring the reforms and adjustment needed in the TVET system to offer better green skills development. The major driving force in this area is from international organizations; ILO's project on green **"Skills for Green Jobs in China"**, conducted by the China Academy of Labour Social Security, MOHRSS in 2010, helped China make an overview of its green skills development for the first time. In 2014 APEC supported the Institute of Vocational and technical education, Ministry of Education in carrying out a project on **"Systematic Design of Green Skills Development in Technical and Vocational Education and Training (TVET)"** in China. The project aims to cultivate a workforce with green skills through TVET specialities offering a revision of teaching and learning objectives, and the establishment of a green skills network. It is expected that through this research a list of typical new TVET green skills specialities would be identified during the analysis. The detailed content of "green skills" as an essential part of the teaching and learning objectives of TVET specialities are also considered the main outcomes of the projects. Although not yet finished, there are some preliminary findings from the project. It puts forward a list of 12 items as the list of generic green skills, including (1) saving resources; (2) reducing waste generation; (3) sorting of domestic and production waste; (4) proper use and maintenance of equipment; (5) following of safety operation procedures; (6) setting up an occupational and environmental health system; (7) assessment of work or equipment problems to prevent accidents; (8) emphasizing integrity at work; (9) applying information technology and artificial intelligence equipment; (10) application of health and safety and energy-saving technology or equipment; (11) provision of green service; (12) and public dissemination of green concepts and knowledge. The final results from the foregoing could provide policy-makers in China with basic information and targeted recommendations for improving its TVET system for offering green skills education and training.

4.3 ALMPs and retraining measures

China's 13th Five-Year Plan proposed pursuing a more proactive employment policy, with the goal of establishing a market-oriented employment mechanism and encouraging people to start their own businesses. Proactive employment policies in China, which are similar to ALMPs adopted by many other countries, relate to policies and measures to provide the unemployed with the necessary professional training for alternative employment or provide in-service staff with vocational training so as to improve their employment adaptability. From a global perspective, most countries are constantly exploring ways of establishing and improving the employment system in a manner suited to their own conditions and with phased characteristics.

The **"Notice on Further efforts to Help Laid-off Workers Realize Re-employment"**, promulgated at the National Conference on Re-employment Issues held by CPC Central Committee and the State Council in 2002, first established the complete framework of proactive employment policies. According to China's proactive employment policy framework established by this notice, there are four major sources for active promotion of employment in China, including (1) labourers finding jobs by themselves or becoming self-employed, (2) employers creating more jobs, (3) government providing public service job positions as job placements, and (4) enterprises transferring employment by separating principal from auxiliary businesses.

To encourage labourers to seek employment through flexible and diverse means, the Chinese government actively develops labour-dispatch organizations and employment bases to provide services and assistance for flexible employment. The role of employment services provider is very important. Since the late-1990s the Chinese government has made great efforts to establish a public employment service system. Public employment service agencies at all levels provide free job placement and employment guidance to the urban unemployed and rural migrant workers. Currently, at both city and district levels in large and medium cities and some small

cities which have the necessary conditions, comprehensive service premises with public job agencies as their key service have been widely established. Cities at prefectural level and above have set up organizations to provide labour security work in local communities, and have improved the network of employment service organizations at grassroots level. This service plays a guiding role in promotion of the rational allocation of labour resources and the development of occupational training. The government also encourages and has standardized the development of job agencies run by non-governmental entities.

China's economy faces relatively large downward pressures and some firms face difficulties in production and operation which lead to insufficient employment. The increasing number of graduates nowadays will also add pressure to the job market. Faced with such great employment pressures, appropriate proactive employment policies are urgently needed. "Suggestions" for relocating redundant workers were jointly released by seven ministries including the MOHRSS and NDRC in 2016. In addition to the help given to redundant staff, support will also be offered to firms who create new jobs by adopting a green development strategy, develop new green or low-carbon industrial fields and products, and expand the domestic and overseas markets. To cushion the effect of job losses on families and society, the central government decided to allocate 100 billion yuan (\$15.4 billion) to help laid-off workers form the basis for energy-intensive sectors so as to create new jobs. The fund can be increased if necessary and local governments should handle their responsibilities accordingly, according to China's Premier Li Keqiang in March 2016.

The Chinese government has again formulated a set of policies for promoting the re-employment of workers laid off from China's traditional heavy industries as a result of the measures taken to phase out outdated production capacity and promote reforms from the supply side. China expected to lay off 1.8 million workers or about 15 per cent of the workforce in the coal and steel industries between 2016 and 2018 as part of efforts to reduce industrial overcapacity, but

no clear timeframe was given. Central and local government attached great importance to measures addressing the needs of these laid-off workers, including vigorous creation of job opportunities, improvements to re-employment services, increased financial inputs for re-employment, strengthened skills training for re-employment, and active guidance to laid-off and unemployed persons on changing their attitudes to employment. However, no specific attention has been given to green skills training to help these laid-off workers find new jobs.

