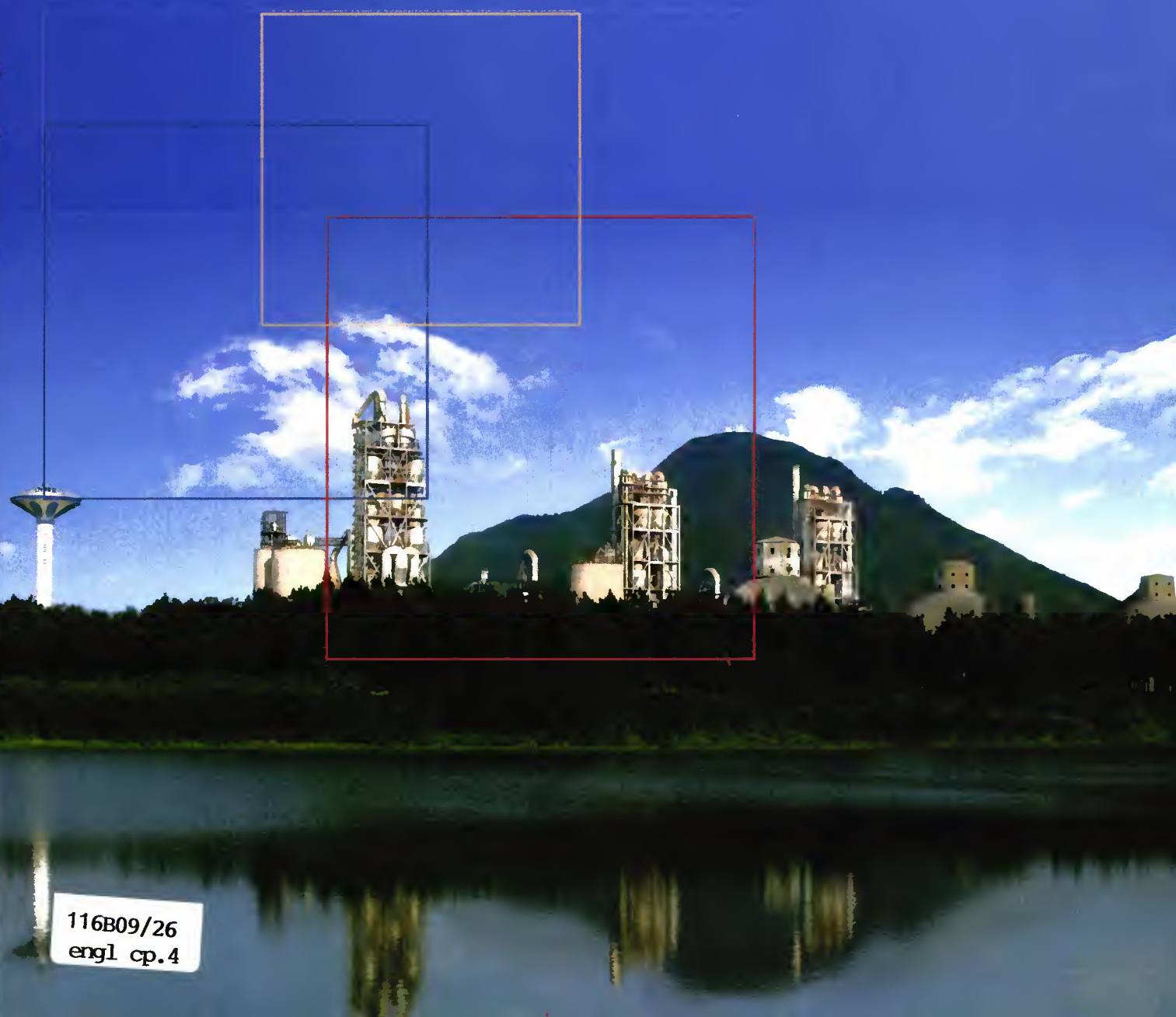




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# Employment impacts of enterprise restructuring in the transition to the green economy:

Case studies on metallurgy, building material and energy enterprises in China



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Case studies on metallurgy, building material and energy enterprises in China

**A study by the Green Jobs Programme for Asia and the Pacific**

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## Preface

The conclusions of the 102nd International Labour Conference in 2013 highlight that the greening of economies presents many opportunities to achieve social objectives. It has the potential to be a new engine of growth, both in emerging and developing economies. Such an inclusive approach can contribute to the creation of green jobs that can alleviate poverty and foster social inclusion. The greening of enterprises and jobs by introducing practices that are more energy and resource efficient, avoiding pollution and managing natural resources sustainably leads to innovation, enhances resilience and generates savings which can drive new investments and employment opportunities in particular.

The transition to a green economy and the restructuring of enterprises will transform jobs and support the creation of new employment opportunities, although some jobs might be replaced. Many will benefit, but many others will face hardships as certain jobs or even whole enterprises decline. It is therefore essential to set in place policies and strategies to ensure the protection of those likely to be negatively affected and to ensure a 'just transition'.

China, being among the world's leading economies on one hand and one of the primary contributors to climate change on the other, currently stands at a crossroads. In addition to the need to mitigate climate change, the country is facing a shortage of environmental resources, labour and core patented technology, which are deemed key barriers to sustained social and economic development. The energy, metallurgy and construction sectors are facing development bottlenecks in terms of high consumption and heavy pollution. All these challenges require the formulation and implementation of measures that are responsive to climate change while ensuring that the transition is well managed and respects equality principles.

This research, undertaken by the ILO Green Jobs Programme for Asia and the Pacific (Green Jobs-AP) in China, through the ILO Country Office for China and Mongolia and the All-China Federation of Trade Unions (ACFTU), provides further evidence and case studies pertaining to the employment implications of enterprise restructuring in the transition to the green economy. It promotes a better understanding of the impact on workers and presents practical approaches undertaken by governments (national and local), industry and enterprises, as well as trade unions in response to possible negative impacts, and maximizes the potential for workers to benefit from the transition.

The findings of this research provide a crucial contribution for decision-making in China and also offer key guidance to other countries in Asia and the Pacific, if not globally, in promoting the greening of enterprises and a just transition to a green economy.

Maurizio Bussi,

Director, ILO Decent Work Technical Support Team  
for East and South-East Asia and the Pacific

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## Executive summary

Many Chinese enterprises are shifting toward the green economy by shutting down outdated production facilities, decreasing overcapacity, saving energy, reducing emissions, updating equipment and technologies, and improving their capacity to innovate, while the Government has taken measures to change the economic development track and adjust the economic structure, as well as to promote public awareness of green(er) consumption. The transition to the green economy in China is seen as directly influencing job opportunities and employment quality in relevant sectors, while also influencing the scale and structure of employment throughout the whole economy.

In order to understand the employment impacts of enterprise restructuring in the transition to the green economy and promotion of decent work, a research study was conducted by the International Labour Organization (ILO) Green Jobs Programme for Asia and the Pacific and the ILO Country Office for China and Mongolia and the All-China Federation of Trade Unions (ACFTU) covering eight enterprises with different ownership systems and of different sizes within three sectors including metallurgy, building materials and energy. The research consisted of a desk review and enterprise field study. This paper presents the results of the research along with recommendations to enterprises and the Government.

### International and national definitions

The ‘transition to the green economy’ includes a process of “restructuring the enterprises and infrastructures, so as to improve the investment return of natural, human and social capitals, reduce greenhouse gas emission, and use fewer natural resources, create less waste and reduce social differentiation” (MoHRSS and Institute for Labor and Wage Studies, 2011). The restructuring of enterprises in traditional ‘brown’ industries is largely driven by market factors and the characteristics of such industries, specifically high energy consumption, high emissions and high pollution. Such restructuring is also greatly influenced by national policies restricting industry, pressed by requirements to shut down outdated facilities, reduce overcapacity, upgrade processes and protect the environment.

A green economy “results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” (UNEP, 2010, p. 5). Green jobs are defined as decent jobs in any economic sector, whether in agriculture, industry or services, which reduce their environmental impact to a level that is sustainable and helps to protect or restore environmental quality. Green jobs: (i) reduce energy and raw material consumption; (ii) restrict greenhouse gas emissions; (iii) reduce rubbish and pollution to the greatest extent; (iv) protect and restore the ecological system; and (v) enable enterprises and communities to adapt to climate change.

While the Bureau of Labor Statistics (BLS) of the United States has an explicit definition for green jobs, the Chinese National Bureau of Statistics has not defined green jobs, which created some difficulty in the analysis of changing work opportunities in enterprises during the transition to the green economy. A definition of green jobs has been provided by the Labor Science Research Institute of the Ministry of Human Resources and Social Security, in which ‘green jobs’ are referred to as jobs created and developed during the greening of the economy and to jobs related to green economic activities. Green jobs use green technologies, processes and raw materials for production, contribute to the production of green products and services, or directly participate in the protection the environment and ecosystems. Any work which features low investment, high yield, low consumption and emissions in circular and sustainable production can be considered a green job. The definition provided by the Ministry does not exclude environmental sector jobs that fail to meet the criteria of decent work, in contrast with the definition used by the ILO, the United Nations Environment Programme (UNEP), the International Organization of Employers (IOE) and the International Trade Union Confederation (ITUC).

## Green jobs and the transition to the green economy

This report employs a pragmatic definition, acknowledging there are no absolutely 'green jobs' as enterprises undergo restructuring in the transition to the green economy. A job that is now considered green may not be in the future as views of environmental impact and job quality evolve. In addition, the transition to the green economy is dynamic and covers all sectors and the whole industrial value chain. There is great potential to apply green technologies in production, and tremendous market space of green products. As people gain a deeper understanding of the environmental impact of economic behaviours, jobs will become greener in terms of their content, target and standards, in response to the changing availability of resources and the relationship between growth and resource consumption. One finding of this investigation is that environmentally friendly and energy-saving equipment enables existing jobs to become greener by decreasing energy consumption while improving safety, working conditions and income. The study shows that green jobs in enterprises undergoing a green restructuring include: (i) jobs which were recently created by the enterprises and are characterized by low energy consumption and high output; (ii) jobs related to environmental protection and ecological restoration (especially jobs related to energy saving transformation, pollution treatment, water resource protection and so on); (iii) jobs related to the circular economy and sustainable production; (iv) jobs greened recently and which are now better in terms of energy consumption, working conditions and workers' incomes; and (v) intelligence, knowledge and technology intensive jobs which do not directly produce carbon emissions or industrial hazards.

The transition to the green economy is generating green jobs in China. Jobs created in the greening process, specifically employment in the environmental sector, reckoned as better quality jobs with greatly enhanced conditions of work and higher incomes for workers are thus considered to be green jobs.

## Promoting green jobs

The results of the desk review indicate the Chinese Government is providing favourable legal and policy support for the development of the green economy and is promoting ecological civilization construction. The idea of providing green jobs and decent work through the green economy is now accepted by more people. Enterprises can benefit from the transition to the green economy, yet the employment impacts of the transition may be both beneficial and challenging. The transition has already created more than 4 million green jobs, and it will create 10 million green jobs by 2020. Nevertheless, the transition has caused some jobs to disappear as machines replace workers in some sectors, a trend that is expected to continue. However, in the long run, the transition to the green economy will have a positive impact on employment.

Trade unions participated in action to demonstrate for the creation of jobs and supported the revision of the National Industrial Adjustment Policies and Legislations to alleviate the negative influence of the transition on labour relations. Trade unions also helped workers to gain green skills and protect workers' rights in the transition.

The case studies validated the findings of the desk review and showed that enterprise restructuring in the transition to the green economy significantly impacted employment. It involved integrating 'greening' into the enterprise mission, aligned with and driven by national policies. In traditional sectors, the number of so called 'brown jobs', characterized by high energy consumption, emissions and pollution but low wages, was reduced remarkably, driven by relevant laws and national policies, including the Environmental Protection Law, 12th Five-Year Plan for Environmental Protection, China's Policies and Actions for Addressing Climate Change, Air Pollution Prevention and Control Action Plan (2013), Water Pollution Control Action Plan (2015) and so on.

## Findings of the enterprise field study

### Impact on job loss and job creation

In the eight enterprises investigated, 20–46 per cent of jobs were lost in the restructuring. The proportion of jobs lost that were held by older labourers (retirement or early retirement) varied from 2.6 per cent to 18.1 per cent. Some 12.5–40.0 per cent of workers were transferred to auxiliary or logistics posts or were laid off because their skills were not aligned with new posts (jobs) and adaptability was low. Temporary workers and auxiliary workers, primarily migrants, also lost their jobs. The proportion of migrant workers who lost their jobs varied from 10 per cent to 80 per cent. Jobs that were lost because of policies that required enterprises to shut down outdated facilities and reduce overcapacity did not cause great fluctuation in the local labour market. Most of the workers who lost their jobs found work in other local enterprises. The study found that the net effect in terms of job creation was negative in eight enterprises.

It was also observed that new positions and green jobs were created in enterprises that restructured during the transition. New green positions are being created directly by upgrading to clean and other advanced technologies. In the Yuguang Gold and Lead Group, the total number of employees on the lead smelting production line increased to 453 during technology upgrading and restructuring, representing an increase of 28.3 per cent (compared to 1988), 16.2 per cent (compared to 1996) and 45.2 per cent (compared to 2005). New green jobs are created directly by implementing projects for energy savings and emissions reduction and developing a circular economy. The number of year-round staff in the Beijing Cement Factory increased by 20 times. New jobs are also created by the expansion of industrial chains and green jobs are directly created by new energy enterprises, or in enterprises which expand during the transition process. In Wanyang Metallurgy Group (WYG), a non-ferrous metallurgy company, the number of new jobs increased by 35 times during a ten-year expansion. Compared to old jobs, most new jobs are higher quality with decent working conditions, higher incomes and better occupational safety.

Furthermore, it is noted that additional green jobs were created by strategic emerging industries which are thought of as China's new engines of growth. Many green jobs are being created in the services industry. The headquarters economy has become a source for green jobs in Beijing. The six high-end industrial zones in Beijing provided job opportunities for a total of 3.23 million people in 2013, a 76.6 per cent increase since 2008. The cultural and creative industry provided job opportunities for 1.84 million people, an increase of 71.3 per cent compared with 2008. The jobs are mainly related to culture and arts, news and publications, broadcasting, television, film, software, website and computer services, advertisement and exhibition, arts transactions, design services, tourism, entertainment and other support services. Most of these jobs are knowledge and technology intensive, producing fewer carbon emissions or industrial hazards than resource intensive work. Numerous green jobs have also been created in emerging strategic industries in Jiangsu and Henan. In 2013, there were 67,000 corporate enterprises in emerging strategic industries in Jiangsu, and a total of 8.28 million year-round jobs accounting for 35 per cent of the total jobs of the same kind all over the country. By the end of 2013, the emerging strategic industries in Henan provided 901,100 year-round jobs, of which 336,500 jobs were in industries related to energy savings and environmental protection and 241,900 jobs were in the new materials industry.

### Impact on job quality

The study found green restructuring reduced workers' exposure to dust and other air pollution in the workplace. For example, in the China Construction Steel Structure Corp. Ltd, most parts and components are manufactured and assembled in the workshop. The construction workers can thus work in any weather from a single location. Before green restructuring, copper line workers at the Yuguang Gold and Lead Group were responsible for two to three furnaces. During production, copper powder was bottom-blown into the furnaces, the waste gas was used to produce acid and the dust was collected in cabinets. The work was exhausting. After the transition, workers are no longer exposed to these conditions. An electrolysis worker on the electrolyzer technological

process line reported that before green restructuring he worked 30 shifts, eight hours a shift and 240 hours a month. Now, he works 20 five to six hour shifts (120 hours a month), meaning the work time was reduced by half. After a wet dust collecting method was introduced in 2010, the factory became much cleaner.

### **Income**

Income has gradually increased year on year. In the Yuguang Gold and Lead Group, after three major process upgrades, the income of the staff quadrupled. Their monthly salary in 2014 was RMB500–RMB600 higher than the average salary in Jiyuan City, and twice the local minimum salary. In the Jiangsu branch of the China Construction Steel Structure Corp. Ltd, the annual income (take-home pay) of general workers, technicians and managers is about RMB40,000–RMB50,000, RMB60,000–RMB70,000, and RMB100,000–RMB150,000 respectively. The annual income of staff of Jiangsu Xingda Foamed Plastics (a private company) increased by 10 per cent each year during green restructuring. Beijing Jingqiao Thermoelectricity (JQT) gives priority to frontline production workers when considering salary increases to ensure simultaneous growth of staff income and company revenue.

### **Welfare**

The study found that workers' welfare improved. The China Construction Steel Structure Corp. Ltd provided free dormitories for its staff. The staff can take the free shuttle buses to go shopping and have leisure time downtown. In addition, the company equipped a staff activity centre, an indoor basketball court, an outdoor basketball court, a small football pitch, four badminton courts and four table tennis tables. The Staff Auditorium and Home of Staff have televisions, chess games and cards. The Staff Reading Room has about 300 books. An assessment and incentive system was established to integrate the staff system, the remuneration system and the performance system.

### **Career development**

Green restructuring also resulted in expanded opportunities for promotion and career development. Jingneng Shire set up a troubleshooting technology training and practice room, improved position-innovation management, built a platform for employees and provided guidance to employees to shift from position-innovation to concept innovation and system innovation. Jingqiao Thermoelectricity provided a development platform for frontline staff, encouraged them to be skilled at their posts, and built a reserve talent pool. The company provided more than ten high-quality experts to the group and fellowship companies. The innovation working studio has 30 staff, of which eight have senior professional titles, and eight have medium-grade professional titles. The Tangshan Steel Group established effective talent-selection and competition systems. It strengthened its follow-up, assessment and development of various kinds of experts and talent, and equipped the main production lines with high-end technical experts to provide support for product upgrading. The working studio of the company has four academicians who have worked with their teams on ten projects. The post-doctoral research station has eight doctors. The achievements of 11 key research teams and 20 technical experts were recognized by the company in 2014. Moreover, the company has strengthened the management and use of newly hired college graduates, provided them with a three-year personalized training plan and has thereby built up the talent reserve for the strategic development of the company.

### **Technological innovation and competitiveness**

The study found many enterprises achieved synergy through greening initiatives and the promotion of skills for green jobs. The technical innovation of general workers contributes greatly to the development of greener enterprises. For example, the widely used top absorbing technology was invented by employees of the Tangshan Steel Group. Relevant inventions include some technologies not covered by large equipment processes featuring low cost and high added value. The inventors are highly valued by the company and are important members of the innovation working studio. They are continuously seeking innovations to save energy

and reduce emission and consumption, and they trained many skilled workers. Activities to improve employee innovation can improve the core competitiveness of the company. According to the information provided by Jiangsu Machinery, Metallurgy and Petrochemical Trade Union, many enterprises in Jiangsu comprehensively improved their core competitiveness by conducting employee technology innovation activities.

Advanced technologies are the major driving force for green job expansion. Wuxi Xingda New Foam Plastic Materials Company is the first enterprise which has established a provincial macromolecule polymerization foaming material engineering and technology research centre and a provincial enterprise-based academic workstation. The company has nine academics from the Chinese Academy of Engineering who are engaged in researching energy saving materials, including low carbon and green expandable polystyrene resin with proprietary intellectual property rights. The company realized a significant expansion while it continuously increased its investment in the research and development of environmental protection products and technologies, expanded its research group, encouraged employees to innovate by providing company stocks to technicians and attracted staff of State-owned enterprises (SoEs). Its subsidiaries are distributed all over Jiangsu Province. In 2011, the company invested RMB600 million and established Xinjiang Weida Foamed Plastics and New Materials Co., Ltd, and invested in an expandable polystyrene resin project with an annual output of 360,000 tons in Heilongjiang. The expansion of the company created a significant number of green jobs.

Through the transition to the green economy, Government and private sector stakeholders experienced significant changes in their perspectives on employment. The Government actively promotes green development and green employment concepts and practices. On 24 March 2015, President Xi Jinping put forward the concept of 'greening' for the first time at the Central Committee Conference of the Communist Party of China, and emphasized that China should accelerate technical innovation and structural adjustment, make a greater effort to protect the natural and ecological system, promote the greening of production methods and the development of a green economy, and form new growth points for social and economic development. Enterprises, including workers and trade unions, increasingly recognized the need for green development and increased their inputs into greening jobs and work processes. Trade unions enhanced awareness and urged enterprises to promote green development and decent work. The Government also recognized that the transition to the green economy can certainly form new industries and create new jobs. Local governments pay great attention to enterprises' transition to the green economy and the promotion of green jobs.