4.4 The role of the private sector in skills training

Mainstream skills development in China is through the formal education system, including colleges and universities or the TVET system, while the private sector plays a more important role in providing the necessary training. In fact, private education is a sunrise industry in China. According to the statistics, there were 579,008 institutions in the education and training industry in 2008, of which 120,526 were private institutions. The courses provided by these private institutions included pre-school, primary, secondary and higher education plus vocational and technical training. Some 37.5 million students were enrolled with these institutions in 2008, of which 8.3 million were pursuing vocational and technical training courses.⁸

There are various forms of skills training offered by the private sector, including:

- a) Non-government or private skills education and training institutions;
- b) Internship skills training or on-the-job training offered by private enterprises;
- c) Modern apprenticeship training;
- d) Investment by enterprises in employee skills development;
- e) Private sector associations training programme.

⁸ http://www.chinadaily.com.cn/hkedition/2011-01/12/content_11830900.htm.

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Generally speaking the provision of skills training by the private sector is non-academic, independent, selective, and not mandatory or compulsory. Thus, its organizational form can be varied. Without the constriction of the rules and regulations applied to public organizations, it can take full advantage of the most flexible forms and resources to serve students. The private sector can more easily change its teaching methods and teaching content according to market demand and the needs of students.

In the training system of skills development, internship is critical in providing opportunities for hands-on experience in an authentic workplace environment. It complements the training programme and for most courses, especially skills-based courses, at certificate, diploma and degree levels. In manufacturing sectors, following liberalization of the economy, factories are private-sector-run enterprises and these are the companies offering practical training opportunities to students from all sources.

There are many enterprise-based training centres in China, which are sponsored by employers or trade associations. In order to improve the skills levels of workers, the Chinese government is also calling on enterprises to become more involved in vocational training. It expects enterprises to provide and encourage VET for their workers. However, there is no detailed data on the scale of such an enterprise-based training provision system. Enterprise-based training is usually offered by large State-owned companies. Efforts vary from simple initiatives such as providing skills training for workers to more complicated, structural initiatives such as establishing an apprenticeship system for highly-skilled technicians to train apprentices. In 2015 China launched the pilot programme of modern apprenticeship training and selected 165 pilot units, including 13 trade associations and 1,878 firms. The pilot units could be categorized according to region, industry, enterprise and school. These apprenticeship-training pilots aim to equip people with advanced green skills, including in the high-technology machinery industry, clean coal production and utilization, green construction material production, tourism and so forth.

The Chinese government encourages and guides private capital into the education sector and continuously updates relevant financial and tax policies. For instance, in March, 2013 the “Decision of the State Council on Accelerating the Development of Modern Vocational Education” was issued. It is expected that the private sector will contribute more in the future and play an important role in offering the green skills training most wanted by pointing out in the decision that “it will release the opinions on encouraging and supporting the development of private education, to implement the policies and measures about the development of private education, and to attract social capital into education sector” to help generate high-quality labourers and technical skilled talents.

In 2014 China’s Premier Li Keqiang attended the national vocational education meeting, the last such vocational education meeting having been held eight years previously. He made a speech at this meeting and emphasized, “In addition to the government, social entities, companies and private investors should take part in establishing more vocational training of different levels to integrate practical needs with teaching.” This shows that the central government hopes that private investors and social enterprises will play an important role in a major reform of China’s vocational training and ensure that students and employers obtain the necessary skills. However, even the skills-based vocational education offered by the private sector is receiving unprecedented attention, judging by these remarks and documents; but there are still no specific policies or targets for green skills provision.

4.5 The role of institutional set-up

In China there is a national Vocational Qualification and Certificate system established in 1994, governing over 50 industries. The Ministry of Labour constituted the corresponding “**Vocational Skill Assessment Regulation**” and “**National Occupational Standards**”, and the Ministry of Personnel constituted

the “**Provisional Means of Vocational Qualification and Certification System**”, both of which were based on the **Vocational Qualification and Certification Regulation**. In 1999 the “Dictionary of Occupations in China” promulgated 1,838 kinds of occupation which lay the foundation for implementation of the vocational qualification certificate system in China. The vocational qualification and certificate system is an essential part of the Chinese labour employment system, and has important influence on advancement of workers’ skills, promoting employment and deepening the market economic reforms. It has two types of qualification certification: job-access qualifications and assessed skill qualifications. The implementation of a vocational qualification system promotes the creation of professional technical personnel and provides an opportunity for human resource management to align itself with international rules and regulations. The national Vocational Qualification and Certificate system is considered the most important way of assessing workers’ skills and abilities for the jobs; other ways of implementing vocational qualifications from sector level are merely supplementary to it. However, after 20 years of development the system has caused many problems and the government is considering making efforts to reform the system in accordance with the latest developments in industrial structure adjustment and the changing demand for skills. Indeed China has started to remove 272 vocational qualification and certification requirements in five steps since early 2014, aiming to support creation of new businesses and bring forward new ideas.

The government is working to create new collaborative programmes between different stakeholders such as enterprises and schools. The “School-Enterprise Cooperative Development of Skilled and Talented People” brings together the government, schools, and enterprises to address these issues together.

To enhance the cooperation and coherence between different departments, China established a joint conference mechanism between various ministries to discuss policies and measures relevant to job skills development. The major participating members included

MOE, MOHRSS, MOF, NDRC and some others according to the issues considered. The MOE’s main responsibility is to provide guidance for development and reform of vocational education and skills training, for which MOF will provide necessary financial support; NDRC can design and implement key programmes for TVET and other forms of skills training, while MOHRSS will coordinate the ministries and provide the policies to promote training in skills from all sources. The joint conference on relevant issues will be held regularly once or twice a year, and all the departments will discuss the terms listed in conference memoranda and settle the details of the conference. Through this coordination mechanism working efficiency can be improved and disputes between ministries can be reduced. However, an inter-ministerial coordination mechanism on green skills provision is still lacking.

5. Analysis of case studies

5.1 Job opportunity in the green transportation sector

China's transportation sector is undergoing a profound transformation. As the average wealth of Chinese citizens increases, the former "kingdom of bicycles" is experiencing a swell of motorization. In 2009 China overtook the United States to become the world's largest automotive market, home to some 170 million vehicles. In 2016 the number increased to reach 290 million. As the vehicle volume continues to grow, China's energy consumption from transportation will also increase rapidly. The transportation sector currently accounts for around one-tenth of China's total primary energy consumption.

The government plans to invest trillions of dollars between now and 2020 to make the transportation sector more environmentally sustainable, and is adopting low-pollution strategies to both meet rising vehicle demand and improve public transport. Although data on green transportation in China are sparse, various analyses explore elements of this transition. Intercity and urban rail, for example, have attracted large-scale investment in China and can be considered "green" approaches when compared to fossil-fuel-intensive road and air transport. From 2014 to 2017 China's annual investment in high-speed rail was more than 800 billion yuan (\$121.3 billion). From 2005 to 2008 the "green" share of China's overall transportation investment increased from 16.5 per cent to 28 per cent.

Data on employment in China's green transportation sector are similarly sparse, although estimates have been derived for certain subsectors. Despite its relative newness the Chinese market for alternatively-fuelled vehicles is expanding rapidly and China's electric vehicle (EV) market is in pole position to become the first nation in the world to realize the EV era. As of November 2016^[update], the Chinese stock of plug-

in electric vehicles consisted of over 640,000 all-electric vehicles (75.6 per cent of the total) and more than 206,000 plug-in hybrids (24.4 per cent of the total) sold since 2011.⁹

Based on China's total investment in developing and producing new energy vehicles, it is possible to calculate potential job creation in this sector during the 2012-2020 period. According to research conducted by Worldwatch and IUE, CASS, if the government prioritizes the development of alternative-fuel vehicles, then cumulative production of hybrid and electric vehicles could reach 16.7 million (15 per cent of total vehicle production), or an average of 1.67 million vehicles annually. This would lead to creation of a rough average of 1.2 million green jobs per annum in this sector. Under a less rosy development scenario, however, China's alternative fuel vehicle industry would generate an average of 640,000 jobs annually between 2011 and 2020 (Pan et al., 2011).

Electric vehicles share many of the same basic components found in traditional vehicles, but they have unique components that separate them from conventional vehicles such as the lithium-ion battery and electric motor. Workers from a variety of educational and employment backgrounds are employed in the electric vehicle industry, including the scientists who conduct research in electric drive technology, the manufacturing workers who build the vehicles, and the automotive maintenance technicians who repair the vehicles. Most of these occupations require specialized training or work experience in electric vehicle manufacturing and maintenance.

9 "China Auto Association: 2016 new energy vehicle production and sales were over 500,000, an increase of about 50 per cent" (in Chinese). http://auto.sina.com.cn/j_kandian.d.html?docid=fyaexzn8803939&subch=bauto&

5.2 Demand gap of professional and technical personnel in wind power sector

Wind provides a clean and renewable energy source. Compared with traditional energy, wind power generation does not rely on fossil fuels, is not subject to fluctuations in the price of fuel, has a stable cost structure, and does not create air pollution or carbon emission. Given these advantages, wind power generation has become a significant source of renewable energy in many countries. According to statistics from the International Renewable Energy Agency (IRENA), in 2013 the global wind power market created a total of 834,000 jobs within the sector, an increase of 11 per cent over the 2012 level. China is the home of 365,000 jobs in wind power sector and ranked top in the world in 2013; in 2012 there were only 267,000 workers in the sector. The fast-growing wind power market in China has created large green employment opportunities in associated industries.

According to a survey of typical firms,¹⁰ in China currently every megawatt(MW) of wind power installed capacity will create 6.6 jobs in operation and maintenance and another 6.3 jobs in equipment manufacturing. According to China's "13th Five-Year Plan of Wind Power Development", 300,000 new jobs would be created in the wind power sector and relevant industries during the period of the Plan and total employment would amount to 800,000 by 2020.

Demand for skilled workers in the wind power industry is not only in power generation and supply and turbine generator system manufacture, but also in wind-power related research, development and consulting. It is estimated that among the 800,000 jobs in the wind power sector, there is a demand for 180,000 professional and technical personnel who have mastered advanced knowledge and skills of wind power generation, which means creation of an annual demand for over 13,000 students trained in universities or the TVET system. As

not as many appropriately-qualified students graduate every year, the significant gap points to an urgent need to provide and enhance training in this sector.