The study found that enterprises recognize that their vitality and competitiveness will improve by undergoing a green restructuring. They no longer make large investments in production capacity expansion. Instead, they make greater efforts to undertake structural adjustments to save energy and protect the environment. The industrial chain expanded and the social value increased as enterprises eliminated backward technologies and reduced overcapacity. The Beijing Cement Factory obtained economic benefits and purified the environment through the fuel replacement of combustible wastes, including solid wastes, waste tires, waste glass, fibre reinforced plastics and landscape waste. The high temperature cement furnaces will be used as environmental purifiers for urban waste, pollutants and hazards.

The study shows that workers now appear to strongly prefer to be employed in green jobs. According to older workers, technology transfer greatly improved production and living conditions. Workers considered greening as an important standard when they selected a job. In an interview, a worker reported that he left a Tianjin coal-fired power plant, a SoE, because of its poor working conditions, including numerous safety hazards, dust, noise and vibrations that greatly influenced workers' health.

### **The role of trade unions in green restructuring**

Trade unions promoted green development awareness, and ACFTU has an important role in promoting green development and green jobs. Early in 2005, ACFTU carried out a campaign, "My Contribution to Energy Saving and Emission Reduction", among enterprise employees and organized trade unions at all levels to improve the

quality of energy saving and emissions reduction activities based on actual conditions. The enterprise trade unions urged enterprises to promote green development, improve working conditions, strengthen safety and health and provide decent work. Trade unions also urged enterprises to nurture a concept of green development and green jobs, to organize and mobilize workers to make small-scale transformations and reforms to make their work greener, to suggest reasonable energy saving solutions and participate in emissions reduction competitions. Trade unions also assisted enterprise administrative departments in reassignment, training and psychological counselling of laid-off and resettled workers.

The study found that enterprise trade unions continuously improved workers' green skills, safety production abilities and environmental protection awareness. The trade union of the Beijing Cement Factory provided training on energy savings and emissions reduction and carried out competitions that popularized related skills. The union advocated a healthy and civilized living manner among workers, encouraged workers to conserve public resources and reduce their consumption of materials and energy and required that each position in each workshop adhere to low carbon and environmental protection principles. Through these activities, greening is becoming a conscious activity of the workers.

The Jiangsu Federation of Trade Unions advertised the concept of saving each droplet of water or oil, each kilowatt of electricity, each piece of paper, each inch of steel and each thread of yarn. The Union posted relevant notices in each corner of the workshop and transferred the saving concept into a conscious activity of the frontline workers throughout all production and living activities.

Enterprise trade unions also organized workers to participate in greening of jobs. After carrying out the "Small Blast Furnace Energy Saving and Emission Reduction Competition", The Tangshan Steel Group increased the utilization index of the small blast furnace from 2.87 to 3.28. The company improved the greening rate through team construction, labour competitions and the collection of suggestions to make the production process greener and more efficient. The trade union of the Yuguang Gold and Lead Group (Henan) encouraged workers to find problems, analyse the causes, put forward suggestions and create innovations based on their findings. The union collected and put into practice the suggestions on energy savings and emissions reduction from workers and improved the company's energy and resource use efficiency.

The study also found that trade unions secured the employment rights of workers during green restructuring, which is an essential function when positions are lost, transitioned or relocated. Trade union staff in Jingneng Shire collected opinions from different workshops and production lines before formulating the reassignment plan in cooperation with the management. The trade union also participated in the design of plans for greening positions and reassigning workers to minimize the negative effects and to assure stable job transfers. Moreover, the trade union provided timely information to workers on transformation solutions and plans, and actively guided workers to correctly respond to the reassignment arrangement. Besides, the trade union also supervised the transformation of work places and production processes, and urged the company to gradually improve working conditions. Pinggu Shunfa, affiliated with the Beijing Xingfa Cement Factory, is a cement manufacturer whose capacity shutdown and reduction scale is small. Capacity shutdown and reduction finished before the end of 2013, and 500 workers were laid off. The enterprise trade union actively communicated with the workers, reflected workers' requirements to the enterprise and assisted the enterprise in reassigning 70 per cent of laid-off workers and redeploying 30 per cent of information and technology workers to the group company.

Trade unions helped improve occupational safety and safeguarded the health rights of workers. The trade union of the Yuguang Gold and Lead Group urged the company to continuously improve the labour security of workers, and guided workers to work safely and to correctly use the protective gear and clothing. During the green restructuring, the trade union suggested the company adopt automatic and mechanical operation and closed-loop or remote-controlled operations to reduce health and safety risks. At the same time, it also arranged periodic physical examinations for workers to monitor their physical and psychological health. The trade union made great efforts to improve the occupational health and safety management system, and held

the “Occupational Safety Health Cup” competition to promote occupational disease prevention and treatment and labour protection. By signing the occupational disease objective responsibility agreement with relevant departments at each level, the trade union established a top-to-down public supervision and management system. In addition, it prioritized the establishment of a public safety supervisor team and held many occupational disease prevention and treatment training sessions. The coverage each year reached 100 per cent.

Trade unions worked to enhance the employability of workers through employment assistance activities. The Wuxi Trade Union Council implemented the project “Care for All Workers”, a support system consisting of five parts, including employment assistance, medical aid, social assistance, education funding and legal aid. It also provided more support and humanitarian care for frontline workers, migrant workers, dispatched labourers and workers with difficult life circumstances, and so on. The Jiyuan Trade Union Council carried out the activities including “Warm Giving in Winter”, “Springtime Job Fair”, “Heatstroke Prevention in Summer” and “Assisting the Impoverished Student in Golden Autumn” to provide support for workers. It also opened a worker services website, provided trade union member cards and established a trade union volunteer service station. The Council held such activities as worker technology games, skills competitions and skills tests to gradually improve workers’ technological knowledge and skills.

## Challenges

Despite the above gains, however, the transition to the green economy must overcome challenges, including the following:

1. High cost of restructuring. Five enterprises in our investigation reported that greening cost RMB100 million. It is estimated that the annual funding gap is RMB2 trillion to restructure Chinese industries.
2. Lack of skills for green jobs. The average workers has completed 12.95 years of schooling, 52.7 per cent of workers were educated at a technical secondary school, and 34.6 per cent of workers only received training after leaving their previous position. According to the results of a questionnaire survey conducted by Jiangsu Federation of Trade Unions in the steel industry, 42.7 per cent of workers worry that they will be unable to find a job later because of their age or lack of skills.
3. Some job opportunities are lost.
4. Labour relations are at risk. During our seminars, employees showed great anxiety about the high mobility of frontline workers and the problem of being transferred to other positions, awaiting job reassignment or being laid off. Although most of the labour disputes in the eight surveyed enterprises were resolved through communication between the trade unions and the enterprise administrative department, some disputes were resolved through arbitration and legal proceedings. Some workers who were laid-off or given early retirement even chose to undertake sit-down protests, to block roads and to petition.

## Recommendations

In order to enhance green development and promote green jobs, stakeholders should strengthen legislation and administration. The Government should improve policy support for the green transition, and should formulate and implement favourable tax policies related to energy savings and emissions reduction, including accelerating the implementation of legislation for resource tax reform and improving legislation for environmental protection. The Government should establish specific funds for enterprises undergoing green restructuring and for enterprise development in relevant industries, and enact a differential energy pricing system. The authorities should also improve the legal system for pollution transfer control and establish a legal mechanism to shut down outdated facilities. The Government should establish a bureau for green statistics and should improve the Statistics Law. It should clearly define green industry and green jobs for statistical purposes so that related data can provide a basis for policy-making.

To address the challenges of the transition, the Government should formulate collective bargaining laws. The parties concerned should deepen social dialogue and reach a consensus for the green transition, strengthen the function of existing tripartite mechanisms and platforms at the national level and enhance social dialogue at local, industrial and community levels in order to prevent labour relations risks. Positive interactions between employers and trade unions are widely encouraged. The Government should raise fiscal investment in education and training for green technologies and skills to improve workers' employability. Employers should provide more green skills training to workers. Trade unions should be encouraged to strengthen the training and education of workers. Green entrepreneurship should be encouraged as well.



## Abbreviations

ACFTU	All-China Federation of Trade Unions
BBMG	Beijing Building Materials Group Corp.
BCF	Beijing Cement Factory
BJA	Beijing Jianji Assets
BTRM	Beijing Tongda Refractory Materials
BXCF	Xingfa Cement Factory (Beijing)
CCSS	China Construction Steel Structure Corp. Ltd (Wuxi, Jiangsu)
CPPCC	Chinese People's Political Consultative Conference
ILO	International Labour Organization
IOE	International Organization of Employers
ITUC	International Trade Union Confederation
JNS	Beijing Jingneng Shire/Shijingshan Thermal Power Plant
JQT	Beijing Jingqiao Thermoelectricity
R&D	research and development
SME	Small and medium-sized enterprises
SOE	Stated-owned enterprise
TJG	Tangshan Jianlong Group (Hebei)
TSG	Tangshan Steel Group (Hebei)
UNEP	United Nations Environment Programme
WFCT	Wuxi First Cotton and Textiles Company (Wuxi, Jiangsu)
WMG	Wanyang Metallurgy Group (Jiyuan, Henan)
XFP	Xingda Foamed Plastics Co., Ltd (Wuxi, Jiangsu)
YGGL	Yuguang Gold and Lead Group (Jiyuan, Henan)

## Glossary

**Reducing overcapacity.** Capacity (product capacity) refers to the quantity of products to be produced or the quantity of raw materials to be processed within a certain period under given technical conditions. Overcapacity occurs when product capacity greatly exceeds effective demand, which results in wasted social and natural resources and reduced resource allocation efficiency. Overcapacity is an obstacle to industrial structure updating. Restricted by the current development process, concept and related institution mechanism, great overcapacity is observed in many industries in China, especially in the steel, cement, electrolytic aluminium and other high-consumption and emissions industries. The Guiding Opinions of the State Council on Resolving Serious Production Overcapacity Conflicts was issued on 15 October 2013, which put forward relevant policies and eight tasks to resolve overcapacity in the steel, cement, electrolytic aluminium, plate glass and shipping industries. First, no new capacity project is allowed, and projects which are under construction and with capacity is not in conformity with relevant regulations shall be classified and handled accordingly. Second, existing projects whose capacity is not in conformity with relevant regulations shall be cancelled, and the standardization and admittance management shall be further strengthened. Third, outdated capacity shall be eliminated. Fourth, annexation and reorganization of enterprises shall be promoted to optimize the industrial structure. Fifth, efforts should be made to expand effective domestic demand and improve the demand structure. Sixth, efforts should be made to explore international markets and strive for more international cooperation. Seventh, key technologies shall be developed and enterprise innovative management shall be strengthened. Eighth, innovation in the government management shall create a fair competition atmosphere, improve the marketing mechanism and establish a long-lasting mechanism.

**Shutting down outdated/backward capacity.** From the perspective of the technical merit of production, outdated capacity occurs when the technical merit of production equipment and processes is lower than the average industrial level. From the perspective of the consequences of the product capacity, outdated capacity occurs when the index of pollutant emissions, energy consumption and water consumption of production equipment and processes is higher than the average industrial level. In practice, outdated capacity refers to a production capacity in which the technical merit (of the equipment and processes) cannot satisfy the standards specified by national laws, regulations and industrial policies. The Notice of the State Council on Further Strengthening the Elimination of Backward Production Capacities (April 2010) requires that all provinces and regions shall eliminate backward production capacities on schedule by focusing on such industries as electricity, coal, iron and steel, cement, non-ferrous metal, coke, paper making, tanning, and printing and dyeing. The Notice explicitly specifies the objectives and tasks of major industries to eliminate outdated capacity before the end of September 2010. The Ministry of Industry and Information Technology published a list of 2,087 enterprises from 18 industries which should eliminate their outdated capacity. Most of the enterprises are from such industries as cement, paper making, printing and dyeing, coke, iron making, iron alloy and tanning. Provinces and regions all over the country have made plans to eliminate outdated capacity.

**Brown industry.** Brown industry refers to industries which negative environmental impact is significantly higher than ordinary industries. Brown production technologies discharge a great amount of carbon dioxide, particulate matter, industrial waste and poisonous and hazardous material, and thus greatly influence the air quality and the environment. Great efforts shall be made to protect the environment and stricter desulphuration and dedusting technologies shall be applied. Brown industries in China mostly have outdated capacity which need to be eliminated, including the steel, cement, electrolytic aluminium, plate glass, paper making and other industries, characterized by low output, high consumption and pollution, a poor working environment and heavy workloads.

**Green industry.** Green industry refers to industries which apply clean production technologies and green processes and technologies free of hazard or having little hazard, have reduced consumption of raw materials and energy, and with emission of pollutants reduced to as much as possible during production. These industries are characterized by low input, high output and low pollution. The products from these industries are called

green products, and jobs in those industries are called green jobs. Based on their environment impact, green jobs are further classified into 'light green' jobs, 'dark green' jobs and 'invisible green' jobs. Light green jobs are related to energy-saving and environmentally friendly vehicles, dark green jobs are related to the high-capacity public traffic system and invisible jobs are related to solar energy applications.

**Job/position transfer.** Job transfer means that an employee is transferred from one position to another under the same employer. A major cause of job transfer is the reduction and elimination of some enterprises and positions when resolving overcapacity and eliminating outdated capacity. It is an important task to replace employees having a job transfer according to law after resolving overcapacity and eliminating outdated capacity.

**Headquarters economy.** A headquarters economy is a new economic model in China in which a great amount of resources are concentrated in a certain place, i.e., a headquarters base or business park or a central business district (CBD). The headquarters economy is deemed to benefit the three main parties, namely the enterprise itself, the region where the headquarters is located and the place where the production and processing bases are located.

More and more companies are relocating their headquarters to Beijing, Shanghai, Shenzhen, Guangzhou and other cities. In particular, Beijing plans to develop a headquarters economy after the withdrawal of manufacturing industries. Among the top ten headquarters locations of the top 500 enterprises of China are the following cities: Beijing, Guangdong, Jiangsu, Shandong, Zhejiang, Shanghai, Tianjin, Hebei and Henan. Beijing is the first choice because it is the capital. Tianjin is among the top ten due to its special location and rapid economic growth. With the implementation of the national 'Develop the West' strategy, the central and western regions of China are increasingly more attractive to these enterprises. Shanghai is home to headquarters of 347 transnational companies.

**Transition to the green economy. Green transformation.** The transition to the green economy is a way for China to reap the rewards of stable, balanced, progressive and innovative sustainable development with Chinese characteristics. Generally, China can realize a green transformation at three levels. First, it requires efforts to solve problems pertaining to green technology including resource saving, pollution control and ecological protection. The second level entails greatly developing green industries and the green economy, especially renewable energy, energy saving vehicles and vehicles that use renewable fuel sources, and environmentally friendly intelligent technologies. The third level entails actively promoting the greening of the whole economic system, integrating the concept of developing a green, low carbon, intelligent and circular economy into the industrialization and urbanization progress, and gradually reducing dependence of economic growth on resources.

According to the China Sustainable Development Strategy 2011: Greening the Economic Transformation published by the Chinese Academy of Sciences, the Government shall formulate "a green development fundamental law" to guide and coordinate the formulation of laws and regulations related to environment and development, and explicitly specify the legal liabilities and government obligations at all levels, enterprises and individuals related to green growth, clean production, energy savings and emissions reduction, ecological protection and climate change response, and form a long-lasting mechanism to promote the green transformation. The Government shall evaluate and select new green and strategic industries in a scientific way, and make a uniform plan for the key and specific plans made by relevant departments and local governments during the 12th Five-Year Period, and formulate a national plan for strategic emerging industries as soon as possible.

**Strategic emerging industries.** Strategic emerging industries refers to knowledge- and technology-intensive industries which have a guiding and driving effect on the overall and long-term development of society and economy. These industries are based on key technical breakthroughs and major development demands,

and are characterized by low consumption of materials and resources, great growth potential and multiple comprehensive benefits.

At the Symposium on the Development of Strategic Emerging Industries, held on 21 September 2009, Premier Wen Jiabao emphasized that China should develop strategic emerging industries as a strategy to deal with current difficulties and long-term development of China. Considering the national conditions, and technical and industrial base of China, the strategic emerging industries to be developed currently include: emerging saving and environmental protection industries, information technologies of the new generation, biological technologies, high-end equipment manufacturing industries and industries related to renewable energy, new materials, and new energy-supported vehicles, etc.

**Producer services.** Producer services refers to industries which provide services to maintain the continuity of industrial production processes, promote industrial technology progress and upgrading and improve production efficiency. They service industries directly related to manufacturing and exist in the upper, middle and lower streams of manufacturing enterprises. These industries attract professional human resources and knowledge capital and play an important role in speeding up the integration of the secondary and tertiary industries. It is explicitly specified in the 12th Five-Year Plan that China shall make efforts to explore the financial services industry, strive to develop a modern logistics industry, culture and develop high-tech services industry, standardize and promote the business services industry. The current focus is on developing producer services in China such as research, development and design, third-party logistics, finance lease, information technology service, energy-saving and environmental protection services, inspection and detection certification, e-commerce, business consultation, service outsourcing, after-sales services, human resource services and brand building.

## 1. Background, definitions and methodology

### 1.1 Background

At the 102nd session of the International Labour Conference in 2013, “environmental sustainability and decent work for all” were determined as two essential challenges in the twenty-first century. The efforts made by China, the second largest economy and a global labour power, to balance environmental sustainability and employment are critical for the global society. Now, painful structural adjustments need to be made in China, as the pace of economic growth is changing and the effects of previous economic stimulus policies are being absorbed. The Government has taken measures to change the economic development pattern and adjust the economic structure, and has increased its awareness of green consumption. Enterprises are paying more attention to the ecological and environmental footprint of their operations and production processes, and are gradually transiting to a greener methods. Enterprises are making efforts to shut down outdated production capacities, reduce overcapacity, save energy, reduce emissions, update equipment and technologies, and improve self-innovation ability, which directly influences job opportunities and employment quality while also influencing the employment scale and structure of the whole society.

To better understand the impacts on employment of enterprise restructuring in the transition to the green economy and promoting decent work, the International Labour Organization (ILO) partnered with the Industrial Relations Research Center (IRRC) of the All-China Federation of Trade Unions (ACFTU) to conduct a document and enterprise-based case study. Commissioned by the ILO Green Jobs Programme for Asia and the Pacific, the ILO Beijing Office was responsible for coordination, while the ILO Bangkok Office provided technical guidance to the Green Job Research Team of the ACFTU (hereinafter referred to as the “Research Team”).

### 1.2 Objectives

This research aimed to do the following:

- study the impact of enterprise restructuring in the transition to a greener, more environmentally friendly and more sustainable economy on employment quantity, quality and concept.
- learn lessons from practices of enterprises with improved core competitiveness and higher social values in promoting green jobs and decent work, to further move forward to a green economy.
- communicate problems found during research to the enterprises involved and provide suggestions for improvement.
- provide suggestions and advice on polices for the development of a green economy and the expansion of green employment in the 13th Five-Year Plan (2016–2020) at the national and local level.
- publish the research conclusions through various channels to raise the awareness of the society and the public on green development.

### 1.3 Definitions of green economy and green jobs

#### 1.3.1 Green economy

According to the United Nations Environment Programme (UNEP), “Green economy refers to an economy capable of ‘promoting human welfare and social equality, and remarkably reducing environmental risks and relieving economical scarcity’” (2011, p. 16). The Partnership Action on Green Economy (PAGE) advocated by UNEP along with the International Labour Organization (ILO), United Nations Industrial Development Organization (UNIDO), and United Nations Institute for Training and Research (UNITAR) aims to help Governments make new policies for, and investments and expenditures on: a) clean technologies, b) renewable energy sources, c) water supply, d) green transport, e) waste management, f) green building, and g) sustainable

agriculture and forestry. The World Bank insisted “Green growth means an effective use of natural resources, a clean growth which reduces pollution and environmental affect to the minimum, emphasizes adaptability to natural disasters and concerns about effect of environment and natural capital on the prevention of physical disasters. At the same time, green growth must be inclusive” (World Bank, 2012, p. 2). ILO (2013) argued that the green economy is capable of job creation, promoting job quality, upgrading existing jobs and contributing to social inclusion.

The green economy is thus regarded to be not only capable of preventing environmental pollution, global warming, resource exhaustion and environmental degradation but also capable of creating green jobs and assuring sustainable economic growth. In most cases, the green economy has a remarkable potential to create job opportunities and considerable net earnings, and the jobs created thereby account for 0.5–2.0 per cent of total jobs even in advanced economies with high substitution effects (ILO, 2013, p. 44). According to a survey on 12 countries by the International Trade Union Confederation and the Millennium Institute (2012), investment of 2 per cent GDP into the green economy can create 9.6 million new jobs. The most pessimistic result is that the net employment benefit or loss is completely cancelled out in some countries, and the net earnings show a neutral result (ILO, 2013, p. 45).