5.3 Skills training offered by private sector: Case of southern power vocational training school

Guangdong province Southern Power Vocational Training school, founded in February 2010, is a comprehensive vocational training organization. The school is noted for its training for electrical network operating licences and the specific types of vocational skills training needed for the power sector. It can also offer training for the vocational qualification examination, and relevant professional and technical qualifications (including professional and technical personnel to continue education). The school is one of the 27 units acknowledged as "example of outstanding national private non-enterprise training organization".

China's power sector and grid system is currently experiencing transition to a cleaner electricity structure, with the changing demand for vocational skills in the power system. The school could train for five kinds of work permit for electric network operation, including high voltage, low voltage, relay protection, high voltage test and power cable systems. According to the "Dictionary of Occupations in China" (2015 edition), almost all the technical jobs in the power sector are considered as green occupations (see annex). Thus, the professional education and training offered by the school could be viewed as a good channel for providing green skills for the power sector.

Unlike the traditional public vocational training school, this school is founded mainly on private capital, thus the education and training systems are more flexible. The school curriculum could fit market needs better. According to the advances in technology and associated policy development, the new green skills in the power sector could be integrated into the training in a

¹⁰ IUE, CASS and ILO. 2009. Low carbon development and employment in China.

more timely fashion as compared with the public training system. The school also establishes good relationship with firms in the power sectors, and sends students to the firms where they can gain on-the-job training. By the end of 2014 the school provided training services not only for individual students but also cumulatively for more than 6,500 government agencies, enterprises and institutions. It successfully provided nearly 900 special training activities in relevant fields, and offered training for more than 10 million people. Among them, most students who graduated or gained training from the school are equipped with green skills in the power sector and find jobs in those green occupations.

In fact the public vocational schools are often poorly equipped, with limited funds and inadequate facilities. Most of the public vocational schools in China still take the initiative in teaching and in course planning, rather than using the successful models from other countries that rely on industry-school cooperation. Thus, exploration in offering green skills training by the private sector such as in this case could lead to substantial engagement by firms and business associations in the training of workers.

5.4 Green employment of rural labour force: Case of Changting county in Fujian province

In recent years China's rural surplus labour force has continued to increase, while the impact of economic fluctuations will gradually weaken the ability of traditional industries to absorb the rural labour force. There is an urgent need to find alternative ways of creating jobs for the surplus rural labour force. With its great efforts to promote green economy, China's modern agriculture, ecological agriculture and rural tourism have developed rapidly, creating new opportunities for the rural labour force find jobs in their hometowns.

Changting County belongs to Longyan City in Fujian Province, which was one of the most

serious soil erosion areas in the southern granite area of China. To address the problem of soil erosion, the local department of human resources and social security in Changting takes measures to implement the "Green Employment Project", guiding surplus labour in the region to take industrial employment, the total number of workers amounting to 492,000. There are also 930 households of more than 5,600 people who initiate their own business in the field of forest development and forestation.

As a pioneer in China, Changting County offered free skills training for residents in soil erosion regions. It creates a so-called "please come in" model, by offering training funds directly to enterprises, encouraging them to provide necessary training in the skills most needed from the production side and hire the trained farmers to achieve a "training person to realize employment" target. In this model the skills training is mainly offered by enterprises to former farmers who lack job skills. When the farmers master the basic skills needed, they can be employed by the enterprises immediately. Since 2003 61,000 free training sessions have been carried out, and 59,000 people have realized employment after training. Most of the skills training is for local green industries, such as the production of textile products, machinery and electronic equipment, eco-agriculture, and sideline products processing.

Besides the working skills, Changting county also provided some training courses to enable residents to start their own entrepreneurship. According to data released by local government, in recent years a total of more than 100 business-training courses were offered by local human resources and social security departments to help people master the skills needed to establish their own businesses. More than 3,000 trainees were trained and around 400 million yuan of small interest loans were granted to them. With such support a group of independent entrepreneurs was established. Most of these self-employed people take the job of planting cash crops in their hometown, including oil tea camellia, red bayberry, ginkgo, bamboo and so forth. Thus, local government also offered the necessary skills to grow these plants. The successful experience of Changting has been

hailed as an example of addressing southern soil erosion. With more and more local residents started to grow plants suitable for its natural conditions, the former “Framing Mountains” have become “Mountains of Flowers and Fruits” with many former farmers working for green jobs and realizing ecological protection targets at the same time.

6. Conclusions and recommendations

6.1 Conclusions

Although the Chinese government has realized the importance of green development and makes unprecedented efforts to achieve green transition, the current environmental and climate change strategies do not generally have a significant skills development component. The sections on skills development in relevant documents are quite limited and most are too generic without details of implementation. Consequently, there does not appear to be a national policy strategy to meet skills needs arising from the required changes in policy and regulation. Meanwhile, understanding and provision of green skills training is not enough. The establishment of a training and education system for green skills is just at the initial stage. Skills gaps are already recognized as a major bottleneck in a number of sectors, such as renewable energy, energy resource efficiency, renovation of buildings, construction, environmental services, and manufacturing (MOHRSS, 2009). The supply of green skilled employers is insufficient, and thus could not satisfy the needs of some green sectors. At the same time there is a surplus of workers with skills and backgrounds which are not in demand who are about to be laid off, contributing to unemployment. Thus, the skills mismatch problem is significant in China's current green transition process.