### 1.3.2 Green jobs

The ILO defines green jobs to be decent work that is capable of reducing environment impact and contributes to realizing the sustainable development of the environment, economy and society.

In 2008, UNEP, ILO, the International Organization of Employers (IOE) and the International Trade Union Confederation (ITUC) defined green jobs as any decent position helpful to protect or restore the environment quality, regardless of in agriculture, industry, services or administrative management fields. Green jobs are capable of: (i) reducing energy and raw material consumption; (ii) restricting greenhouse gas emission; (iii) reducing rubbish and pollution to the greatest extent; (iv) protecting and restoring the ecological system; and (v) enabling the enterprises and communities adapt to climate changes (ILO 2013, p. 23).

In accordance with the Labor Science Research Institute of the Ministry of Human Resources and Social Security of China, green jobs refer to jobs created and developed during the greening of the economy, jobs in economic activities that have undergone greening and jobs in green economic activities. Green jobs use green technologies, process and raw materials for production, or participate in the production of green products and services, or directly participate in environmental and ecological protection (MoHRSS Institute for Labor Studies, 2010, p. 16). Compared with average jobs, green jobs feature low investment, high yield, low consumption and emissions in circular and sustainable sectors, industries, departments, enterprises and positions.<sup>1</sup> As these jobs do not make reference to meeting the decent work criteria, they cannot automatically be considered ‘green jobs’ according to the definition of UNEP, ILO, IOE and ITUC.

Unlike the Bureau of Labor Statistics (BLS) of the United States, which has explicit definition for green jobs, the Chinese national statistics department does not have an official definition for green jobs. This presented certain difficulties for the research team to evaluate the decrease or increase in work opportunities during the transition to the green economy.

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1 ‘Low investment and high yield’ jobs are jobs which can improve the organizational management level and the production efficiency. Improvement of production efficiency means saving various production factors and thus saving resources and protecting the environment. It is a key point for the transformation of the economic growth pattern and is crucial for the whole economy of China. ‘Low consumption and emissions’ jobs mainly refer to jobs which save energy and resources and reduce pollutant emissions in general through technologies. These are the basic elements of green jobs. ‘Circular and sustainable’ not only refers to the self-restoration of ecological system and the sustainability of social development, but also refers to jobs related to the circular economy, pollution treatment and protection of the ecological environment.

The research team adopted a dynamic and relative concept for the ongoing transition process in China for this research. There are no absolutely 'green jobs' in enterprises which are undergoing a green restructuring. Accordingly, a job which is green now may become not green anymore when its productivity lags behind the progression of the average one of the whole industry. In addition, compared with the traditional brown economic growth pattern, the connotation of the transition is dynamic and covers all the sectors of the whole industrial value chain. Both the application potential of green technologies in the production field, and the market space of green products are great. As people gain a deeper understanding of the environmental impact of economic

behaviours, the content, target and standards of green jobs created during the transition will change with the changes in carrying capacity of resources and environment and the relationship between growth and resource consumption. Besides, another significance of green jobs is gradually greening the current jobs. After installing environmentally friendly and energy saving equipment, the original jobs will become greener because their energy consumption, safety, working conditions, intensity and income have all been improved.

Figure 1-1. Green jobs during the transition to the green economy



Source: ACFTU research team.

As summarized in figure 1-1, green jobs in enterprises transiting to a green economy include: 1) jobs recently created and characterized by low energy consumption and high output; 2) jobs related to environmental protection and ecological restoration (especially jobs related to energy saving, pollution treatment, and water resource protection and reservation, etc.); 3) jobs related to the circular economy and production; 4) jobs greened recently which have improved energy consumption, working conditions and incomes; and 5) intelligence, knowledge and technology intensive jobs which do not directly produce carbon emission or industrial hazard. The transition to the green economy generates green job in China. Jobs created in the 'greening', particularly in the environmental sector, have conditions of work and incomes that are greatly enhanced, and thus they are reckoned as quality jobs and as green jobs in the context of the transition.

## 1.4 The ILO Green Jobs Programme for Asia and the Pacific

The Green Jobs Programme of the ILO works towards environmentally sustainable social and economic development. It promotes worldwide the creation of green jobs as a way of generating decent employment and income opportunities with a reduced environmental impact and an increased ability to cope with the challenges of climate change, resource scarcity and environmental degradation.

The ILO Green Jobs Programme works to ensure that social and labour market policies complement economic and environmental policies to buffer the downside risk of the transition to a greener economy. On one hand, it addresses the employment and social dimension of environmental policies to ensure decent work for the present and future generations. On the other hand, it mainstreams environmental concerns into the world of work to change and promote sustainable consumption and production patterns.

The Green Jobs Programme for Asia and the Pacific (Green Jobs-AP) was established in 2009. Since its inception, Green Jobs-AP has collaborated with ILO constituents as well as other stakeholders in countries including Bangladesh, China, Fiji, India, Indonesia, Malaysia, Mongolia, Nepal, Pakistan, Philippines, Sri Lanka and Thailand.

The programme's three-fold objectives are: 1) to enhance the capacity of ILO constituents to take part in dialogue on green jobs at local, subnational and national levels by giving them access to quality data and information; 2) to influence national policies and so contribute to an inclusive growth model that is job-centred, environmentally sustainable and promotes decent work; and 3) to promote gender sensitive opportunities for green jobs by supporting demonstration activities and national programmes.

In view of the abovementioned objectives, Green Jobs-AP is working on the following strategic areas: a) Policy Development and Research; b) Capacity Building and Programme Development; and c) Knowledge Sharing and Cooperation .

This research on the employment impacts of enterprise restructuring in the transition to the green economy in China falls under the policy development and research strategic work area.

## 1.5 Methodology

The report is combined with field study, and policy review is combined with case study.

### 1.5.1 Desk review

The review of existing research literature involved collecting domestic and foreign research reports, academic monographs and journal articles and earlier analysis on the employment impact of enterprise restructuring in the transition to a green economy. The review also focused on the efforts of trade unions in promoting green employment.

Through this component of research it was possible to sum up practices and achievements of Chinese trade unions in promoting green jobs during current industry upgrading. The participation of trade unions in national policy and legislation for industrial restructuring and economy greening are summarized in this report.

Moreover, the review considered laws and regulations related to economy greening and employment expansion in recent years. This enabled the description of the development of policies for green industries in China and the discussion of the systems and policy space for promoting green employment.



## 1.5.2 Enterprise research and case study

The research team selected eight enterprises<sup>2</sup> (see table 2-1) with different ownership systems and of different sizes from sectors including steel, metallurgy, building materials and energy as the research targets. The team included enterprises from brown industries and green industries, both State-owned enterprises (SoEs) and private enterprises, large enterprises and small and medium-sized ones, so as to have insights into the employment impact of greening on various types.

The research team held four seminars and attracted the attendance of over 53 staff from the local office of Legislative Affairs, Development and Reform Committee, Economy and Information Committee, Science and Technology Committee, departments of financial and human resources, environmental protection and construction, enterprises associations, industrial associations and trade unions.

### Enterprise seminars

The research team interviewed 67 enterprise staff responsible for production process updating, technology upgrading and rebuilding, energy savings and emissions reduction and staff training as well as leaders of enterprise trade unions. Through these interviews, the research team gathered information on the following: 1) the efforts made by the enterprises in energy savings, emissions reduction, environmental protection and the provision of decent work; 2) the impact of local industrial upgrading policies on enterprises; 3) enterprise investment, new technology introduction and production process and method adjustment; 4) changes in productivity, number of positions, number of employees, working conditions, salary and income, training and education and occupational development before and after the upgrading of production processes and technology rebuilding; and 5) how to communicate with the employee representative congresses, trade unions and the employees when the enterprise must reduce some positions or transfer some employees, and how to resettle employees losing their position/job.

Table 1-1. Basic case study information

Content	Times	Object and Place	Type
Local/industrial seminar	4	<i>Jiyuan, Henan</i>	City-level/industrial seminar
		<i>Tangshan, Hebei</i>	City-level/industrial seminar
		<i>Wuxi, Jiangsu</i>	City-level/industrial seminar
		<i>Nanjing, Jiangsu</i>	Provincial/local seminar

Source: ACFTU research team.

### Individual interview

The research team conducted semi-structured interviews with 32 managing, technological and professional staff responsible for production process updating, technology rebuilding and energy savings and emissions

<sup>2</sup> The research team made a field survey in eight enterprises, including the Beijing Cement Factory (BCF), Yuguang Gold and Lead Co., Ltd (YGGL, Jiyuan, Henan), Tangshan Steel Group (TSG, Tangshan, Hebei), Jingneng Shire (JNS, Beijing), Wuxi First Cotton and Textiles Company (WFCT, Jiangsu), Xingda Foamed Plastics (XFP, Wuxi, Jiangsu), and the China Construction Steel Structure Corp. Ltd (CCSS, Wuxi); the following nine enterprises were invited to attend the local seminars, including Beijing Xingfa Cement Factory (BXCF), Beijing Tongda Refractory Materials (BTRM), Beijing Jianji Assets (BJA), Wanyang Metallurgy Group (VMG, Jiyuan, Henan), Gold Rakem Lead Co. (Jiyuan), Tangshan Jinxi Steel Group, Tangshan Guofeng Steel Group, Tangshan Jianlong Group (TJG) and Wuxi Weifu Technology Co.

reduction, and general employees. These employees had been involved in production process updating and technology rebuilding in the past two years. The interviews were conducted, to collect their opinions and suggestions about the greening of the enterprises.

### **1.5.3 Expert's opinions**

The research team solicited suggestions and advice from experts of international organizations, domestic research institutes and trade unions during the project initiation, verification, operation, report compilation and review.

## **1.6 Analytical framework**

The analytical framework consists of three levels: macro, middle-level and micro. This research focuses on the influence of national strategies, laws and policies related to the green transformation on employment and the impact of the implementation of local (mainly provincial) economic transformation plans on regional employment. This research also focuses on the changes in employment effect, quality and skills during the green restructuring of eight enterprises in three industrial sectors (metallurgy, building materials and energy). At the same time, this research focuses on the changes in employment concept of the Government, enterprises (employers), workers and trade unions during the green transformation. Based on the findings of the desk research and conclusions summarized from cases, the last part of the report provides suggestions and policies to promote green jobs during the green transformation, to increase the awareness and capacity of the Government, employers, workers and trade unions to promote green job and decent work while deepening the reform.

## 2. Transition to the green economy and research context

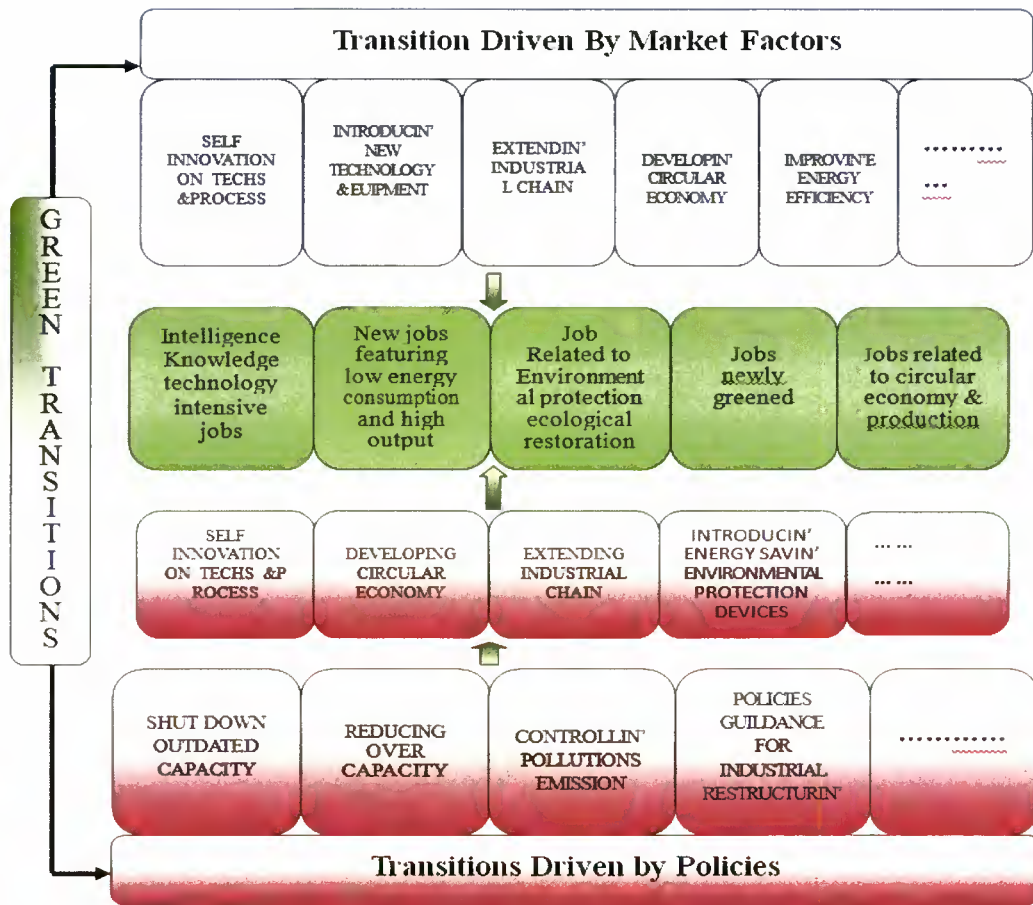
Economic transformation is particularly significant for China today because it is a process in which resources and energy are intensively used, emission of pollutants is reduced, environmental impact is lowered, productivity is increased, and the sustainable development capability is improved.

### 2.1 Understanding the transition to the green economy

Enterprises are the important units of economic production and implementers of a green economy. The transition to the green economy refers to a process of “restructuring the enterprises and infrastructures, so as to improve the investment return of natural, humanistic and social capitals, and reduce greenhouse gas emission, extract and use few natural resources, create little waste and reduce social differentiation” (MoHRSS and Institute for Labor and Wage Studies, 2011). Multiple measures can be taken to achieve this objective, for example, using new technologies, improving management patterns, and unleashing workers’ potential, etc. The transition to the green economy indicates different meanings in different industries and enterprises, including: reducing overcapacity, extending the industrial chain, developing a circular economy, changing the production lines and increasing added values of products, and so on. Despite these different applications, the transition to the green economy is generally characterized by reduced energy consumption, enhanced environmental protection measures, decreased carbon emission and improved productivity.

Enterprise restructuring is driven by market factors regardless of market failures. During restructuring, enterprises continuously improve their productivity by self-innovation or the introduction of new technologies and equipment. At the same time, enterprises can reduce their operating costs, improve their core competitiveness and create more social value either by extending the industrial chain or by developing a circular economy and implementing energy saving projects. Green jobs can be generated or induced at any phase of restructuring. Pressed by the requirement of shutting down outdated capacity, reducing overcapacity, upgrading processes and protecting the environment, the restructuring of brown industries accelerates the speed of the transition, extends the industrial chain and seeks markets to fill the gap between production and employment caused by capacity shutdown or reduction. The enterprises will create green jobs, although some brown jobs will be lost (those featuring high energy consumption, emission and pollution, and low income). Figure 2-1 depicts the relationship between the green economy and green jobs.

Figure 2-1. Green economy and its relationship with green jobs



Source: ACFTU research team.

## 2.2 Sectors outlook of the research findings

The economy of China is characterized by outstanding structural contradictions, poor sustainable growth capability and in-depth problems. Some industrial sectors can hardly survive any more due to its growth pattern of high input, high consumption, high pollution, but poor quality, poor benefit and low output. Electricity, steel, cement, non-ferrous metallurgy and petrochemical industries are the key objects of restructuring and upgrading and the major subjects of green transformation. Therefore, this research has focused on the transformation of metallurgy, building materials and energy industries.

### 2.2.1 Metallurgy

The metallurgy industry in China mainly consists of two sectors: non-ferrous metals, and iron and steel. The non-ferrous metal sector is characterized by unreasonable structure, low concentration, excess production capacity, low industrial intensive degree and poor independent innovation capability. The output of non-ferrous metals in China by 2010 was 31.21 million tons. Although its output led other countries in eight consecutive years, its rate of return on sale is only 4.8 per cent. The average number of employees in the non-ferrous metallurgy and rolling sectors in 2010 was 1.92 million (SUN Lin, 2012, pp. 41 and 47). To make the non-ferrous metal sector more competitive, the Chinese Government issued a series of macro-control polices, industrial polices and industrial admittance mechanism to improve their productivity and narrow the gap in product consumption between the non-ferrous metal sector in China and its international peers. The employment of almost 2 million people is

influenced by the green transformation of non-ferrous metallurgy and rolling enterprises. The iron and steel industry in China is challenged by several problems, including overcapacity, unreasonable product and industrial structures, low product added value, and poor resource control, etc. the steelmaking capacity in China now is about 1 billion tons but the rate of capacity utilization is only 72 per cent, obviously lower than the normal level. In 2013, the accumulated capacity of pig iron, crude steel and rolled steel (including recycled steel) all over the country was 708.79 million tons, 779.04 million tons and 1,067.62 million tons respectively, increased by 6.2 per cent, 7.5 per cent and 11.4 per cent on a year-on-year base respectively. The growth rate was increased by 2.5 per cent, 4.4 per cent and 3.7 per cent respectively compared with the growth rate of the previous year (China Metallurgy News, 2014). The quantity of employees in the iron and steel industry is great. By 2011, 3.3066 million people worked in 6,621 iron and steel enterprises above designated size (Wang and Wei, 2012). Employment of 3.3 million people will be influenced during green transformation of iron and steel enterprises.

### **2.2.2 Building materials (cement)**

In 2013, the output and capacity of cement in China were 2.42 billion tons and 3.29 billion tons respectively, and those of clinker were 1.38 billion tons and 1.86 billion tons respectively. 1,586 new dry process production lines were applied. The capacity of clinker was 1.77 billion tons, accounting for 95.2 per cent of the total clinker capacity all over the country. Over 900,000 employees worked in about 3,500 enterprises. The cement industry has finished its process and structure adjustment objectives (China Cement Association, 2015). The rate of capacity use in the cement industry is 75 per cent, and the excess rate is 25 per cent (20 per cent higher than the reasonable range). In the cement industry, the number of employee influenced per 1,000 tons of capacity eliminated is 20 to 30. And thus according to the target of 2014, a total of 100,000 to 150,000 employees will be influenced when it eliminates 505 million tons of overcapacity of cement (China Machinery, Metallurgy and Building Materials Union and China Cement Association, 2014), accounting for 11 per cent to 16 per cent of over 900,000 employees in 3,500 enterprises all over the country (China Cement Association, 2015).

### **2.2.3 Energy (electricity and heating power)**

China is a major energy producer and coal consumer. In 2013, the full-covered generating capacity in China was 5,347.4 billion KWH while the installed capacity of thermal power generating units accounted for 69.14 per cent of the total installed capacity. The number of electricity and thermal power production and supply enterprises above designated size was 5,772, among which, 1,344 were unprofitable, and the industrial loss rate was 23.28 per cent (NBS, 2014a). In the first three quarters in 2014, the number of employees was 3.977 million (China Monthly Economic Indicators, 2015). The environment is heavily polluted because coal is burned in large quantities. The pollution caused by electricity and thermal power enterprises is an important factor restricting the sustainable development of China. Enterprises shall shift to combined heat and power generation and realize energy savings, environmental protection and green growth.

## **2.3 Regional economic context of the research**

### **2.3.2 Hebei: Industrial upgrading and environmental protection**

The national industrial strategic plan of China requires Hebei Province to formulate its own structure adjustment and economic transformation and upgrading plans. Nowadays, Hebei is at the most challenging stage of restructuring. By the end of October 2014, Hebei has cumulatively reduced the capacity of iron making by 12.02 million tons, crude steel by 9.77 million tons, cement by 28.13 million tons and glass by 21.765 million weight cases. Thus the capacity of steel, cement and glass manufacturers, which are major sources of air pollutants, has been greatly reduced. At the same time, as a result of industrial upgrading, Hebei has eliminated 3,525 coal-fired boilers, established 53 clean coal production and distribution centres, and remodelled over 4 million square metres of buildings to make them more energy efficient. The amount of fire coal consumed has been reduced by 18.75 million tons compared with 2014 levels. In 2014, Hebei launched the 6643 Project to

reduce capacity of 60 million tons of iron and steel, of 60 million tons of cement, 40 million tons of standard coal and of 30 million cases of glass in three years. It's estimated that 1.06 million jobs will be impacted by the Project. By March in 2015, industry restructuring in Hebei influenced 3,182 enterprises and 447,500 workers. It is reported that 210,000 workers were transferred to other positions, 50,500 left their former position to get training for new opportunities and it is reported that 80 per cent of 447,500 workers were reemployed. (Jin and Li, 2015). After the relevant factories closed, Hebei is more greatly challenged considering the local economic growth and employment. Of the top ten cities with poorest air quality listed by the Ministry of Environmental Protection of China, seven are in Hebei Province, including Tangshan, Baoding, Xingtai, Handan, Hengshui, Shijiazhuang and Langfang. The other two cities are Beijing and Tianjin.

### **2.3.3 Henan: Speeding up greening of traditional industries**

In recent years, Henan Province gradually began to shift from an agricultural to an industrial economy. The target of Henan Province includes transforming its economic development pattern, promoting green, circular, low carbon and sustainable development, developing a high-growth manufacturing industry, actively nurturing strategic emerging industries, transforming and improving traditional pillar industries, supporting and further developing services industries and accelerating the development of high-growth services industries. The 'Blue Sky', 'Blue Water' and 'Clean Villages' projects focus on improving environment quality, increasing the ecological natural recovery capability, strengthening the environment capacity control and promoting intensive use of resources. Against such a background, the traditional industrial enterprises within the province have accelerated the greening of their production methods to satisfy the requirements of the local government.

### **2.3.4 Jiangsu: Strategic emerging industries and upgrading of small and medium-sized enterprises (SMEs)**

Located in the middle of the eastern coastal regions of China and the Yangtze River Delta, Jiangsu Province has a total area of 102,600 square kilometres (accounting for 1.06 per cent of the total area of China) and a permanent resident population of 78.98 million. It has the highest population density of all the provinces and regions of China. The core social and economic development strategy of Jiangsu is to promote industrial upgrading with innovation. A contribution rate of technology progress to economic growth has reached 56.5 per cent. The province faces great environmental pressure due to increasing energy and resource restriction. The manufacturing sectors in the province are mostly at the low end of the industrial chain. The enterprises have few proprietary intellectual property rights and self-owned brands and their core competitiveness is poor. The degree of dependence on foreign technologies is about 60 per cent. Key equipment and many technologies have to be imported from abroad, which influences its economic competitiveness growth. Jiangsu Province is making efforts to promote the greening of its traditional enterprises and to guide the development, particularly of strategic emerging industries, to realize sustainable economic growth.

### **2.3.5 Beijing: Replacing manufacturing industries with green economy**

Developing a green economy is a strategy Beijing has adopted to foster scientific development. An important task is to speed up its economic growth rate. The 12th Five-Year Plan of Beijing explicitly specified to implement the strategy of "Environment-friendly Beijing, Culture-enriched Beijing and Technology-empowered Beijing". The Interim Measures by the Beijing Municipality for Awards to Energy Saving and Emission Reduction was issued on 6 June 2010, and the Plan by Beijing Municipality for Energy Saving and Emission Reduction Action during the 12th Five-Year Period was issued in December of the same year. By developing a green economy, Beijing strives to build a low consumption, low emissions and high added value industrial structure while reducing the emission of fine particulate matter (PM<sub>2.5</sub>) and other pollutants from the source and improve the environment. Making use of its regional advantages (as the capital of China), Beijing has attracted the headquarters of many world's top 500 enterprises and China's top 500 enterprises and created jobs related to research and development, marketing, innovation and trading, thus developing a headquarters economy. Research shows that the resources and environmental efficiency and green economic index of Beijing are the highest among 31 provinces, cities and autonomous regions (World Economy Research Center, 2012).

## 2.4 Profile of case enterprises

### 2.4.1 Tangshan Steel Group (TSG)

With its headquarters located in Tangshan City of Hebei Province, TSG is close to Yanshan Mountain, the Bohai Sea and Tianjin and Beijing. An important branch of Hebei Iron and Steel Group, the company was established in 1943. After 70 years of development, TSG has 37,000 regular employees and a production capacity of 18 million tons of iron and steel per year. Its major products include steel plates, steel bars, steel wires and structural steel. In 2012, the output of iron was 15.6 million tons, steel was 15 million tons, and rolled steel was 14.7 million tons. It generates an income of RMB62.5 billion and a profit tax of RMB1.5 billion. Its main business (iron and steel) is at the middle part of the industrial production chain. The company is a great consumer of domestic and foreign steel and iron ore and a steel supplier of vehicle manufacturer and builders. The company is now making efforts to reduce overcapacity, eliminate backward capacity and explore non-steel business.

### 2.4.2 China Construction Steel Structure Corp. Ltd (CCSS)

The CCSS is a large steel structure enterprise under China State Construction Engineering Corporation. It is engaged in research and development, design, manufacturing, installation and detection business. The company went into production on 12 December 2008 and now a steel structure production base with the largest one-off construction scale, highest capacity and more advanced design among its peers in China. The company is located beside the Tai Lake in Eastern China. It now has its own steel structure building research institute, and a high-tech development centre. Its fixed assets value over RMB100 million. The company has 3,100 employees (1,927 are regular employees). The company is devoted to the development of green construction products.

### 2.4.3 Yuguang Gold and Lead Group (YGGL)

Located in Jiyuan City of Henan Province and founded in 1957, YGGL became a group company in 1997. It now has about 8,000 employees and its primary business include metallurgy of ferrous metals and precious metals, and so on. The group has two core enterprises, namely, Yuguang Gold and Lead Co., Ltd and Yuguang Zinc Co., Ltd established in 2000. YGGL is the largest electrolytic lead and silver producer in China. The sales revenue and profit tax of the company in 2012 were RMB1.29 billion and RMB143 million. The total assets of YGGL are valued at RMB7.2 billion and covers an area of over 2,000 hectares. The company is engaged in the metallurgy and transaction of electrolytic lead, silver, gold and other non-ferrous metals. Each year, YGGL can produce 0.4 million tons lead, 5,000 kg of gold, 10 million tons of silver, 0.24 million tons of sulphuric acid and 40 million tons of blister copper. YGGL is a typical traditional enterprise which has undertaken greening of its production methods by implementing energy saving and environmental protection transformation, developing circular economy and upgrading production processes.

### 2.4.4 Beijing Cement Factory Co., Ltd (BCF)

A subsidiary corporation of the Beijing Building Materials Group Corp. (BBMG), the company was founded in 1992 in Changping District of Beijing and put into operation in 1995. The company is also devoted to processing urban wastes into materials in a harmless way. It owns the first environmentally-friendly production line which uses cement kilns to handle industrial waste. The production line was independently researched and developed by the company and has its own proprietary intellectual property rights. The production line can handle over 200,000 tons of urban and industrial waste and about 2 million tons of "Jinyu Cement". Compared with land filling and burning methods, no secondary pollution is caused by the production line and thus the production line is called an urban purifier on the banks of the Wenyu River. This approach to resolving overcapacity implemented by the Beijing Cement Factory provides an example for traditional cement enterprises during their green restructuring.

#### **2.4.5 Xingda Foamed Plastics Co., Ltd (XFP)**

The group is located in Donggang Town of Xishan District of Wuxi City. Founded in 1992, XFP is a large private plastics enterprise group engaged in the production of expandable polystyrene (EPS). The annual capacity of EPS production has reached 1.18 million tons. Its production scale is regarded the third in the world and leading its peers in China. XFP was the highest ranked company in terms of output, quality, sales, output value, market share and contribution for 14 consecutive years beginning in 1996. It has been listed in China Top 500 Private Companies for 12 consecutive years since 2002. The process of upgrading XFP reflects the efforts of middle and small-sized private companies to achieve sustainable development under dual pressure to protect the environment and compete in the market.

#### **2.4.6 Beijing Jingneng Shire/Shijingshan Thermal Power Plant (JNS)**

Located in Shijingshan District of Beijing, it is a large electricity generation and heat-supply enterprise in which Beijing Energy Investment Holding Co., Ltd holds a certain percentage of shares. The company has 4,220 MW steam turbine generator units which are produced in China. The installed capacity is 880 MW. The accumulated electricity generated in 2014 was 4.711 billion KWH. The total amount of heat supplied was 9.03 million GJ. The net coal consumption rate was 295g/KWH and the comprehensive power consumption rate was 10.09 per cent. The total profit was RMB683 million. The company is the largest centralized heating source west of Beijing. JNS has 1,303 regular employees. According to the General Energy Development Plan of Beijing, the three sets of coal-fired units of JNS will be temporarily closed after the heat-supply period, and relocated to Zhuozhou, Hebei Province. JNS is an example of Plant Relocation in the context of green restructuring.

#### **2.4.7 Beijing Jingqiao Thermolectricity Co., Ltd (JQT)**

The company is a subsidiary corporation of Beijing Energy Investment Holding Co., Ltd and a major electricity and thermolectricity supplier in Beijing. Established on 29 December 2003 with a registered capital of RMB870 million, the company has a total asset of RMB3.5 billion and covered an area of 10.3 hectares. The company is located at Caoqiao East Road of Fengtai District of Beijing. The first stage project started in February 2005 and finished in November 2008. The four 116 MW gas-fired hot water boilers can provide heat for a total area of about 9 million square metres. The second stage project was started in May 2011 and put into operation in February 2013. The generating capacity of the whole units is 838 MW, and the amount of electricity generation is 3.7 billion KW. The heating capacity is about 592 MW, and the area being heated is about 12 million square metres. The company has 143 regular employees with an average age of 34 years old. The company is a typical enterprise developing green basic energies.

#### **2.4.8 Wuxi First Cotton and Textiles Company (WFCT)**

Established by Mr Rong Desheng and Mr Rong Jingzong in 1919, the company is now one of the leading enterprises in the Chinese cotton and textile industries. Located in the economic development zone in Wuxi City, Eastern China, the company has 500,000 spindles and 500 weaving machines. The company can produce 250 million tons of precision spinning yarn and 26 million metres of high-end fabrics each year. Its annual sales volume is over RMB2 billion. The company has installed 5,500 advanced textile machines and a whole set of USTER textile instruments. It is now the world largest precision spinning manufacturer and can product 300 spindles of cotton yarn in a batch. It provides an example for traditional cotton and textiles enterprises which strive to improve their productivity and energy use efficiency and thus strengthen their market competitiveness.



Table 2-1. Profiles of case enterprises

Name	Place	Industry	Owner	Position in the industrial chain	Revenue (RMB100 million)	Employees	Pathway of Restructuring (Major)	Employment Impact	Unionized
Tangshan Steel Group (TSG)	Tangshan Hebei (Northern China)	Iron and steel	SoE (Local)	Product design, manufacturing and sale; middle in the iron and steel industrial chain; ore miner at the upper stream, and manufacturers in the building and machinery fields at the lower stream	1 500 (2015)	38 000	Reducing overcapacity Shutting up outdated capacity greening Exploring non-steel business	Fewer iron and steel workers, more research and development and selling job opportunities, increased demand for green skilled specialists, improved labour environment and job quality	✓
China Construction Steel Structure (CCSS)	Wuxi, Jiangsu (Eastern China)	Iron and steel novel building materials	SoE (Central)	Product design, manufacturing and sale; A whole industrial business model; Intermediate producer in the iron and steel industry, contractor in the building industry	74a (2012)	3 100	Upgrading technologies Improving product added value	Fewer employee per unit production area; New jobs creation during enterprise expansion; Expanding overseas markets, creating knowledge intensive job opportunities	✓
Yuguang Gold and Lead Group (YGGL)	Jiyuan Henan (Central China)	Non-ferrous metals	SoE (Local)	Product design, manufacturing and sale; A whole industrial business model; Having mines, engaging in non-ferrous metallurgy; providing intermediate products and final products of precious metals	88.79b (2014)	8 000	Improving energy efficiency Developing circular economy	Fewer metallurgy workers, more jobs in the circular economy field, improved labour environment and job quality.	✓
Beijing Cement Factory (BCF)	Changping Beijing (Northern China)	Building materials	SoE (Local)	Product design, manufacturing and sale; at the middle and upstream of the building materials field; entering in to the circular economy and environmental protection field engaging in handling of urban wastes, hazards and household garbage	/	700	Developing circular economy Extending the industrial chain	Reduce in job quantity; extending business toward upstream sectors (purchasing mines); creating new jobs when developing circular economy and environmental protection industries, compensating job loss in the building field to some extent.	✓
Xingda Foamed Plastics (XFP)	Wuxi Jiangsu (Central China)	Novel building materials	Private enterprise	Product design, manufacturing and sale; intermediate supplier in the building materials field	97.3c (2014)	390	Technological upgrading developing new products	New jobs created during enterprise expansion and new branches establishment, technology intensive jobs created with investment in research and development and design	✓
Beijing Jingneng Shire/Shijingshan Thermal Power Plant (JNS)	Shijingshan Beijing (Eastern China)	Traditional energy (coal)	SoE (Local)	Infrastructure product manufacturing; at the middle part of the energy industry; providing electricity and thermo-electricity for cities.	/	1 303	Energy savings and emissions reduction; Greening of production Moving plant	Production site of enterprise changed to another place, promoting regional flow of job opportunities; few employees due to introduction of new technologies, but the job loss is compensated to some extent by the introduction of environmental protection equipment	✓
Beijing Jingqiao Thermo-electricity (JQT)	Fengtai Beijing (Eastern China)	New energy (natural gas)	SoE (Holding)	Infrastructure product manufacturing; at the middle part of the energy industry; providing electricity and thermo-electricity for cities; new energy supplier at the upper stream, and urban energy (natural gas) consumption groups at the lower upstream	/	143	Developing clean technologies	Limited direct job opportunities created in new energy industries; great indirect jobs and other jobs in supporting industries.	✓
Wuxi First Cotton and Textiles Company (WFCT)	Wuxi Jiangsu (Central China)	Textiles	Mixed ownership	Product design, manufacturing and sale; at the middle and final part in the textile industry; garment manufacturer and consumers at the lower downstream	/	2 500	Introducing environmental protection and emission reduction equipment; Technological upgrading; developing new products	Higher productivity, fewer workers, large demand for highly skilled specialists, automation skills and researchers and developers, greener management and research and development jobs created.	✓

Sources: a) Survey Report on Production and Operation Conditions of Steel Structure Manufactures in China in 2012; b) Review Opinion about the 2014 Annual Report of Henan Yuguang Gold and Lead. <http://finance.sina.com.cn/stock/t/20150424/061922034782.shtml>; c) China Top 500 Private Enterprises in 2014, <http://finance.sina.com.cn/china/20140818/101620041508.shtml>.

## 3. Main findings

### 3.1 Findings of the desk review

#### 3.1.1 Policy environment: Laws and policies in support of greening

On legislative aspects, Chinese authorities have enacted relevant laws of environmental protection, including the Environmental Protection Law (for trial implementation) (13 September 1979), Land Administration Law, Water Law, Forestry Law, Grassland Law, Water and Soil Conservation Law and Wildlife Protection Law. The authorities enacted laws and regulations related to environment pollution and public nuisance control, mainly related to the prevention and treatment of waste gas, wastewater and waste solids, noise and radioactive contamination as well as supporting environment quality standards and pollutant emission standards. These include the Law on the Prevention and Control of Environmental Pollution by Solid Wastes, Water Pollution Prevention and Control Law, Gas Pollution Prevention and Control Law and Detailed Rules for the Implementation of the Water Pollution Prevention and Control Law, and the Law and Regulations Related to Resource Saving and Compressive Utilization.

A series of resource-related laws were published in 1980s, including the Electric Power Law, the Coal Law and Energy Saving Law. In the twenty-first century, the Chinese energy legal system was further improved, and new phenomena and problems related to climate changes, sustainable development and energy safety are integrated into relevant laws, including the Oil and Natural Gas Pipeline Protection Law. At the same time, some published laws and regulations were revised. Laws and regulations Promoting Circular Economy and Clean Production were also introduced, including the Cleaner Production Promotion Law (July 2012), aiming to promote clean production, improve resource use efficiency, and reduce and avoid generating pollution. Other laws include the Renewable Energy Law (1 January 2006) and the Circular Economy Promotion Law. The State Council and Competent Authorities enacted laws about specific environment administrative system and supporting regulations, including the Law on Appraising of Environment Impacts, Regulations on the Administration of Construction Project Environmental Protection and Provisions on the Hierarchical Examination and Approval of the Documents for the Assessment of the Environmental Implications of Construction Projects.

The laws above encourage enterprises to develop and use clean and low carbon energy, enact regulations on standards of energy saving, water conservation and materials consumptions during routine production towards sustainable development. These laws also establish appropriate penalties for violations and even criminal responsibility. For example, Article 5 of the Electric Power Law rules

in the construction, generation, supply and consumption of electric power, attention shall be paid to promoting the environment according to law and adopting new technology to decrease the discharge of poison waste, prevent and control pollution and other public hazards.

#### **Article 17 points out**

power construction projects shall conform to the electric power development plan as well as the State policies regarding the power industry. No power facilities or technology announced obsolete by formal decree of the State shall be used in power construction projects.

**Article 17 also notes “the electric power enterprises shall economize on the use of water.” The law also set out punishments for violations. Article 62 regulates**

construction of electric power projects in violation of the provisions of Article 14 of this law, or not in conformity with the electric power development plan or industrial policy, shall be ordered to stop by the

electric power administration department. Where, in violation of provisions of Article 14 of this Law, electric power equipment or technology announced obsolete by formal decree of the State are used in construction of electric power projects, electric power administration shall order to stop their use, confiscate the electric power equipment and impose a fine not more than 50,000 Yuan.

**The law also regulates the criminal provisions for the violation. Article 14 rules**

forces workers to work in a hazardous way in violation of the rules and nearby causes a serious accident in involving injury or death and serious consequences, the responsible shall be sentenced to fixed-term imprisonment of not more than three years or criminal detention; if the circumstances are especially flagrant, the responsible shall be sentenced to fixed-term imprisonment of not less than three years and not more than seven years.

In a summary, the relevant laws provide guidelines for enterprises to develop the green economy. They also raise the cost of violating the law, which spurs enterprises to comply with the sustainable development plan of the State.

On policy aspects, the Government of China took measures to boost green economic development, including the following: Report to the 18th National Congress of the Communist Party of China in 2012; Decision of the CCPC on Some Major Issues Concerning Comprehensively Deepening the Reform passed on the 3rd Plenary Session of the 18th CPC Central Committee; the 12th Five-year Plan for National Economic and Social Development in 2011; Decisions by the State Council on Accelerating the Fostering and Development of Strategic Emerging Industries (No. 32 [2010]); Plan for the Development of New Energies; Comprehensive Working Plans for Energy Saving and Emission Reduction; Notification about Printing Opinions of Implementing the Spirits of No. 1 Document by the Central Government to Accelerate Technological Innovation in Urban Areas by the Ministry of Science and Technology (No. 156 [2012]); National 12th Five-year Plan for Environmental Protection; China's Policies and Actions for Addressing Climate Changes; Air Pollution Prevention and Control Action Plan (2013); Water Pollution Control Action Plan (2015) and so on.

China's National Iron and Steel Revitalization Program (2009) stressed the need to push the sector towards low carbon development by controlling the total number of plants, closing down small-scale inefficient plants and consolidating and reorganizing existing plants.

The implementation of measures for energy saving and emissions reduction will impact employment in two ways: first, employment will be reduced by curbing the expansion of the traditional iron and steel industry; and second, new jobs will be created through the introduction of advanced technology. Increasing productivity via advanced technology will also push forward the development of services related to the sector and will create new jobs.

On the Adjustment of Industrial Structure and Closing down of Outdated Production Capacity, the Government of China launched policies and regulations, including Decision of the National Development and Reform Commission on Amending the Relevant Entries under the Catalogue for Guiding Industrial Restructuring (Version 2011), Notice of the National Development and Reform Commission on Promoting Cement Industry Restructuring with Pricing Methods (No. 880 [2014] by NDRC) etc.

In order to handle issues such as employment promotion, employment placement and skill training, the Government of China introduced policies, mainly including the following:

- Plan of Employment Promotion (2011–2015) in 2011;
- Outline of the 12th Five-Year Plan for the Construction of High-skill Talent Training System (2011–2015);
- Outline of National Medium and Long-Term Talent Development Plan (2010–2020);

- Opinions of the Ministry of Human Resources and Social Security, the National Development and Reform Commission, the Ministry of Finance, the Ministry of Industry and Information Technology, the State-Owned Assets Supervision and Administration Commission of the State Council, the National Energy Administration and ACFTU on Effectively Resetting Employees of Enterprises Eliminating Backward Production Capacity and Restructuring (No. 50 [2011]).

The Government of China is providing favourable legal and policy supports for the development of a green economy and promoting ecological civilization construction, and the idea of providing green jobs and decent works through green economy is accepted by more people.