Another significant barrier to China's green transition is the lack of basic research and statistical capacity. It is extremely difficult to find accurate, reliable data on economic and social trends in China, because this has not been included in the existing statistical system. Expert estimates and projections often vary significantly, requiring careful scrutiny to determine their reliability or suitability in China's context. Concerning green skills training, there are no detailed data on the number of green jobs or the need for green skills, which makes it difficult to provide targeted training and education.

The current TVET system and most vocational colleges in China do not pay enough attention to the development of green skills. There is no overall design in the TVET for green skills. The lack of clear definition on what jobs and skills are green make it difficult to develop specific training and education curricula in the TVET system, especially for most public vocational colleges and schools. The lack of qualified teachers in the TVET system to provide green skills education and training, along with outdated curricula, will result in poor quality and relevance of green skills training.

China is currently experiencing the heavy burden of helping millions of workers laid off from some traditional energy-intensive sectors such as coal mining, iron and steel production, and so forth. The government has already released a series of proactive employment policies on relocating redundant workers. However, there is still no specific attention or detailed measures directed to green skills training to help these laid-off workers find new jobs.

As China advances its economic and political reforms, the country has become less centralized than two decades ago, making relationships between the different levels of government increasingly complex, which also increases the difficulties of coordinating central and local government. Besides, owing to the unclear definition and lack of attention focused on green skills provision, coordination between sectors and departments on green skills development is quite weak.

A large number of actors and providers (ministries, agencies, central and regional governments, NGOs, employers and workers) are already involved in skills development at present. But their efforts often overlap and are not well coordinated. In China, the active participation of employers' and workers' organizations in labour markets, which is essential for ensuring provision of relevant and appropriate green skills training, is also quite limited.

Given the above facts and problems, much work is still needed to establish a better system for providing green skills. While not enough, China has taken many measures, including identification of green occupations, to emphasize the role of private investors and social enterprises in offering vocational training. In its relevant documents there are more and more references to skills training. There is also a great impetus from international organizations to help China conduct research on green skills development. ILO and APEC have already supported several Chinese institutes in studying the status of green skills development in China. It is expected that the research findings will arouse the attention of policy-makers and significantly help promotion of green skills development in China.

6.2 Recommendations

Skills development is key to the transformation to green employment. All existing training should be greened, including practical skills training in agriculture, and skills training for transforming rural employment. Green skills should be incorporated into all these training programmes and a new skills development plan should also be drawn up.

Establish a system to identify and anticipate green jobs or green skills

In many developed countries there are well-defined green jobs. However, as mentioned before, identification of green jobs is still far from perfect in China, especially within the TVET system. There is an urgent need in China for a more rigorous approach to the analysis and anticipation of demand for green jobs and related skills. There are already various kinds of jobs considered as green, such as environmental assessment engineers, jobs in renewable resource recycling, sewage treatment operators, solar power workers, biogas production operators and so forth. China should continue to research new green jobs in each industry; and on the other hand speed up the process of developing green job standards by developing specialized green training and gradually improving the

range of green employment and the system of green employment training standards. The vague definition of the green jobs and green skills needed makes it difficult to design targeted policies, while clear identification of green skills needs could benefit skills provision. Study of green skills needs is currently being undertaken, supported by international organizations. It would be positive if the final findings could be used as the basis for the design of China's green strategies.

When the priority sectors for green skills development are identified, all kinds of channels - vocational schools, community training centres, public sector employment agencies and companies - should be used to equip potential employees with the necessary green skills. Green skills training should also be provided for the unemployed as return-to-work training. There should be a mechanism for offering up-skilling and re-training for workers in struggling companies; provision of green vocational skills training for migrant workers; provision of free green vocational training for demobilized soldiers; provision of green entrepreneurial training for university graduates and those wanting to start their own businesses; and offering of green vocational training as part of skills development for existing workers.

Incorporate green concepts in curricula development of skills training

The current skills training curriculum and education system should integrate more green elements. The design of a green skills curriculum could be divided into three stages. The initial stage is to promote scientific professional positioning. Based on demands from the social and economic markets the key green jobs and green skills could be identified. Next, based on the analysis of enterprises experts and curriculum experts, the second stage is to determine the main green skills needed. The third step is to design detailed new curricula, including connecting them with the old curricula and clarifying the logical relationship between specific courses. Further emphasis should also be placed on greening TVET as a catalyst for cross-sectoral planning and implementation of programmes in priority areas.

Furthermore, in modern society every citizen is required to have an awareness of environmental protection and resource conservation. “Green skills” should be viewed as a basic necessity for everyone. It is necessary to incorporate generic green skills in the content of teaching objectives in the current vocational skills training system. Thus, the concepts and skills of energy conservation, environmental protection, sustainable development and other green notions should all be subtly embedded in the curricula. Skills training curricula should be reviewed periodically to ensure they remain up-to-date and thus able to maximize the employability of students and their adaptability to the labour market implications of green growth.