### **3.1.2 Benefits of enterprise restructuring and greening**

By developing and restructuring during the transiting to a green economy, Chinese enterprises promote successful technologies, realize a scaled economy, reduce the unit cost, improve the investment rate and rapidly upgrade less effective and highly polluting production. Domestic and foreign market opportunities and rewards can also be brought in.

The market has an obvious effect on driving Chinese enterprises towards green innovation at present because 'green consumption' produces an incentive for enterprises to develop green products and green technologies. To compete for market share, enterprises will also improve green products and foster green innovation. In an intensively competitive market, enterprises usually derive more profit from green innovation on products and technology. According to a sample survey of 269 manufacturing enterprises in China conducted in 2013, there is a positive correlation between green innovation (products and technologies) and economic benefits in these enterprises. Green product innovation contributes particularly to enterprises' gains (Li, 2014, pp. 130–131).

### **3.1.3 Double-edged impacts on employment**

The influence of the green economy transition is positive overall, with some challenges. For example, the transition has created new jobs and evidence shows the great employment potential of the transition. Since 1984 China has created over 4 million green jobs, and from 2009 to 2012, 5.3 million jobs were created in the green economy (ILO, 2013, pp. 18 and 94). It is estimated that the Chinese wind energy industry can create an average 34,000 green jobs each year from 2011 to 2020. The thermal power station desulfurization industry is expected to create 1.08 million direct, indirect and derived jobs from 2005 to 2020. In the sector of energy saving retrofitting of buildings, about 12.6 million new jobs can be created (Wang and Zheng, 2009). At present, there are 10 million people engaged in various resource recycling sectors, with 700,000 worked in the electrical recycling sector (MoHRSS Labor Science Research Institute, 2011, p. 9). It is anticipated that by 2020, contributions to the national GDP of such industries as alternative energy, energy conservation and environmental protection, biotechnology, high-end equipment manufacture, and vehicles using clean energies will increase from 2 per cent to 15 per cent, and a total of 10 million green jobs will be created (CCICED, 2011, pp. 220 and 227).

Meanwhile, some jobs have disappeared or are expected to disappear as enterprises upgrade equipment and adopt technological innovations. Meanwhile, production cost will rise when enterprises invested in energy-saving emissions reduction processes in accordance with higher standards of environmental protection, and this will compel enterprises to reduce the number of staff. Thus, in the transition to the green economy, machines will replace some workers.

Overall, in the long run, the transition to the green economy will have a positive impact on employment.

Table 3-1. Annual green jobs created by relevant industries in China ('000s)

Sector	2007	2009	2011	2020
Environmental protection industry	/		396	/
<b>Industries related to environmental protection</b>	/		3 195	/
Wherein: new energy industry	1 100	1 500	/	/
Solar thermal electricity	/	600	/	/
Biomass power generation	/	266	/	/
Solar photovoltaic power generation	/	55	/	/
Wind power generation	/	22	/	/
<b>Renewable energy</b>	/	300	/	/
<b>Resource recycling industry</b>	/	/	10 000	/
Wherein: electric appliance recycling	/	/	700	/
<b>Energy, transportation, forestry (green tourism) industry</b>	/	/	/	4 500

Source: Ministry of Environmental Protection, National Development and Reform Commission, and National Bureau of Statistics, 2014; Ministry of Human Resources and Social Security, 2011; data by Jiahua Pan et al., 2011.

### 3.1.4 The role of Chinese trade unions in greening

Trade unions participate in the demonstration and revision of national industrial adjustment policies and legislation, particularly laws, regulations and policies related to policy-based bankruptcy, reorganization, restructuring and closing down of outdated production capacity which may lead to changes in labour relations. Chinese trade unions have participated in the formulation and revision of the Labor Contract Law, Regulation on the Implementation of the Labor Contract Law, Opinions of the State Council On Promoting Enterprise Merger and Restructuring, and Notification to Protect the Employees' Legal Interest During Restructuring, Reform and Bankruptcy of State-owned Enterprises issued by Ministry of Human Resources and Social Security of the People's Republic of China. Trade unions have also assisted the Government in standardizing enterprise operation, proposed competent authorities to comprehensively consider the effect of adjustment measures on employment in the short, medium and long term, and made efforts to balance economic transformation with stable employment.

Trade unions organize and call on workers to carry out energy saving and emissions reduction activities. For example, ACFTU launched the campaign "My Contribution to Energy Saving and Emission Reduction" in 2005 and issued the Implementation Plan of Relevant Activities of National Employee Energy Saving and Emission Reduction Activity Month in 2008 (order No. 9). The Implementation Plan required trade unions to carry out employee competitions entitled: "To be the Main Force and Making Contributions during the 12th Five-Year Plan" and "My Contribution to Energy Saving and Emission Reduction". Moreover, AFCTU has made efforts to reduce energy consumption and pollution during production processes through team construction, labour competitions and suggestions collection.

The Notification on Appointing Employees as Supervisors of Energy Saving and Emission Reduction jointly issued by AFCTU and NDRC specified that some employees would be appointed as supervisors of energy savings and emissions reduction. By October 2010, a total of 31 provinces (districts and municipalities) had 670,000 supervisors of energy savings and emissions reduction. These supervisors play an active role in the efforts towards these objectives while maintaining quick but stable economic growth (Xin Hua Net, 2010a). In 2009, ACFTU carried out energy savings and emissions reduction competitions between major enterprises in key industries, and found gaps and formulated measures based on domestic and foreign advanced standards.

After conducting energy savings and emissions reduction competitions in the steel industry, the energy consumption of blast furnaces and converters in large steel companies was reduced by over 10 per cent.

In 2010, ACFTU and Ministry of Industry and Information Technology issued the notification about implementing “My Suggestion for Energy Saving and Emission Reduction”, which aimed to explore new ways to carry out worker competitions in the non-public enterprises and SMEs in emerging industries and modern services industry, and improving the general workers’ awareness and skills of green production. During the 11th Five-Year Period, a total of 50 million employees from 25 enterprises and public institutions in 31 provinces (districts and municipalities) participated in the National Employee Energy Saving and Emission Reduction Activity Month. Trade unions at all levels have collected over 220,000 proposals on emissions reduction, awarded 1,000 prizes to the best rationalization proposals, published over 21,000 new innovative emissions reduction results and carried out knowledge competitions on energy savings and environmental protection. These activities attracted the participation of 11 million of workers (Xin Hua Net, 2010b).

Trade unions help workers to acquire green skills. They urge enterprises to increase employee education and training expenditures; strive for more government funds, subsidies or preferential policies; promote cooperation between schools and enterprises; advocate for training for specific positions; and order training and remote education to improve employees’ technical quality and innovative skills. In August 2014, ACFTU opened a training course on energy savings and emissions reduction for employees from North China in Hebei Province. NDRC, the Ministry of Industry and Information Technology and the Ministry of Environmental Protection provided training on the current domestic energy saving and emission reduction situation, tasks and policies, enterprises’ efforts to save energy and reduce emissions, and laws and regulations on environmental protection.

Trade unions are also involved in protecting workers’ rights during the transition to the green economy. Major methods employed are outlined below.

- 1) Strengthening social dialogue. Enterprise trade unions strengthened dialogue and cooperation with enterprises (organizations) during their technology upgrading and operation restructuring, and enhanced the democratic management of enterprises of in which outdated production capacity was closed down. Trade unions participated in designing plans for greening some positions in the company and repositioning redundant personnel through the congress of workers and staff. They duly handled labour relations according to law and did a good job in job placement, economic compensation and social insurance relations.
- 2) Improving skill construction. Trade unions improved the employees’ green skills, safety production skills and green and environmental protection awareness; urged competent authorities to formulate and improve industrial production safety standards, assisted relevant departments to close down poisonous and hazardous outdated production capacity and intensify the prevention and treatment of occupational diseases.
- 3) Promoting decent work. Trade unions gradually improved working conditions and reasonably increased their remuneration and welfare through collective consultation on wages after improving labour productivity during upgrading of working sites and production processes.
- 4) Providing support to employees with difficulties. Trade unions provided training and supports to employees with working and living difficulties during enterprise upgrading and rebuilding and while arranging for reemployment.

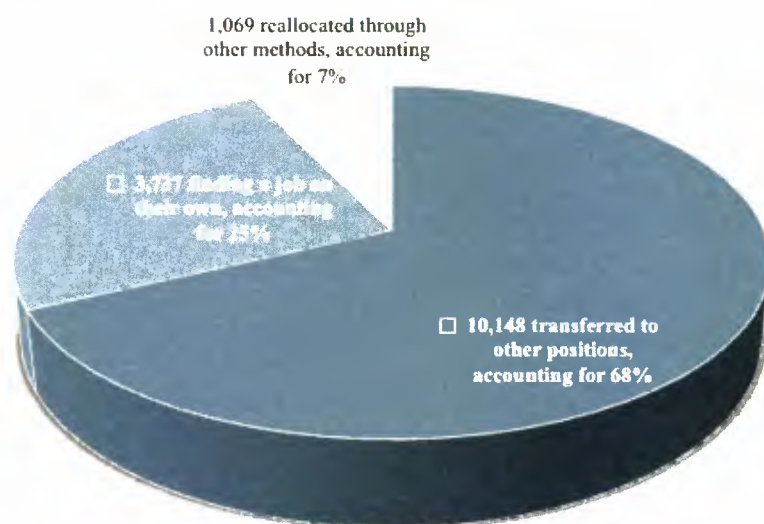
## 3.2. Findings of the enterprise research and case study

### 3.2.1 Significant employment impacts of enterprise restructuring and greening

#### Shrinking number and disappearance of “brown jobs” in traditional sectors

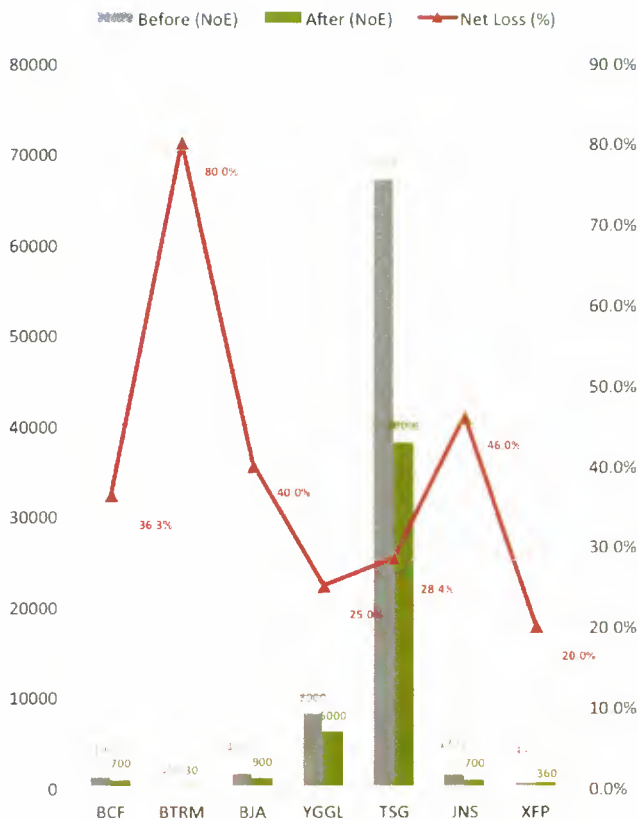
National industrial adjustment and control policies have significant employment impacts. The employment scale of relevant industries will shrink as outdated capacity is shut down and overcapacity is reduced. According to the investigation, Hebei Province reduced steel capacity by 40 million tons, which directly influenced the jobs of 68,000 people; Tangshan City reduced the steel capacity by 28 million tons, which directly influenced the jobs of 48,000 people. Employment of upstream logistics industries has dwindled due to the decrease in consumption of iron ore powder. Hebei Province planned to reduce steel capacity by 60 million tons by the year 2017, and to reallocate over 600,000 people in direct or indirect positions. By 2014, Jiangsu Province had reduced capacity in steel, cement, plate glass and shipping industries by 3.77 million tons, 1.53 million tons, 2.2 million tons, and 3.45 million dead weight tons respectively. The jobs of 14,954 people in 121 projects were influenced, wherein 10,148 were transferred to other positions, 3,737 found a job on their own, and 1,069 were reallocated in other ways (figure 3-1). Overall, 25 per cent of positions disappeared in the transition driven by shutting down outdated capacity and reducing overcapacity; 68 per cent of staff were transferred to other positions and 7 per cent of staff were reassigned through other methods in 121 capacity reduction projects conducted in Jiangsu Province in 2014.

Figure 3-1. Employment impact of upgrading in Jiangsu Province, 2014



Source: Data from local/industrial seminar in Jiangsu Province.

Figure 3-2. Decease of brown jobs during transition (percentage)



Source: Summarized based on enterprise survey data on the employee number before transition.

“Brown jobs” in traditional enterprises are reduced remarkably during the transition, particularly those featuring high energy consumption, high emission, high pollution but low income (figure 3-2). Among the surveyed enterprises, in the steel industry, the Tangshan Steel Group (TSG) reduced its employee number from 67,000 in 2010 to 38,000 in 2014, a reduction of 28.4 per cent of the total employees before undergoing green restructuring. The number of year-round working opportunities has been reduced by 4,000. The Yuguang Gold and Lead Group (YGGL), a non-ferrous metallurgy company, reduced 2,000 positions after shutting down outdated capacity during its restructuring, accounting for 25 per cent of total positions before restructuring. The Beijing Xingfa Cement Factory (BXCF, BBMG) reduced its number of employees by 46 per cent, from 1,303 to 700. The factory shall be relocated to another province and thus staff will be reassigned.

The number of jobs was remarkably reduced due to the application of new technologies and equipment, and the improvement of productivity. In the seven enterprises above, net employment impact was negative during the transition. Two factors underlie the net loss. One is greening; the other is the rise of productivity because of technological innovation which reduced the number of employees needed.



## Feature 3-1.

**Jobs reduced in technology upgrading of the textile industry**

The Wuxi First Cotton and Textiles Company introduced information technology in 2000, ERP technology in 2004 and sensor technology in 2009. Today the enterprise operation is highly automated and information-based. The Changjiang Precision Spinning Workshop exemplifies the introduction of advanced import equipment to important working processes. The wide use of sensors, automatic operation and large package has reduced employees' workload and thus the number of employees decreased greatly and working condition improved. Occupational health and safety also improved as a result of fewer noises and mechanic hazards. The consumption of raw materials also decreased.

The technology used in domestic ring spun yarn companies has improved greatly, and the average number of employee needed for every 10,000 spindles has been reduced from 300 in the 1980s to 200 in 2000, to the current average of 70 for every 10,000 spindles. Changjiang Precision Spinning Workshop of the Wuxi First Cotton and Textiles Company has a capacity of 135,000 spindles and 270 regular employees, or about 20 employees for every 10,000 spindle. However, in 1990s, for each 1,000 spindles, the number of employees was 100 to 200. Thus, with 20 employees for every 10,000 spindles, the workshop requires only 28.6 per cent of the industrial average. The number of jobs fell remarkably due to the application of new technologies and equipment, and productivity improved and a new record has been set.

Source: Enterprise seminar; Fang Weiming 2012. "Secret of 20 Employee per 10,000 Spindles", in China Textile and Apparel No. 11; China Cotton Textile Association 2015. Textile Enterprises Actively Adopting to New Trends, 24 March.

Table 3-2. Zinc smelting productivity at home and abroad (same equipment), Yuguang Gold and Lead Group

Smelting operation	Staff requirements	
	Number of staff equipped for each production line	Number of electricians on-duty
Japanese peer	200	0
Yuguang Gold and Lead Group	2 000	2
Domestic peer	Over 10 000	/
German peer	/	0

Source: Seminar with Yuguang Gold and Lead.

Machines replace workers as the introduction of new equipment improves productivity and reduces the need for staff. Enterprises further reduce the number of employees according to the labour standards of leading foreign peers. The zinc smelting branch of the Yuguang Gold and Lead Group reduced the number of staff for a single production line to 20 per cent of the level of its domestic peers after introducing advanced international equipment. However, the company thinks the current level is still ten times of the level in its Japanese peers, and thus expects to further reduce the employee number after the operators become familiar with the new equipment and fully grasp the new technology.

According to the requirement of new standards issued by environmental protection authorities of Beijing, Jingneng Shire has reduced 50 per cent of its employees responsible for dedusting, desulphuration and denitration (from 30 to 15), and reduced 26.5 per cent of the employees working in the dedusting workshop (from 49 to 36). In battery storage enterprises in Jiangsu Province, after the application of new energy saving

equipment, the number of employees needed for relevant positions has been reduced as much as 90 per cent (from 20–30 to 2–3). The number of employees in the open-end spinning workshop of the Wuxi First Cotton and Textile Company has been reduced by 66.7 per cent (from 300 to 100), and the number of maintainers in the open-ended spinning workshop has also been reduced by one third.

### Structure and relocation of employees who lost jobs during the transition

Older labourers: retirement or early retirement. Some older employees (those with signed labour contracts) are reassigned to auxiliary positions because they are poorly educated and slow to accept new knowledge. Many enterprises reduce their employees through retirement or early retirement of some employees. Some enterprise leaders say that after employees retire their positions will be eliminated (table 3-3). During the transformation and upgrading of the Beijing Cement Factory (BCF), over 200 employees retired or took early retirement from the company, accounting for 18.1 per cent of its total employees before restructuring. The percentage of these employees in Beijing Jianji Assets (BJA, BBMG) is 3 per cent. Through retirement and early retirement, the number of working positions from 2010 to 2014 in the Tangshan Steel Group, a traditional large State-owned steel company, had been reduced by 4,000. Jingneng Shire reduced over 100 working opportunities, accounting for 7.7 per cent of total positions. The Yuguang Gold and Lead Group did not recruit new employees for the positions from which 1,000 older employees retired from 2010 to 2014. The percentage of positions reduced by the means of retirement ranges from 3.0 per cent to 18.1 per cent in different kinds of enterprises.

Table 3-3. Employment changes during enterprise restructuring

Name	Employee group	Before (number of employees)	After (number of employees)	Reduced	Percentage
BCF	Total employees	1 100	700	400	36.3
	Retirement and early retirement			200	18.1
	Dispatched labourer (migrant worker)	200	100	100	50
BXCF	Total employees (mainly migrants)	/	/	/	30
BTRM	Dispatched labourer (migrant worker)	150	30	120	80
BJA	Resettled	1 500	900	600	40
	Early retirement	/	/	40	3
YGGL	Total employees	8 000	6 000	2 000	25
	Retirement (aged employee)	/	/	1 000	12.5
	Left the company and found a new job	/	/	1 000	12.5
TSG	Total employees	67 000	38 000	19 000	28.4/
	Retirement/early retirement from the main positions	/	/	4 000	10
	Auxiliary worker	/	/	10 000+	14.9
	Laid-off	/	/	5000	7.5
TJG	Positions requiring few skills	5 000	4 200	800	16
	Dispatched labour	/	/	500	10
JNS	Total employees	1 303	700	600	46
	Retirement	/	/	100	7.7
	Positions for dedusting, desulphuration, denitration	30	15 <sup>a</sup>	15	50
	Dedusting workshop	49 <sup>b</sup>	36 <sup>c</sup>	13	26.5

Name	Employee group	Before (number of employees)	After (number of employees)	Reduced	Percentage
WFT <sup>d</sup>	Total employees	8 000	6 300 <sup>e</sup>	1 700	21.2
WFCT	Total employees	/	2 500	/	/
	Each open-end spinning workshop	300	100	200	66.7
	Maintainer in each open-end spinning workshop	/	/	/	33.3
XFP	Total employees	450	360	90	20
	Laid-off workers	/	/	70-80	15.6-17.8
	Retirement; dispatched to branches	/	/	10-20	2-4

Source: local/industrial seminars, enterprise seminars and interview data.

Notes: a) Statistics for 2017; b) 2012; c) 2014; d) The company lost over 1,700 employees when moving into the industrial park, mainly aged workers, workers with low skills and auxiliary workers; e) There are over 1,000 technicians, over 200 middle-level workers, and the remained are general staff. There are seven technicians having senior professional position titles, and 32 technicians having medium-grade professional titles.

Employees who are not qualified for the new positions or whose learning ability and adaptability are poor may be assigned to auxiliary or logistic positions or may even lose their job. Employees who are not skilled or are not qualified for new positions after the introduction of new equipment and technologies are the main group who are resettled by the enterprises to other positions or who are laid off. Some employees are assigned to new positions. Some 40 per cent of employees in Beijing Jianji Assets (BJA) were assigned to other positions. Some were assigned to service positions in other companies of the group to which the company belongs, accounting for 12.5 per cent of the total employees before the green restructuring. During technology upgrading of the Tangshan Jianlong Group (TJG), a steel enterprise, 800 employees who were not qualified for the new positions were resettled, accounting for 16 per cent of the total employees in technical positions before the upgrade.