Set up a complete green skills evaluation system and green professional qualification standards

A scientific evaluation system for green skills can promote progress in green skills provision. The establishment of such an evaluation system for green skills should be based on the existing occupation education evaluation system. Green-collar assessment and evaluation should be developed in accordance with green job standards so as to gradually develop green job practitioner qualifications and green skills assessment. By setting up a national vocational qualification evaluation institution, specific national green vocational qualification standards could be established based on the development and real situation of green industries.

The well-established green professional qualification standards could also help guarantee the quality of trainees’ green skills. With the development of green economy, there are more and more green jobs and green occupations. Meanwhile, the professional qualification standards of corresponding green industries change accordingly, so it is necessary to improve the catalogue of professional qualifications. A national unified green skills vocational qualification certificate system is urgently needed.

Enhance policy coordination and encourage social dialogue in green skills provision

Green skills development needs to be integrated into a wider environmental and climate change policy framework, rather than being seen as additional to or separate from other forms of skills development. Closer cooperation between different departments, different levels of government, employers and employees, policy-makers and educational institutions will benefit green skills development.

As green technologies and working practices diffuse throughout the economy, skill requirements will change correspondingly. Social partners and governments at all levels should collaborate in a broad effort to adapt TVET to changing green skills needs, with particular attention to the local level, where different stakeholders representing both supply and demand come into direct contact. The labour unions in China should play a more important role in representing workers’ interests and require employers to invest more in offering necessary green skills. It is important to avoid skills bottlenecks that slow the transition towards a green economy and marginalize workers.

When designing green skills development policies, all the social partners should be involved more closely in discussing the details. Responsibility should be shared between the government (with primary responsibility), enterprises, the social partners, and individuals.

Encourage private sectors to invest more in green skills development

There is a great need for increased private sector investment and new, innovative methods of financing training for green occupations. Skills development has been shown to be an important driver of change in its own right, triggering green investment and technological innovation, and thereby bringing sustainable innovations into markets at competitive prices. The current public vocational education and training system faces many barriers in offering the emerging green skills needed. The private sectors, including individuals and enterprises,

could be encouraged to engage with skills development through incentives to invest in acquiring new skills or in upgrading and maintaining their existing skills. Small and medium-sized enterprises are particularly likely to require assistance in upgrading the skills of their workers. These enterprises need to be made aware of business opportunities in green sectors and at the same time be persuaded of the value of green skills and the need to devote resources to acquiring them.

Improve the quality of jobs and maximize the green jobs potential

The green transition could create many decent new jobs with proper green skills development. During the process of offering green skills training, more attention should be placed on occupational safety and health, minimizing waste and protecting workers' rights. All these elements may contribute to improvements in job quality and avoidance of occupational hazards.

One of the main drivers in achieving green transition and green growth is to raise overall employment rates, especially during the time when traditional industries gradually lose the sustainable power to create new jobs. To achieve the target, policy-makers need to deliver policy portfolios to maximize the jobs potential for green transition. China could find it more useful to focus on attracting investment in expanding labour-intensive renewable energy capacity.

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8. List of key resource persons

Cai Fang, Deputy President, Chinese Academy of Social Sciences

Zhuang Guiyang, Chinese Academy of Social Sciences

Chen Ying, Chinese Academy of Social Sciences

Researchers from China Academy of Labour and Social Security

Jiang Jinghao, National Development and Reform Commission

Researchers from NRDC

Officials from the All China Federation of Trade Union

Officials from Ministry of Human Resources and Social Security

9. Annex: Green occupations identified by “Dictionary of occupations in China” (2015 Edition)

CATEGORIZATION	SUB-CATEGORIZATION	DETAILED OCCUPATION
2-01 (GBM 20100) Scientific researcher	2-01-02(GBM20102) Economics researcher	2-01-02-00 Economics researcher L
	2-01-06(GBM20106) Natural science and geoscience researcher	2-01-06-01 Mathematics researcher L 2-01-07-00 Agricultural science researcher L
	2-01-07(GBM20107) Agricultural science researcher	2-01-09-00 Management science researcher L
	2-01-09(GBM20109) Management science researcher	
2-02 (GBM 20200) Engineering technician	2-02-01(GBM20101) Geological prospecting engineering technician	2-02-01-02 Geophysical, geochemical and remote sensing exploration engineering technician L
		2-02-01-03 Hydrogeological engineering technician L
	2-02-02(GBM20202) Geographic information Surveying and mapping engineering technician	2-02-02-01 Geodetic engineering technician L
		2-02-02-03 Photogrammetric and remote sensing engineering technician L
		2-02-02-05 Marine surveying and mapping engineering technician L
		2-02-02-06 Geographical condition monitoring engineering technician L
		2-02-02-07 GIS engineering technician L
		2-02-02-08 Navigation and location services engineering technician L
		2-02-02-09 Geological surveying and mapping engineering technician L
	2-02-03(GBM20203) Mining engineering technician	2-02-03-05 Mine environmental reclamation engineering technician L
	2-02-05(GBM20205) Metallurgical engineering technician	
	2-02-07(GBM20206) Mechanical engineering technician	2-02-05-07 Metallurgical thermal engineering technician L
		2-02-07-11 Automotive engineering technician L
	2-02-010(GBM20210) Information and communication engineering technician	2-02-10-05 Information systems analysis engineering technician L
		2-02-10-06 Embedded system design engineering technician L
	2-02-012(GBM20212) Electrical engineer technicians	2-02-12-01 Power generation engineering technician L
		2-02-12-02 Power supply engineering technician L