Temporary workers and auxiliary workers, of which migrant workers are the majority, are likely to experience unemployment and re-employment. Most enterprises have used plenty of dispatched labour (or agency workers, the majority are migrant workers) before their green restructuring. Temporary workers sign a labour dispatch contract with the enterprises and thus are not regarded as the regular employees. When an enterprise needs to reduce staff during restructuring, upgrading, technical innovation, energy savings and emissions reduction, the reduction of overcapacity or rise in labour costs, the enterprises will first lay off dispatched labours in temporary and auxiliary positions. Some enterprises lay off dispatched labourers to save costs and alleviate pressure while other enterprises want to reserve the positions of dispatched labourers for resettled regular employees. The Beijing Cement Factory had more than 200 dispatched workers before its restructuring and half of the dispatched workers lost their jobs. 80 per cent of dispatched workers (mainly migrant workers) of Tongda Refractory Materials Company (BTRM, BBMG), a building material company, lost their jobs during restructuring. The Tangshan Steel Group laid off over 10,000 dispatched workers in four years, accounting for 14.9 per cent of total employees. The auxiliary positions which were occupied by dispatched workers before are now arranged for the resettlement of regular employees from main steel-related positions. The Tangshan Jianlong Group laid off over 500 migrant workers during restructuring, equal to 10 per cent of its total number of employees.

Local governments regard the reduction of overcapacity as an important way to promote economic restructuring, transformation and upgrading, and they make great efforts to reassign workers and protect their rights and interests. Dispatched labourers are not regular employees of enterprises and thus are not included in the reassignment plan. Most enterprises will no longer use dispatched labourers upon expiration of dispatch agreements, and provide no compensation for them for not reassigning them to other positions.

In recent years, trade unions have taken the protection of rights and interests of dispatched labourers and migrant workers into the core of their work and they provide support and services for them. Trade unions have begun to include dispatched labourers in the guarantee systems and take it as an important task to improve their salary and welfare. Trade unions provide more training for them and nurture workers with multiple skills; based on the requirements of new production positions and jobs created during enterprise restructuring, upgrading and shutting down outdated capacity. Local trade unions have brought in experts to provide professional technical training courses to improve the skills of dispatched labourers and migrant workers. Enterprises trade unions have selected qualified dispatched labourers to be regular employees of the enterprises, as so to motivate other dispatched labourers to continuously improve their occupational skills and adapt to new requirements of the labour market. Members of the National Committee of the Chinese People's Political Consultative Conference (CPPCC) proposed to consider all the impacts of shutting down outdated capacity shutdown on workers and reassignment of workers. Migrant workers and dispatched labourers are highly influenced by outdated capacity shutdown, and they can hardly find a new job because they are less skilled. The committee members appealed to all levels of government to guide and support the re-training and reemployment of workers and recovery of social and medical insurances, and actively create new job opportunities and positions for them (Zheng and Zou, 2014).

Those who lost jobs due to enterprise restructuring driven by policies related to shutting down outdated capacity and reducing overcapacity have not caused turbulence in the local labour market. Some workers entered other local enterprises. For example, in Jiyuan City of Henan Province, where the Yuguang Gold and Lead Group is located, a Yili company established in 2013, provided job opportunities for 1,000 people, and Foxconn provided job opportunities for 40,000 people. According to the Jiyuan Bureau of Human Resources and Social Security, the supply and demand in the local labour market is balanced. Jiangsu Weifu Technology, a fuel injection system manufacturer in Wuxi, laid off 1,700 workers during restructuring. In Jiangsu Province, a total of 191,000 new jobs were created from January to February in 2015, the same as that in the same period of last year, and 99,000 people who lost jobs found a new job, increased by 1.3 per cent on a year-on-year base. By the end of February, the urban registered employment rate in the province was 3.01 per cent, having decreased by 0.08 per cent year-on-year. The overall employment situation is stable, except for Tangshan City which has a large employment gap caused by great pressure of policy-driven restructuring. According to an official of the Employment Promotion Division of the Tangshan Human Resources and Social Security Bureau, the demand for new jobs each year in Tangshan is 140,000. However, only 90,000 new jobs are created each year, and thus there is a gap of 50,000. The number of workers who enter into the labour market after leaving from or being laid off by the Tangshan Steel Group is more than 5,000.

Workers who cannot find jobs at other enterprises immediately after losing their jobs are able to do so after training. Some of them having living difficulties have received relief from local civil administrative departments, trade unions and other organizations.

### **New green positions are created directly by technology upgrading and successful enterprise restructuring.**

The lead smelting system of the Yuguang Gold and Lead Group has been upgraded three times from 1998 to 2010 (table 3-4). After each upgrade, productivity was significantly improved and the unit energy consumption was clearly decreased. New green positions, which are more energy saving and environmentally friendly, were created each time when old ones were cancelled. In particular, after applying a direct reduction technology of lead-rich liquid slag in 2010, the production scale was further expanded. The total number of employees on the lead smelting production line increased to 453 during technology upgrading and restructuring, representing an increase of 28.3 per cent (compared to 1988), 16.2 per cent (compared to 1996) and 45.2 per cent (compared to 2005).

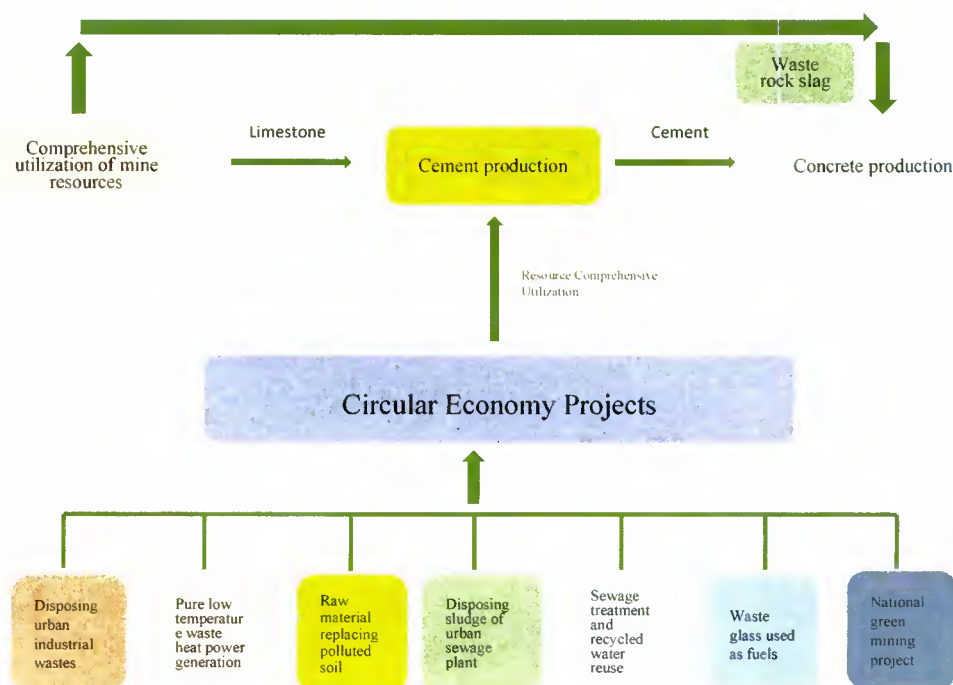
Table 3-4. Changes to the lead smelting system of the Yuguang Gold and Lead Group

Technology upgrading	Phase I	Phase II	Phase III		
Year of use	1988	1996	2002-2005	2010	
Technology name	Sinister Blast Roasting Pot Lead Smelting Technology	Sinister Blast Furnace Lead Smelting Technology	Bottom-blowing Oxygen-rich Oxidation Technology	Direct Reduction Technology of Lead-rich Liquid Slag	
Output (10 000 tons)		2	7.3	16	26
People employed		353	390	312	453
Productivity (ton/person)		57	187	513	575
Number of work type		64	76	72	60
Year cancelled		2002	2009	/	/

Source: Seminar with the Yuguang Gold and Lead Group.

New green jobs are created directly by implementing projects for energy savings and emissions reduction and developing a circular economy. Through circular economy projects, the number of year-round stable staff in the Beijing Cement Factory has increased by 20 times, from about ten people to more than 200 people. These people are assisting in the disposal of urban industrial waste, polluted soil and urban sewage, or they are engaged in pure low temperature waste heat power generation projects, alternative energy projects and other circular economy projects. Their jobs not only protect the natural environment surrounding the city, but also help to restore the ecological environment, and thus are green jobs (figure 3-3).

Figure 3-3. Circular economy projects of the Beijing Cement Factory Source: Seminar with the Beijing Cement Factory.



Source: Seminar with the Beijing Cement Factory.

Feature 3-2.

**Greening and water recycling**

The water treatment centre project of the Tangshan Steel Group is a key energy savings, emissions reduction and water recycling project that began on 1 April 2009. The project includes an urban recycled water treatment and industrial wastewater pre-treatment system, a wastewater advanced treatment system, and an electrical automation and control system. The designed water treatment capability is: 3,000m<sup>3</sup>/h for industrial wastewater, 3,000m<sup>3</sup>/h for urban recycled water, 4,200m<sup>3</sup>/h for purified water supplied for other companies, 1,000m<sup>3</sup>/h for softened water supplied for other companies, and 300m<sup>3</sup>/h for demineralized water. Following a circular economy concept, the project puts the efficient use of resources at the core and features low consumption, low emissions and high efficiency. With the project, the industrial water of the company is comprehensively treated and recycled. No new water is needed for each ton of steel produced and no industrial wastewater is discharged. In the first year after operating the project, the company purchased no new water from other enterprises, saved 14.6 million tons of new water, discharged no industrial wastewater and the water recycling rate reached 97 per cent. A total of more than RMB13 million was saved from water charges and chemical costs. It is now the largest industrial water recycling and treatment centre in Eastern China and provides dozens of stable green jobs.

The Tangshan Steel Group transformed its enclosed underground stockyard and upgraded the rotating speed of the dust-removing fans at dust outlets of eight blast furnaces, and thus created many green jobs. Besides, green jobs are also created in its water treatment centre project (figure 3-4), the top-pressure recovery turbine (TRT) power generation project and top gas pressure recovery turbine unit project (500,000 KW).

Figure 3-4. Water treated in the water treatment centre



All photos © D. Weijun.

New jobs are created by the expansion of industrial chains. Many enterprises seek opportunities in upstream and downstream sectors to ensure sustainable development. The expansion of industrial chains usually comes together with the introduction of new businesses and sectors, and thus new jobs are created (table 3-5). The Tangshan Steel Group has focused R&D efforts on construction steel and high-strength products. The company recruited sales agents, made direct contact with the clients, and now manufactures customized steel plates for downstream enterprises. After the expansion of industrial chains, the number of new non-steel-related positions has increased by 2,000, some of which are green jobs. Greener jobs are directly created with more investment in R&D by the enterprises. Tangshan Steel Group recruited as many as 400 high-end R&D specialists each year. The Yuguang Gold and Lead Group recruited 30–50 specialists with high skills and knowledge each year during restructuring. Wuxi Weifu Technology recruited 63 managers in 2013 and 26 managers in 2014, and recruited 107 technicians in 2013 and 208 in 2014. These positions are related to efficiency management, technology innovation, research and design, consuming less energy and producing less pollution, which are green jobs.

Green jobs are directly created by new energy enterprises. Beijing Jingqiao Thermoelectricity (JQT), a newly established natural gas power generation and heat supply green company, has created 143 year-round stable and decent jobs for resettled employees of Jingneng Group as well as college graduates and specialists with high skills. Besides, the company also provided over 200 indirect jobs for other enterprises by outsourcing.

Many green jobs are created in enterprises which are expanded during the transition process. Some enterprises are expanded by transforming, upgrading and introducing new technologies, thus creating many jobs (and many green jobs). The Beijing Tongda Refractory Materials Company (BTRM) had only 100 regular employees before undergoing green restructuring. With the expansion of its production scale, it now has more than 1,000 employees, a ten-fold increase. Wanyang Metallurgy Group (WMG) enlarged its employment number from about 100 people to 3,500 people in 2014 after a ten-year expansion. The number of jobs newly added increased by 35 times.

Negative impacts on employment were seen during the transition to the green economy in eight case enterprises. However, new jobs were created to somewhat counteract the negative influences. Moreover, in the context of new economic trends in China, this research investigated the fall and rise of jobs at a more macro level.

### **Many green jobs are created in the producer services industry**

The number of direct jobs created is limited and far fewer than those lost during the transition to the green economy. However, a considerable number of indirect jobs are created as well. Although lacking clear data and evidence, according to officials of the industrial enterprises who agreed to be interviewed, green restructuring has driven the emergence of the producer services industry which can create many new jobs, especially greener, more decent and high quality jobs.

First, the green transformation can promote the development of the producer services industry. 'Producer services' refer to services which are used by producers of other commodities. Such services produce an intermediate input and mainly include the following industries: transportation, modern logistics, technology services, information, service trade, conference and exhibition, intermediary services and agricultural production services. The producer services industry is a product of the ever-developing economic level and deepening division of labour. It can promote the growth of other industrial sectors. The green transformation of an enterprise will include labour divisions in production, an increase of production sectors, or outsourcing of some sectors, which will stimulate the development of the producer services industry.

Table 3-5. Net jobs gained or lost in enterprises during the transition to the green economy

Name	Job Lost		Job Newly Created				Net Change
	Work Type	Reduced	Work Type	Before	After	Added	
BCF	Total employees	400	Environmental protection, circular economy	10+	200+	190+	-210
BTRM	Dispatched labourer (migrant worker)	120	Total employment	100+	1 000	900	780+
YGGL	Total employees	2 000	Specialists with high skills			30-50 people each year	-1 950-1 970
WMG			Total employment	100+	3 500*		
TSG	Total employees	19 000	Non-steel-related jobs		2 000		-17 000
JNS	Total employees	600	R&D, senior management			400	
JQT <sup>b</sup>			Environmental protection	2	7	5	-595
			Employees	/	143		
			Dispatched labourers	/	200		
			Electric appliance assembly department		100+		
			Managing positions in 2013			63	
WFT			Technical positions in 2013			107	
			Managing positions in 2014			26	
	Total employees	1 700	Technical positions in 2014			208	-1 492

Source: ACFTU research team.

Notes: a) Wanyang Metallurgy Group is a private company founded in 1995. Its output value in 2014 was RMB10.6 billion. The company now has six production factories, five wholly-owned subsidiaries and four joint ventures; b) A newly established company. Part of its employees are resettled staff from other subsidiaries of Jingheng Group. Most of the positions are created during transition to the green economy.



Secondly, green transformation will promote the development of services industries related to energy savings and environmental protection, namely the environmental services industry, which includes service trading activities related to the environment. It is an important branch of the modern services industry and plays an important role both in the producer services industry and the consumer services industry. The environmental services industry mainly includes such activities as environmental engineering design, construction and operation, environmental evaluation, planning, decision-making, management and consultation, environment technology research and development, environment supervision and detection, environment transaction, financial services, environment information, education and training. The Government shall formulate relevant energy saving and environmental protection standards to guide the green restructuring of enterprises, establish relevant intermediary service companies related to consultation, design, detection, evaluation and supervision, which can stimulate the development of services industries to some extent.

Thirdly, green transformation can promote the development of the consumer services industry, namely industries which can satisfy the consumption demand and basic livelihood requirements of the citizens. Service sectors are included within the consumer services industry if over 50 per cent of their products are for direct consumption. Thus the consumer services industry includes tourism, commerce circulation, catering, hotel and lodging, amusement, real estate, physical fitness, community service, municipal administration and public service and rural life services. On one hand, the green transformation of enterprises will help the formation of a green consumption concept. On the other hand, people's awareness of green consumption will promote the green transformation of enterprises. When people are accustomed to a high-quality lifestyle featuring leisure tourism, ecological residence and green health foods, it will certainly promote the development of such industries as environment treatment, health care, ecologic agriculture, green residence and energy saving vehicles.

### **Green jobs are created in emerging strategic industries**

With the rapid growth of emerging strategic industries, low carbon and sustainable development becomes possible. Emerging industries feature long industrial chains and great potential for development and job creation. Besides, emerging industries are green and environmentally friendly. According to a joint analysis by IBM and relevant Chinese authorities, a total of more than 1.5 million jobs would be created by an investment of RMB100 billion in smart power grids, broadband and smart medical treatment (MoHRSS and Institute for Labor and Wage Studies, 2012).

### Feature 3-3.

#### **Direct and indirect jobs created by the transition to the green economy**

Jiangsu CEMT Energy Equipment Co., Ltd is a supplier of energy-saving production equipment for manufacturing companies. Mr Chen Yingcai, Vice President, said: “as far as I know, the use of energy saving and environmentally friendly equipment significantly influences the employee number of our clients. A position previously needing 20–30 employees now only needs two to three employees. It seems that jobs are reduced due to their application. However, more than 500 workers were needed to produce such a piece of energy saving equipment. More jobs are created when taking into consideration our upstream and downstream industries”. According to research by Geng Guobiao, 90 per cent of new jobs are indirect jobs created when the energy cost is decreased and the relevant investment in new technologies is increased. In other words, the new direct jobs only account for 10 per cent while 90 per cent of the remaining jobs are created after new technologies are introduced. This finding is also supported by information obtained in the enterprise seminars. It is commonly believed that great job opportunities will be provided during development of modern logistics, industrial design, information service, finance and insurance and commercial services industries, shifting from a manufacturing industry to a service industry and an integrated competitive system in which manufacturing, technology and the market coordinate well with each other.

Source: Local/industrial seminars; and Geng Guobiao, 2008. Allowing Power Generation Right Trade and Reducing Consumption and Emissions through Market Mechanism, Green China, No. 1.

#### **The headquarters economy has become a source for green jobs in Beijing**

Based on the location, talent, technology, information, education and cultural advantages of Beijing, headquarters enterprises have formed a green and low carbon development pattern led by high-end products and driven by innovation. Of the top 500 companies in the world, 48 had headquarters in Beijing in 2013, and Beijing had more headquarters of world top 500 companies (19.4 per cent) than any other city. The six high-end industrial zones in Beijing provided job opportunities for a total of 3.23 million people in 2013, after increasing 76.6 per cent over the previous five years. The cultural and creative industry provided job opportunities for 1.84 million people, an increase of 71.3 per cent compared to 2008. The jobs were mainly centred in nine fields, including culture and arts, news and publications, broadcasting, television, film, software, website and computer service, advertisement and exhibition, arts transaction, design service, tourism, entertainment, and other supporting services (National Bureau of Statistics, 2014). These jobs are typically green and decent.

#### **Green jobs are created in emerging strategic industries in Jiangsu and Henan**

Since the 12th Five-Year Period, Jiangsu Province has invested in more than 200 major manufacturing projects each valued at over RMB2 billion. The output value of high-tech industries in regions along the Shanghai-Nanning railway line accounts for 65 per cent of the total output value of the province; the output value of base materials and new materials industries in regions along the Yangtze River accounts for 55 per cent of the total output value of the province; and the output value of wind electricity and ocean engineering project accounts for 50 per cent of the total output value of the province. The output value of high-tech industries in 2014 in Wuxi was estimated at more than RMB600 billion, accounting for 41.5 per cent of the total industrial output value. The total output value of emerging industries is RMB946.05 billion, representing an increase of 16.2 per cent year-on-year, wherein the output values of the Internet of Things and cloud computing industries, high-end equipment manufacturing industry and micro-electronics industry increase by 40.5 per cent, 11.2 per cent, and 12.1 per cent respectively year-on-year. The output value of the industrial design industry is RMB45.88 billion and the output value of the bioengineering and pharmaceutical industries is RMB46.55 billion, increasing by 20 per cent and 15.5 per cent respectively year-on-year. In 2013, there were 67,000 corporate enterprises

in emerging strategic industries in Jiangsu, and a total of 8.28 million year-round jobs, accounting for 35 per cent of the total jobs of the same kind all over the country (National Bureau of Statistics, 2015b). By the end of 2013, the emerging strategic industries in Henan had provided year-round jobs for 901,100 people, of which, 336,500 jobs were provided by the energy saving and environmental protection industries and 241,900 jobs were provided by the new materials industry (Henan Daily, 2015). Jobs in energy saving and environmental protection industries are typically greens jobs and most jobs created in the new materials industry are green jobs.

### 3.2.2 Quality of work constantly improved during greening

#### Working conditions improved, workload/work intensity was reduced and occupational health and safety was enhanced

During green restructuring of enterprises, with improved production processes and innovative technologies and equipment, working conditions are improved and the workload is reduced. With the shutdown of outdated processes and the use of new technologies, safety is enhanced (figures 3-5 and 3-6).

Most parts and components of the China Construction Steel Structure Corp. Ltd are manufactured and assembled in workshops. Construction workers can thus avoid wind and dew and are able to do their work in one place because the production site is fixed. Little reinforced concrete is used during construction and the major work is carried out by assembly workers, such that the whole construction no longer needs a great number of migrant workers, and construction workers can work decently just as those in other industries. Therefore, the slogan of the China Construction Steel Structure Corp. Ltd is “building a house just like building a car”.

Figure 3-5. Changes of working conditions in BCF and YGGL



All photos © D. Weijun and the Beijing Cement Factory (upper middle and upper right)

Figure 3-6. Working conditions in TSG, JNS and JQT



**Tangshan Steel Group**  
*Steel Melting Workshop (left); Galvanizing Package Workshop (top right); Central Control Room (bottom right)*

**Jingneng Shire**  
*Central Control Room (upper); Workshop (lower)*

**Qingqiao Thermoelectricity**  
*Central Control Room (upper); Blast Furnace (left)*

All photos © D. Weijun.

**Feature 3-4.**

**Improved working conditions after process and technology upgrading**

An operator from the copper melting workshop of the Yuguang Gold and Lead Group said: "one worker would be responsible for two to three furnaces before, copper powder was bottom-blown into the furnaces, the waste gas was used to produce acid and the dust was collected into dust collection cabinets. After the technology transformation, physical effort is saved because there are no time and energy-costing jobs. In the past, the work time was long and the workload was great because the workers had to be responsible for all the operation in person. Now, the workers just need to push control buttons in the control room."

An electrolysis worker on the electrolyzer technological process line said: "our company introduced a technology from Japan in 2010, and thus the production process becomes automatic. In the past, I had to work 30 shifts, eight hours a shift and 240 hours a month. Now, I just have to work 20 shifts, five to six hours a shift and 120 hours a month. The work time is reduced by half. In the past, I had to be in charge of 60 electrolyzers; now the number is reduced to 25. At the beginning, the smoke was directly discharged to the outside through the flues, and thus the factory was full of dust. Later, hop-pockets were used to collect dusts. Now a wet dust collecting method is used and the factory is much cleaner."

### **Labour income and social welfare improved**

Income has gradually increased year on year. After three major processes of upgrading, the income of staff of the Yuguang Gold and Lead Group has quadrupled. The average monthly salary of its staff was RMB400 in 1997, RMB1,400 in 2003, RMB2,400 in 2010, and RMB3,000 in 2014. Their monthly salary in 2014 was RMB500–RMB800 higher than the average salary (RMB2,400–RMB2,500) in Jiyuan City, and two times the local minimum salary (RMB1,680).

Jiangsu Branch of the China Construction Steel Structure Corp. Ltd was established in 2008, and thus the average age of its staff is relatively low. The workshop has about 200 workers with annual incomes (take-home pay) as follows: general workers, about RMB40,000 to RMB50,000; technicians, RMB60,000 to RMB70,000; and managers, RMB100,000 to RMB150,000.

The annual income of staff of Jiangsu Xingda Foamed Plastics (a private company) increased by 10 per cent each year during the transition.

The China Construction Steel Structure Corp. Ltd is a State-owned holding enterprise. Because the company is far away from the downtown, it changed from a three-shift system to a two-shift system and provided shuttle buses for its staff. It also provides free dormitories for its staff. The staff can take the free shuttle buses to shopping and have a leisure time downtown. The company is equipped with one staff activity centre, one indoor basketball court, one outdoor basketball court, a small football pitch, four badminton courts and four table tennis tables. The Staff Auditorium and Home of Staff have televisions, chess games and cards. The Staff Reading Room has about 300 books. There is a barbershop, a clinic, an e-reading room and a supermarket. Staff enjoy better welfare than workers in other industries. An assessment and incentive system was established to integrate the staff system, the remuneration system and the performance system.

### **Promotion and career advancement opportunities were created**

Jingneng Shire highly values seasoned workers and actively nurtures new workers. The company takes full advantages of technicians' talents and interests and has set up a troubleshooting technology training and practice room. Jingneng Shire improves position innovation management, builds a platform for employees and guides the employees to shift from position innovation to concept innovation and system innovation. Beijing Jingqiao Thermoelectricity (JQT) gives priority to frontline production workers when considering salary increases so as to ensure simultaneous growth of staff income and company revenue. Besides, the company provides a development platform for frontline staff, encourages them to be skilled at their positions, and builds a reserve talent pool. The company has provided over ten high-quality experts to the group and fellowship companies. The innovation working studio has 30 staff, of which eight have senior professional titles, and eight have medium-grade professional titles. The Tangshan Steel Group has established effective talent selection and competition systems. It has strengthened its assessment and development of various kinds of experts and talents, and equipped the main production lines with high-end technicians to provide intelligence support for product upgrading. The academic working studio of the company has four academics who have worked with their teams on ten projects. The post-doctoral research station has eight doctors. Eleven key research teams and 20 technical specialists were rewarded by the company in 2014. Moreover, the company has strengthened its management and use of college graduates newly recruited to the company, and has provided a three-year personalized training plan and a reserve talent pool for the strategic development of the company.

### **3.2.3 The synergy of enterprises greening and promotion of green skills**

#### **Green skills promote the greening of jobs**

The energy consumption reduction tasks of traditional industries are heavy during the transition. The technical innovation of general workers contributes greatly to the green development of the enterprises.

Feature 3-5.

**Effect of technology transformation on greening of traditional high energy-consuming industries**

Tangshan suffers from a lot of haze and atmospheric pollution, and the steel industry is the indisputable pollution source. The local government has ordered the high-polluting steel, coking, electricity and cement production enterprises to move out from the downtown and to shut down five steel enterprises with overcapacity. The main equipment of the Tangshan Steel Group is large and modern and the processes are at an advanced international level. The Group employs technical experts who contributed a lot during the company's transition from a high energy consumption and pollution to green and environmentally friendly processes. For example, the widely used top absorbing technology is invented by employees of the Tangshan Steel Group. Relevant invention includes some technologies not covered by large equipment processes featuring low cost and high added value. The inventors are highly valued by the company and have become important members of the innovation working studio. They continuously seek innovations that can save energy, and reduce emission and consumption. They have trained many skilled workers.

According to information provided by the Jiangsu Machinery, Metallurgy and Petrochemical Trade Union, many enterprises in Jiangsu have comprehensively improved their core competitiveness by conducting employee technology innovation activities.

Feature 3-6.

**Enterprises' core competitiveness improved through employee innovation**

The 0.0045mm–0.005mm ultrathin aluminium foil independently researched and developed by employees of Jiangsu Daya Aluminum Co., Ltd, the aluminium-transferred composite liner paper process transformation project in a new package company, and the aluminium scrap recycling project of Daya Vehicle Wheels Co., Ltd have all brought direct economic benefits for these companies.

Employees of Jiangsu Yangnong Chemical Group Co., Ltd have independently researched and developed the epoxy chloropropane production technology and hold proprietary intellectual property rights thereof. Besides, several patent rights were granted to this invention. The technology extends the use of hydrogen chloride with low added value to the production of epoxy chloropropane, which not only significantly improves the added value of the product, but also recycles the by-product sodium oxide. The annual consumption of hydrogen chloride is 50,000 tons, the amount of recycled sodium oxide is 40,000 tons and the recycling rate has reached over 95 per cent.

Jiangsu Xukuang Power Co., Ltd has made great efforts to encourage employees to engage in technological innovation and tackle scientific problems. The company has resolved some technological bottlenecks, and has finished over 80 medium and small-scaled technology transformation projects in recent years. The operation index of two power generation units are always leading the power generation units of the same kind in other companies. In particular, after transformation of anti-abrasion technology for furnace water cooling walls, the circulating fluidized bed (CFB) generation unit continuously worked for 168 days, which made a new record all over the country, and was rewarded a first prize by China Electricity Council.

Source: Jiangsu Federation of Trade Unions.

### **Greening reinforces the green skills of workers**

Advanced technologies used in greening are the major driving force for the expansion of green jobs. The Wuxi Xingda Foamed Plastics Co., Ltd is a large private enterprise group engaged in the production of expandable polystyrene, a high-tech enterprise under the National Torch Plan, and one of the top 500 private enterprises in China. Its production scale is ranked among the top two in the world and it is ranked first in China. Its products are sold in 30 provinces and regions all over the country, and in over 60 countries in Europe, the Americas and Oceania. The company is the first enterprise which has established a provincial macromolecule polymerization foaming material engineering and technology research centre and a provincial enterprise-based academic workstation. The company has nine academicians from the Chinese Academy of Engineering who are engaged in researching internationally leading, energy saving, low carbon and green expandable polystyrene (EPS) functional materials. The EPS functional materials have been granted many patent rights. The company has continuously increased its investment in for environmental protection products and technologies, and has expanded the research group, encouraged the employees to be innovative by providing company stocks to technicians, attracted staff of SoEs, and realized a leap expansion. Its subsidiaries are distributed all over Jiangsu Province. In 2011, the company invested RMB600 million and established Xinjiang Weida Foamed Plastics and New Materials Co., Ltd, and invested in an EPS project with an annual output of 360,000 tons in Heilongjiang. The expansion of the company created many green jobs.

#### **3.2.4 Changes in concept of employment**

##### **Government: Conceptual change on development and employment**

Green development is highly valued by the Government. Concerning the National People's Congress and CPPCC in 2015, the Report on the Work of the Government points out that China shall promote the industrial structure to move toward a medium-high level of development. China shall implement the Made in China 2025 strategy, seek innovation-driven development, apply smart technologies, strengthen foundations, pursue green development and redouble efforts to upgrade China from a manufacturer of quantity to one of quality. The CPC Central Committee Conference adopted the Opinions for Promoting the Ecological Civilization Construction on 24 March 2015. President Xi Jinping put forward the concept of 'greening' for the first time at the conference, and emphasized that China should speed up technical innovation and structural adjustments, make more efforts to protect the natural and ecological system, promote the greening of production methods and the development of a green economy and form new growth points for social and economic development. The Government and enterprises are determined to update economic growth patterns and shutdown outdated capacity. The Government has recognized the importance and urgency to develop a green economy and taken several measures, including the following:

- Plan for Implementing the Statistics Index System of Energy Consumption per GDP;
- Plan for Implementing the Monitoring System of Energy Consumption per GDP;
- Plan for Implementing the Assessment System of Energy Consumption per GDP;
- Measures for the Statistics of Reduction of Total Amount of Major Pollutants Discharged;
- Measures for the Monitoring of Reduction of Total Amount of Major Pollutants Discharged;
- Measures for the Assessment of Reduction of Total Amount of Major Pollutants Discharged; and
- Notification of Print and Issuance of the Comprehensive Working Plan of Energy Saving and Emission Reduction during the 12th Five-Year Period.

The above laws and regulations have made a comprehensive deployment and arrangement for the working objectives, tasks, responsibilities and measures of energy saving and emission reduction during the 12th Five-Year Period. The Renewable Energy Law of the People's Republic of China and National Plan for Addressing Climate Changes have put forward new requirements related to environment improvement and resource use based on the concept of green development and green jobs.

The Chinese Government is gradually establishing and improving a system to assess and evaluate social and economic development and creating an integrated index of energy consumption, damage to the environment and ecological benefit and other indicators showing the ecological civilization construction situation. The Government has established a framework and policy system related to energy savings and ecological and environmental protection, and has increased investment, strengthened efforts in terms of energy savings and emissions reduction, circular economy development and ecological and environmental protection, and other achievements. To better conduct ecological civilization construction under the legal framework, the 8th session of the Standing Committee of the National People's Congress passed the Environmental Protection Law (Amended Version) on 24 April 2014, which would certainly strengthen the uniform monitoring responsibilities of environmental authorities, the pollution accountability of the enterprises and the supervision responsibilities of the public.

The Government has also recognized that the transition to the green economy can certainly form new industries and create new jobs. The 10th session of the Standing Committee of the National People's Congress passed the Employment Promotion Law, which specified government duties, working principles and mechanisms, policy support, fair employment, employment services and management, occupational education and training, employment relief, supervision and inspection, and legal responsibilities. The Government highly values employment expansion and issues active employment policies. It insists on a principle of job selection by the workers and employment adjustment by the market and employment promotion by the Government. The Employment Promotion Law expands employment channels and clearly specifies the responsibility of the Government to promote employment. On 26 November 2009, China announced the actionable objectives of greenhouse gas emissions control, including three employment growth points in the future: jobs created in environmental protection, jobs created in energy growth, and jobs created in environmental regeneration. It indicated that active national employment policies have created green jobs and are an important channel for employment expansion.

The Opinions of the Ministry of Human Resources and Social Security, the National Development and Reform Commission, the Ministry of Finance and Other Departments on Effectively Resettling Employees of Enterprises Eliminating Backward Production Capacity and Restructuring (No. 50 [2011]) put forward that enterprises are encouraged to absorb employees with employment difficulties who are laid off when the enterprise eliminates backward production capacity. The funds for integrating laid-off employees can be allocated from the central and local employment funds.

The local governments pay great attention to enterprise restructuring during the transition to the green economy and to the promotion of green jobs. According to the survey by the research team in Beijing, Hebei, Henan and Jiangsu, the local governments require enterprises to do a good job in ensuring stability, staff assignment, current economic benefits, listed company shareholders and internal production plan and human resource allocation. Within the legal framework, the policies shall be formulated and implemented according to the principle of 'green development and green benefits'. The local Economy and Information Committee and Reform and Development Committee have adjusted the policies, provided interest subsidy and allowance for key enterprises carrying out restructuring and further improved inventiveness of enterprises.

### **Enterprises are inclined towards green development**

Enterprises recognize the value of improving their vitality and competitiveness through the transition to a green economy. Rather than investing large sums in production capacity expansion they have made more effort towards structural adjustment, energy savings and environmental protection. Although the cost will increase in the short term, the increased investment in environmental protection can promote the enterprise's transition to a green economy and promote the strategy in the long term.

The industrial chain expands and the social value increases when enterprises eliminate backward technologies and reduce overcapacity. The Beijing Cement Factory has obtained economic benefits and functioned as an



environment purifier through the fuel replacement of combustible wastes, including solid wastes, waste tires, waste glass fibre reinforced plastics, and landscape waste. In 2015, the cement capacity is reduced to 6 million tons and is expected to be 4 million tons in 2017. The cement high temperature furnaces will be used as environmental purifiers for urban waste, pollutants and hazards.

### **Workers prefer green jobs**

Workers strongly prefer to be employed in green jobs during green restructuring. According to older workers, production and living conditions are greatly improved after technology transformation. A worker who started working in Jingneng Shire since 1995 told the research team:

When I began working for the company, the equipment and facilities were old-fashioned, the problem of leakage of hazardous and poisonous materials was serious and the workshop was full of dust. The personal protective clothing used by the workers was poor. After a day's work, we were covered with dust. I worked in such an environment for seven years. Our workers all expect changes to our working conditions. After discovering oil, gas and water were leaking into the environment, more and more workers identified leakage points at their positions. Finally our company was determined to implement a thorough energy saving and environment protection transformation project after recognizing the benefits of solving the leakage problem.

Workers considered greening as an important standard when they selected a job. In an interview, a former employee of a Tianjin coal-fired power plant who had worked there for ten years, reported that the working conditions were poor, and the work place was full of safety hazards. The dust, noise and vibration greatly influenced the worker's health. The worker obtained a job with Beijing Jingqiao Thermoelectricity in 2013, where the working conditions are very good, the operation is highly automated and the workload is greatly reduced.

### **Trade unions: Green awareness promotion**

ACFTU has played an important role in promoting green development and green jobs. Early in 2005, ACFTU carried out the "My Contribution to Energy Saving and Emission Reduction" activities among enterprise employees, organized trade unions at all levels to improve the quality and level of energy savings and emissions reduction activities based on their actual conditions.

National and local industrial trade unions in energy, steel, machinery, building materials, national defence, finance and trade and textiles have strengthened communication and coordination with the Government, industrial associations and relevant functional departments based on the green restructuring of the enterprises. They have also participated in the formation of policies related to position transfer and reemployment, revenue distribution and social security, and guided and urged the enterprise trade unions to safeguard their legal rights in an effective and legitimate manner, and protected the legitimate rights and interests of workers. Local trade unions have summarize the experience of safeguarding worker rights and protecting green jobs and employees' interests in enterprise restructuring, providing support for local and industrial objectives of shutting down outdated capacity and reducing overcapacity.

Based on the enterprises' sustainable development objectives, the enterprise trade unions urged enterprises to promote green development, improve working conditions, strengthen their safety and health, and provide decent work. The trade unions helped to nurture a concept of green development and green jobs, organized and mobilized workers to change their positions into green jobs through small-scale transformation and reform, and encouraged workers to make reasonable suggestions. The unions held energy savings and emissions reduction competitions; and assisted the enterprises' administrative departments in the reassignment and training of resettled workers, and the provision of psychological counselling to laid-off workers. All these indicate an important role of trade unions in promoting green development and green jobs.

### Feature 3-7.

#### **Role of local and enterprise trade unions during the transition**

Based on local economic development characteristics, the Tangshan Trade Union Council has taken energy savings and emissions reduction as major tasks, and carried out the “Contribution of 100 Enterprises to Energy Saving and Emission Reduction” activity and made great achievements in energy savings and emissions reduction. Since 2008, 218 technology innovation achievements have been made during the employee energy savings and emissions reduction activities, 42 new energy saving, emission reducing and environmentally friendly technologies, processes, materials and equipment have been promoted. The energy consumption index of 59 enterprises reached either the average industrial level or the advanced level.

To attract more attention and support to activity from all sectors of society and especially the enterprises, the Tangshan Trade Union Council, jointly with seven other departments including the Tangshan Reform and Development Committee, issued the “Contribution of 100 Enterprises to Energy Saving and Emission Reduction”, and specified its total requirements and the specific objectives of energy and water savings and pollution and emissions reduction. The leading group has also signed liability statement with 101 key energy-saving and emissions reduction-enterprises.

The trade union of Jingneng Shire strengthened dialogue with the administrative department of the company during its technology transformation and green restructuring by participating in the design of plans for position greening and employee resettlement, supervising the transformation of the work place and working procedures, and urging the company to gradually improve working conditions.

Enterprise trade unions continuously improve the workers' green skill, safety production ability and green and environmental protection awareness. To make the workers understand that the transition to the green economy is a big event related to national strategies and each person, the trade union of the Beijing Cement Factory provided workers with training on energy savings and emissions reduction, carried out energy saving and environmental protection competitions, popularized energy savings and emissions reduction skills, advocated a healthy and civilized living manner among workers, guided the workers to save public resources, reduce material and energy consumption and put the low carbon and environmental protection principle into each position of each workshop. Jiangsu Federation of Trade Unions advertised the concept of saving each water droplet, oil droplet, each kilowatt of electricity, each piece of paper, each inch of steel and each spool of yarn. It posts relevant information in each corner of the workshop, and transfers the saving concept into a conscious activity of the frontline workers throughout all production and living activities.

Enterprise trade unions organize workers to participate in job greening. After carrying out the “Small Blast Furnace Energy Saving and Emission Reduction Competition”, the Tangshan Steel Group increased the utilization index of the small blast furnace from 2.87 to 3.28. The company reduced energy consumption and pollution emissions during production and improved the greening rate through team construction, labour competition and the collection of suggestions for rationalization. The trade union has also carried out activities, including ‘Putting Forward One Suggestion for Energy Saving and Emission Reduction’, ‘Grasping One Energy Saving and Emission Reduction Skill’, ‘Creating One Energy Saving and Emission Reduction Innovation’, ‘Implementing One Energy Saving and Emission Reduction Reform’ and ‘Educating One Piece of Energy Saving and Emission Reduction Knowledge’. The trade union of the Yuguang Gold and Lead Group in Henan encourages workers to find and analyse problems, put forward suggestions and create innovations based on their positions. It collects and puts into practice the suggestions on energy savings and emissions reduction from workers and continuously improves the company's energy and resource utilization efficiency.

Trade unions assist enterprises in the reassignment of laid-off workers and workers transferred to other positions. During seminars, the issue most frequently mentioned by trade union leaders is to take opportunities to participate in the formulation of the overall plan to reduce overcapacity and resettle or reassign employees. At the enterprises' employee representative congress, the trade unions voiced the workers' opinions about the plans and their specific demands. The trade unions supervised the formulation of plans to provide training to workers transferred to other positions and compensation for laid-off workers. The trade unions keep records for workers with difficulties, provide psychological counselling for laid-off workers, and help workers to overcome difficulties and resolve conflicts. The trade unions of Jingneng Shire, the Beijing Cement Factory and the Tangshan Steel Group have accumulated rich experience in training workers transferred to other positions, and providing support and relief, reemployment services and psychological counselling.