CATEGORIZATION	SUB-CATEGORIZATION	DETAILED OCCUPATION
		2-02-12-03 Power transformation engineering technician L
		2-02-12-04 Power transmission engineering technician L
		2-02-12-05 Power installation engineering technician L
	2-02-017(GBM20217) Railway engineer technicians	2-02-17-01 Railway transportation engineer technicians L
	2-02-018(GBM20218) Construction engineer technicians	2-02-18-01 Urban and rural planning engineering technician L
		2-02-18-02 Architectural and municipal design engineering technician L
		2-02-18-04 Landscape engineering technician L
		2-02-18-05 Water supply and drainage engineering technician L
		2-02-18-07 Urban gas supply engineering technician
		2-02-18-07 Environmental Sanitation engineering technician
	2-02-020(GBM20220) Forestry engineer technicians	2-02-20-01 Desertification prevention and control engineering technician L
		2-02-20-02 Forest cultivation engineering technician L
		2-02-20-03 Landscaping engineering technician L
		2-02-20-04 Wildlife protection and utilization engineering technician L
		2-02-20-05 Natural reserves engineering technician L
		2-02-20-06 Forest protection engineering technician L
		2-02-20-10 Forestry resources investigation and monitoring engineering technician L
		2-02-20-11 Landscape plant protection engineering technician L
	2-02-021(GBM20221) Hydraulic engineer technicians	2-02-21-01 Water resources engineering technician L
		2-02-21-02 Water ecology and river harnessing engineering technician L
		2-02-21-04 Flood control, drought relief and disaster reduction engineering technician L
	2-02-022(GBM20222) Marine engineer technicians	2-02-22-01 Marine survey and monitoring engineering technician L
		2-02-22-02 Marine environment forecast engineering technician L
		2-02-22-03 Development, utilization and protection of marine resources engineering technician L

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CATEGORIZATION	SUB-CATEGORIZATION	DETAILED OCCUPATION
	2-02-025(GBM20222) Meteorological engineer technicians	2-02-25-01 Meteorological observation engineering technician L 2-02-25-02 Weather forecast engineering technician L 2-02-25-03 Climate monitoring, forecasting, engineering technician L 2-02-25-04 Meteorological service engineering technician L
	2-02-027(GBM20227) Environmental protection engineer technicians	2-02-27-01 Environment monitoring engineering technician L 2-02-27-02 Prevention and control of pollution engineering technician L 2-02-27-03 Environmental impacts evaluation engineering technician L 2-02-27-04 Nuclear and radiological security engineering technician L 2-02-27-05 Nuclear and radiological monitoring engineering technician L 2-02-27-06 Environmental health and security engineering technician L
	2-02-030(GBM20230) Industrial administration engineer technicians	2-02-30-02 Logistics engineering technician L 2-02-30-05 Renewable resources utilization engineering technician L
	2-02-031(GBM20231) Inspection and quarantine engineer technician	2-02-31-03 Entry and exit animal and plant inspection an quarantine engineering technician L 2-02-31-04 Special equipment inspection engineering technician L
	2-02-037(GBM20237) Land reclamation	2-02-37-00 Land reclamation engineer technician L
	2-03 (GBM 20300) Agricultural technician	2-03-03-00 Plant protection technician L
	2-03-04(GBM20304) Horticultural technician	2-03-04-00 Horticultural technician L
	2-03-07(GBM20307) Animal husbandry and grass industry technician	2-03-07-02 Grass industry technician L
	3-02 (GBM 30200) Security guard and fire fighters	3-02-02-06 Forest fire fighter L 3-02-02-07 Forest fire lookout inspector L
	4-01 (GBM 40100) Workers in wholesale and retail service industries	4-01-04-00 Waste materials recycling workers L

CATEGORIZATION	SUB-CATEGORIZATION	DETAILED OCCUPATION
4-02 (GBM 40200) Workers to provide services in transportation, storage and postal sectors	4-02-01(GBM40201) Rail transit service personnel	4-02-01-01 Rail transit driver L
	4-02-02(GBM40202) Road transport service staff	4-02-02-01 Road passenger traffic driver L
		4-02-02-02 Road freight traffic driver L
	4-02-06(GBM40206) Staff in storage industry	4-02-06-03 Logistics service staffs L
4-08 (GBM 40800) Technical assistance staff in service sector	4-08-02(GBM40802) Marine service staff	4-08-02-01 Marine hydrographic observers L
		4-08-02-03 Marine hydrographic inspector L
		4-08-02-04 Halobios inspector L
	4-08-03(GBM40803) Surveying and mapping service staff	4-08-03-01 Geodesic surveyor L
		4-08-03-02 Photographic surveyor L
		4-08-03-06 Marine surveyor L
		4-08-03-07 Unmanned aerial vehicle surveying and mapping operator L
	4-08-04(GBM40804) Geographic information service staff	4-08-04-01 Geographic information collector L
		4-08-04-02 Geographic information processor L
		4-08-04-03 Geographic information application operator L
	4-08-05(GBM40805) Inspection, inspection and measurement service staff	4-08-05-01 Agricultural food inspector L
	4-08-06(GBM40806) Environmental monitoring service staff	4-08-06-00 Environmental monitoring service staff L
	4-08-07(GBM40807) Geological survey staff	4-08-07-04 Geological survey staff L

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CATEGORIZATION	SUB-CATEGORIZATION	DETAILED OCCUPATION
4-09 (GBM 40900) Water conservancy, environment and public facilities management service staff	4-09-03(GBM40903) Soil and water conservation staff	4-09-03-00 Soil and water conservation staff L
	4-09-05(GBM40905) Nature reserve and grassland guardian	4-09-05-01 Nature Reserve patrol monitor L
		4-09-05-02 Grassland guardian L
	4-09-06(GBM40906) Wildlife conservation staff	4-09-06-01 Wild animals conservation staff L
		4-09-06-02 Wild plants conservation staff L
	4-09-07(GBM40907) Environmental management service staff	4-09-07-01 Sewage treatment staff L
		4-09-07-02 Industrial solid waste disposal worker L
		4-09-07-03 Hazardous waste disposal worker L
	4-09-08(GBM40908) Environmental health service staff	4-09-08-01 Cleaner L
		4-09-08-02 Living garbage collector L
		4-09-08-03 Living garbage treatment staff L
		4-09-09-00 Pest controller L
5-02 (GBM 50200) Forestry production worker	4-09-09(GBM40909) Pest controller	4-09-09-00 Landscaping working staff L
	4-09-10(GBM40910) Afforest and horticultural service staff	
	5-02-01(GBM50201) Tree seed and seedling breeders	5-02-01-00 Tree seed and seeding worker L
	5-02-02(GBM50202) Afforestation worker	5-02-02-00 Afforestation worker L
5-05 (GBM 50500) Supporting workers of agriculture, forestry, animal husbandry and fishery production	5-02-03(GBM50203) Forest management staff	5-02-03-01 Forest ranger L
		5-02-03-02 Forest tending worker L
	5-05-02(GBM50502) Animal and plant disease control staff	5-05-02-01 Crop protection worker L
		5-05-02-02 Forestry pest control officer L
	5-05-03(GBM50503) Rural energy utilization worker	5-05-03-01 Methane worker L
		5-05-03-02 Rural energy conservation worker L
		5-05-03-03 Solar utilization worker L
		5-05-03-04 Small hydropower utilization worker L
		5-05-03-05 Small wind-power utilization worker L
	5-05-04(GBM50504) Rural environmental protection worker	5-05-04-00 Rural environmental protection worker L
6-07 (GBM 60700) Production of paper and paper products manufacturer	6-07-01 (GBM60701)Pulp and paper production worker	6-07-01-02 Recycling worker for pulping waste liquid L

CATEGORIZATION	SUB-CATEGORIZATION	DETAILED OCCUPATION
6-10 (GBM 61000) Petroleum processing and coking, coal chemical industry worker	6-10-01 (GBM61001) Oil refiner	6-10-01-11 Shale oil refiner L
6-11 (GBM 61100) Chemical raw materials and chemical products manufacturer	6-11-08 (GBM61108) Specialty chemicals manufacturer	6-11-08-26 Biomass chemical products manufacturer L
6-14 (GBM 61400) Rubber and plastic products manufacturer	6-14-01 (GBM62002) Rubber products manufacturer	6-14-01-02 Tyre retreading worker L
6-20 (GBM 62000) General equipment manufacturer	6-20-02 (GBM62002) Boiler and driving device manufacturer	6-20-02-04 Wind turbine manufacture L
6-22 (GBM 62200) Automobile manufacturer	6-22-01 (GBM62201) Automobile components and accessories manufacturer 6-22-02 (GBM62202) Automobile manufacturer	6-22-01-03 Automobile components reproduction worker L 6-22-02-02 Automobile recycle and disintegrate worker L
6-23 (GBM 62300) Rail, ship and aviation equipment manufacturer	6-23-02 (GBM62302) Ship manufacturer	6-23-02-06 Shipbreaking worker L
6-24 (GBM 62400) Waste disposal utilization worker	6-24-02 (GBM62402) Electricity transmission and control equipment manufacturer	6-24-02-04 PV module manufacturer L
6-27 (GBM 62700) Waste disposal utilization worker	6-27-01 (GBM62701) Waste and scrap processing worker	6-27-01-00 Waste materials processing worker L
6-28 (GBM 62800) Workers for electricity, heat, gas, water production and distribution	6-28-01 (GBM62801) Workers for electricity, heat production and supply 6-28-02 (GBM62802) Workers for gas production treatment and transmission 6-28-03 (GBM62803) Workers for water production, transmission and treatment	6-28-01-08 Waste heat and pressure utilization system operator L 6-28-01-09 Hydropower generation operator L 6-28-01-10 Photovoltaic power generation operator L 6-28-01-12 Wind power generation operator L 6-28-02-05 Industrial waste gas treatment worker L 6-28-03-01 Water production worker L 6-28-03-02 Water supply and transmission worker L 6-28-03-03 Industrial wastewater treatment worker L

ISBN 978-92-2-132907-7



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