### **3.2.5 Trade unions protect workers in enterprises greening**

#### **Secure rights of employment of workers**

Enterprise trade unions strengthen their communication with the administrative departments of enterprises, and actively guide and organize workers to participate in formulating the reassignment plan. Trade union staff in Jingneng Shire collected opinions from different workshops and production lines before formulating the reassignment plan together with the company. The trade union also participated in the design of plans for the greening of positions and the reassignment plan, minimized the negative effects, and assured a stable position transfer. Moreover, the trade union informed the workers in a timely manner of the transformation solutions and plans, and actively guided the workers to correctly respond to the reassignment arrangement. Besides, the trade union also supervised the transformation of working places and production processes and urged the company to gradually improve working conditions. Pinggu Shunfa, affiliated with Beijing Xingfa Cement Factory, is a cement manufacturer whose capacity shutdown and reduction scale is small. Capacity shutdown and reduction finished before the end of 2013 and 500 workers were laid off. The enterprise trade union actively communicated with the workers, reflected workers' requirements to the enterprise, and assisted the enterprise in reassigning 70 per cent of laid-off workers and resettling 30 per cent of information and technology specialists to the group company.

#### **Improve occupational health and safety rights of workers**

During the green restructuring of the Yuguang Gold and Lead Group, the trade union urged the company to continuously improve the labour security of workers and guided workers to correctly use personal protective clothing and to work safely. The trade union suggested the company adopt automatic and mechanical operations and closed-loop or remote-controlled operations during its green restructuring to avoid related risks. At the same time, it also arranged periodic physical examinations for workers to ensure their physical and psychological health. The trade union made great efforts to improve the occupational health and safety management system, and held the 'Occupational Safety Health Cup' competition to promote occupational disease prevention and treatment and labour protection. By signing the occupational disease objective responsibility agreement with relevant departments at each level, the trade union established a top-down public supervision and management system. Besides, it placed high value on establishing a public safety supervisor team and held many occupational disease prevention and treatment training courses. The coverage each year reached 100 per cent.

#### **Develop workers' employability through employment assisting activities**

The Wuxi Trade Union Council established and improved assistance and support systems consisting of five parts, including employment assistance, medical-aid, life relief, education funding and legal aid. Besides, it also provided more support and humanistic care for frontline workers, migrant workers, dispatched labourers and workers with difficulties, etc. The Council implemented the project 'Care for All Workers' through the following activities: (i) actively providing employment assistance services for laid-off workers and helping them

overcome difficulties by holding job fairs and making use of the employment introduction platforms of trade unions at various levels; (ii) initiating a medical-aid project, relieving the medical burden of workers by providing specific subsidies and striving for fund supports from Government and social public interest organizations and alleviating the economic burden of families in which a member was ill; and (iii) providing life aids for workers through such activities as 'Warm Giving during Spring Festival and New year's Day', 'Assisting the Impoverished Student in Golden Autumn' and 'Care for Women Workers' and so on.

The Jiyuan Trade Union Council carried out the activities including 'Warm Giving in Winter', 'Springtime Job Fair', 'Heatstroke Prevention in Summer' and 'Assisting the Impoverished Student in Golden Autumn' to provide supports for workers, opened a worker services website, provided union member cards and established a volunteer service station. The Council held such activities as worker technology games, skills competitions and skills tests to gradually improve workers' technological knowledge and skills.

### 3.2.6 Temporary challenges of greening enterprises

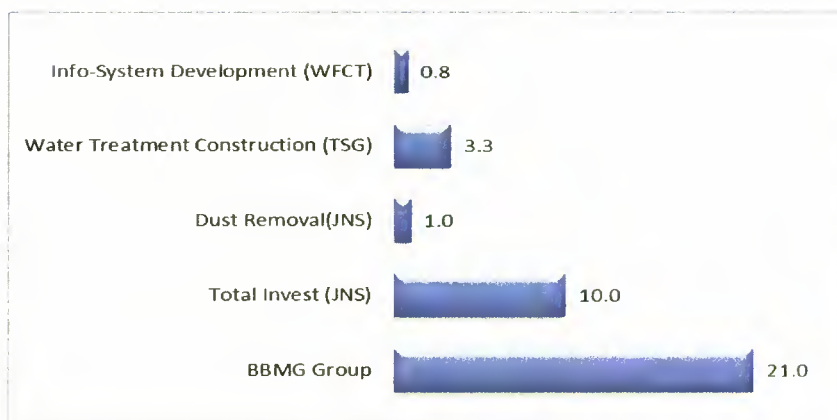
#### High costs of the transition

Great investment needs to be made to carry out energy savings and emissions reduction in production processes and develop a circular economy. During the 11th Five-Year Period, BBMG invested over RMB2.1 billion in energy savings and emissions reduction technology transformation and development of environmental protection industries, to achieve a leading position on its environmental protection index, based on such indicators as smoke, dust, sulphur oxide and chemical oxygen demand.

Jingneng Shire (JNS) has invested as high as RMB1 billion in the transformation of energy savings, desulphuration, denitration, dedusting and capacity increasing and other environmental protection protect since 2002, wherein the company has invested RMB100 million in the dedusting transformation, and controlled the dust emission amount to be less than 5mg with the application of electric bag dust removal technology. The Tangshan Steel Group (TSG) has invested RMB330 million to build a water treatment centre so as to meet the relevant requirements.

Great also needs to be made to introduce new equipment and technologies (figure 3-7). The Wuxi First Cotton and Textile Company (WFCT) has continuously improved the comprehensive information system consisting of a sensor network, enterprise resource planning and e-commerce block in ten years since 2000 and realized the deep integration of information and various businesses. Its total investment exceeded RMB80 million.

Figure 3-7. Investment in environmental protection and energy savings transformation and new technologies and equipment (RMB100 million)



Source: ACFTU research team.

It is estimated that the annual fund gap is RMB2 trillion to general restructuring Chinese green industries (Zhang and Yang, 2015).

### **Lack of green skills**

This research found most employees in scaled industrial enterprises possess poor education background, and there is a great shortage of top talent. The proportion of top talent in some high-tech manufacturing enterprises is relatively low and the overall qualification of job hunters in the labour market is not satisfying. According to a survey by ACFTU in 2012, workers averaged 12.95 years of education, and 52.7 per cent of workers had completed technical secondary school. The percentage of workers only having a primary level professional title or having no professional title is as high as 76 per cent, and only 34.6 per cent of workers received training after leaving their previous position (ACFTU Research Center, 2014, pp. 29–54). Domask (2007) pointed out after the emergence of a new energy structure, new training and education are required to find a job.

This investigation found that new jobs created during enterprise greening and restructuring require higher skills and new knowledge. As for new jobs related to previous positions, enterprises can provide training or entrust other organizations to provide training to their workers to qualify them for the new jobs. For example, before starting a new project, the human resource department of the Tangshan Steel Group formulated a detailed training plan and selected well-educated youth workers who were quick learners to participate in an apprentice-type training course lasting from three months to one year at Wuhan Iron and Steel Group. These workers assured the smooth transformation of company's technologies and equipment. A similar situation was seen in the Yuguang Gold and Lead Group. Elites of previous positions could become competent for new positions after training. For some new positions with remarkably higher technology and skill requirements, knowledge-intensive R&D jobs in particular, the company introduced new skilled specialists from other companies. For example, while developing a circular economy, the Yuguang Gold and Lead Group recruited many R&D and technical talents to improve the output and recycling rate of bismuth, tackle problems in key technologies, and make the leading businesses of the company more intelligent, high-end and advanced. The Tangshan Steel Group also introduced a certain percentage of highly educated and skilled talents each year. Xingda Foamed Plastics, a private company, attracted key staff of SoEs to new jobs created during the green restructuring.

### **Job loss in traditional industrial sectors**

Section 3.2 discussed in detail the disappearance or decrease in job opportunities during the transition to the green economy with the aim of reaching an objective and comprehensive understanding of the phenomenon. Some job opportunities have disappeared during the transition, but most were high polluting and high energy consuming jobs. With the growth rate decrease and quality improvement of the Chinese economy, more attention is being paid to environmental and ecological balance. Therefore, these jobs disappeared as productivity improved, conforming to the objective law of economic development. At the same time, some jobs are lost when enterprises outsource producer services to other companies to allocate resources in a more rational way. Producer services include procurement, storage and logistics, marketing and design. The relevant jobs do not disappear, but are transferred within the enterprises, among different enterprises and between the industrial field and the services field. According to an official of Energy Saving Division of Jiangsu Reform and Development Committee, to judge whether a job has disappeared one must look beyond the industrial field alone, because more jobs may be created in housekeeping, catering and living services industries. Nevertheless, it should be noted that some workers who lost their jobs during restructuring may have living difficulties before they find another job.

### **Risk to labour relations**

Labour relations will be impacted when enterprises shut down outdated capacity, reduce overcapacity and change the company location, which could easily cause labour disputes. Some workers may lose their jobs during the green restructuring of enterprises, which will greatly impact their rights, benefits and psychology. According to results of a questionnaire survey by Jiangsu Federation of Trade Unions, workers are pessimistic about the recovery prospects of the steel industry. Almost 50 per cent of respondents anticipated that the steel

industry needs five to ten years to recover, while 32.6 per cent responded that the revenue of the enterprises could hardly be recovered in a short time. Workers of companies which will be shut down, or are in the process of shutting down and transformed are afraid of being laid off and losing their jobs. Some 42.7 per cent worker worry that they will not find a job later because of their age or skills. During seminars, employees showed great anxiety about the high mobility of frontline workers and the problem of being transferred to other positions, awaiting job assignment or being laid off. In many steel enterprises, particularly the private ones, major decisions are made by the boss and a mere handful of people. The purpose of holding the employee representative congress is only to announce the results or explain the situation. Workers can only accept and implement, rather than participate, and therefore disputes and conflicts will rise in the long term. Those who will be resettled during transition may not be satisfied with the reassignment plan, and workers losing their jobs may not accept the compensation standard. When the company moves to another city or province, the difference in regional social security welfare and commuting problems can also lead to labour disputes. According to the information gained from the surveyed enterprises, most disputes can be resolved through communication between the trade unions and the administrative departments of the enterprises. Some disputes are solved through arbitration and legal proceedings, although some early retired workers and laid-off workers chose to express their dispute through sit-down protests, blocking roads and petitioning.

## 4. Recommendations and suggestions

According to the 12th Five-Year Plan, China should "establish a green and low carbon development concept". Local governments therefore have made strategic plans for the overall development of energy industries, and increased legislative and policy support. More enterprises, taking public interests into account, have undertaken efforts to save energy, reduce emissions and expand markets. They strive to increase green jobs while developing a green economy, and explore new channels for the sustainable development of enterprises and decent working conditions. Both the Central Government and local governments have increased policy-based support for the green economy. However, influenced by the economic downturn, oversupply of the energy industries and backward technologies and skills, there is tension between enterprise transformation and upgrading and employment stability for workers. Thus, the following recommendations are provided.

### 4.1 Strengthen legislation and administration

#### 4.1.1 Legislation on environmental protection and resource tax reform

The legislation for environmental protection shall be accelerated and environmental protection tax legal regulations shall be put into practice. Specific laws shall be applied to specific taxes and the environmental protection investment fund shortage shall be solved.

China shall have a clear understanding of market pricing mechanism of resources and materials, formulate differential pricing policies, improve the requirements of market access related to energy, material and water consumption and ecological and environmental protection standards, and make full use of the basic role of market in resource allocation.

China shall require enterprises to shut down overcapacity, meet energy savings and emissions reduction goals and improve the natural environment based on the upper limit of the carrying capacity of the environment and ecosystem.

Chinese authorities shall improve the transfer payment system, establish a system of responsibility for ecological and environmental protection compensation and provide enterprises with support for technology transformation, energy savings, reduction of consumption and green production.

#### 4.1.2 Strict control on pollution transfer

China shall establish and improve the legal system supporting green investment and inhibiting pollution-generating investment, and formulate laws to explicitly prohibit industrial transfer behaviours aimed at avoiding environmental regulations. Local governments shall introduce laws to control pollution transfer, strengthen the total quantity control system, the regional restricted approval system, the centralized pollution management system and the damage relief system. Stakeholders shall make efforts to thoroughly eradicate pollution transfer behaviours of some enterprises taking advantage of legal loopholes and investigate the legal responsibility of the persons in charge of enterprises under the "crime of endangering public security".

#### 4.1.3 Legal system to handle production capacity

Unlike the previous practices of shutting down outdated capacity through administrative orders, China shall establish a legal system to promote the shutdown of outdated capacity.

China shall formulate and improve laws and regulations related to environmental protection and energy consumption and emission standards, and encourage provinces to formulate relevant administrative

rules related to environmental protection and energy consumption based on local economic development characteristics.

China shall undertake comprehensive research on the unemployment and living difficulties caused by enterprise restructuring and upgrading, provide necessary financial support to enterprises withdrawing from capacity-concentrated regions and industries, and make appropriate reassignments of workers from closed enterprises.

#### **4.1.4 Enact collective bargaining laws**

Stakeholders shall clearly specify the procedures, principles and contents of collective bargaining in the law, including the protection of trade union representatives participating in collective bargaining and methods to resolve disputes caused by collective bargaining. The transparency of enterprise management shall be increased by the following means: improving the collective bargaining procedures; ensuring that workers are well informed by disclosing information during collective bargaining; increasing the participation of workers in democratic decision making and democratic management; minimizing the damage to workers in the short term during green development; nurturing stable and harmonious labour relations; and promoting social and economic development.

#### **4.1.5 Collect statistics of green jobs**

The authorities shall improve the Statistics Law, clearly define 'green industry' and 'green jobs' from the perspective of statistics, integrate relevant indicators into existing data categories of national statistics departments, and become familiar with basic data related to environmental carrying capacity, ecological performance and green jobs. It shall be established that scientific statistics and information on green development, including the total quantity of green jobs, industrial distribution, staff structure and skill requirement, shall be collected and regularly published to provide a basis for economic policy formulation and employment promotion.

## **4.2 Improve policy support for economic greening**

### **4.2.1 Enact favourable tax policies**

China shall formulate a fuel oil tax system capable of promoting energy savings, implement different reform methods for energy and mining resource tax collection and improve relevant resource tax collection standards. China shall implement an enterprise income tax deduction and exemption policy for enterprise projects to save energy and protect the environment. A policy will be implemented of providing credit against enterprise income tax for investments in specific equipment for energy savings and environmental protection. China shall implement an income tax deduction policy for income obtained by enterprises which comprehensively use resources and produce green products as prescribed by national green industry policies. China shall implement a policy of credits against value-added tax for investment in equipment for energy savings and emissions reduction, and the authorities shall provide favourable value-added tax policies for products made of waste and oil materials and products capable of comprehensively using resources.

China shall further develop green credit and such financial tools as green bonds, green public-private partnerships and financing and carbon transactions, provide policy and regulatory support, reduce the financial cost of green projects, improve the availability of green finance, and nurture and promote the establishment of institutes engaged in green loans and investments to use professional skills to develop economies of scale and control for risk.



#### **4.2.2 Road map to restructuring and more financial support**

The Government at all levels is recommended to allocate budgetary funds to support the promotion of key projects for energy savings and emissions reduction, high-efficiency and energy-saving products and mechanisms in the form of subsidy and rewards, the construction of energy saving management capability and the construction of a pollution and emissions reduction regulatory system.

The Government shall increase the proportion of investment in projects to save energy and protect the environment, improve the mineral resource paid-use system, and enhance resource development and the ecological compensation system.

#### **4.2.3 Differentiate energy pricing**

It is recommended that the Government do the following: deepen the energy price reform; adjust the current energy price system; gradually promote the industrial energy use-structure optimization according to the principle of combing government guidance; support market-driving policies; make use of favourable price policies and compulsory market share policies as well as such measures as government franchise and government purchase; and establish an energy pricing mechanism favourable for enterprise energy use-structure optimization.

The Government shall strengthen and enhance electricity price management, establish a cost restriction mechanism, improve the time-of-use electricity price charging method and guide industrial enterprises to use electricity in a rational and efficient manner. The Government shall expand the coverage of the differential electricity pricing system, inhibit the expansion of industries that consume high levels of energy and strengthen energy savings and emissions reduction through functions of economic leverage.

### **4.3 Build consensus for the transition**

The Democratic Consultation and Dialogue mechanism, the Tripartite Consultation Mechanism and the Joint Conference of Trade Unions and the Government in China are profound mechanisms and platforms to carry out social dialogue and reach a consensus for transition to the green economy in China.

#### **4.3.1 Extend existing tripartite platforms**

In response to market changes during the transition to the green economy, the existing tripartite mechanisms shall focus on the following: the negotiation and discussion of restructure adjustments; employment difficulties of resettled and laid-off workers when outdated capacity is shut down; and collective labour disputes caused by the reduction of overcapacity, especially the formulation and implementation of policies related to the transition to the green economy and development. For example, polices related to labour relations include dissolution and social security restoration for workers after an enterprise closes, finding new jobs for workers, and economic compensation and social insurance restoration for workers relocated to another place.

The Government shall listen to and adopt the opinions agreed upon between labour and the employer when making relevant policies and decisions, standardize enterprises' employer resettlement and personnel reduction practices, promote law-based employment practice in enterprises and relieve social employment pressure from the source. The agreements concluded during the social dialogues can be implemented in the form of policies or collective agreements.

#### **4.3.2 More social dialogue**

It is suggested to establish a systematic dialogue mechanism at the local and industrial levels. The local government, industrial associations, employer association and trade union organizations can negotiate and

communicate with each other on the employment of resettled workers after outdated capacity is shut down, overcapacity is reduced and enterprises are closed. They can coordinate on the implementation of favourable national measures to promote reemployment of laid-off workers to minimize the scale of personnel reduction and reduce its impact on the workers, the community and the enterprises.

Stakeholders shall make a full use of the active role of social dialogue in creating green jobs in communities and industries, and in supporting unemployed workers. Parties concerned shall improve the formulation and implementation of local green employment plan through community- and industry-based social dialogue and collective bargaining mechanisms to maintain local and industrial production and employment stability. Trade unions and employees shall research and summarize practices and experience from industrial and regional collective bargaining, and encourage the active participation of social partners and other interested groups.

### **4.3.3 Positive interactions between employers and trade unions**

Enterprises shall independently coordinate labour relations, and workers shall have more rights to participation, to be informed and more decision-making rights through equal negotiation between employees and trade unions. The trade unions urge the enterprises to fulfil certain social responsibilities, help them to provide position-transfer training for laid-off workers, seek reemployment opportunities for laid-off workers or introduce laid-off workers to new fields. Before the decision is taken to reduce personnel, enterprises shall negotiate with trade unions on reasons, reduction quantity, compensation and the social responsibilities of the enterprises thereafter and put forward relevant solutions.

## **4.4 Capacity building and promotion of green skills**

### **4.4.1 Increase investment in green technologies and skills**

The Government shall increase investment in education and training to improve the skills of workers, migrant workers in particular, add technology and skill education content in the courses of colleges and universities. The Government shall also increase investment in skill training activities, and provide more guarantee to nurture and preserve talent.

The Government can provide support for enterprises to research and develop low carbon technologies and equipment through policy guidance and capital investment, encourage the development and establishment of technologies and facilities required to develop the green economy in various industries and enterprises, and set up various kinds of technology research and development centres to continuously improve the technical content in production and provide technical support for the transition to the green economy.

The Government supports the transformation of scientific research results and provides funds for the research, development and application of green development technologies. The Government helps to solve the problem that some research results of universities and research institutes are neglected because the investment burden of private enterprises in technology R&D is too heavy, and supports the rational and effective transformation of research results within enterprises to help their development.

### **4.4.2 Define employers' obligation to skill promotion**

Enterprises are recommended to establish and improve technology and skill education and training guarantee system, take vocational training as an important part of green development and improve their workers' technology and skill level. The pilot function of SoEs in leading the development of the green economy can continuously function as technician training schools for their industrial peers. These enterprises can train many skilled technicians for the society, and become the backbone for the green development of private enterprises.

#### **4.4.3 The role of trade unions on training**

Trade unions are encouraged to actively carry out specific trainings and consultation services with green development as the major content, compile relevant readings and hold lectures to help workers to grasp new skills and methods for green production. Trade unions can carry out technology competitions and other activities in the enterprises to stimulate enthusiasm toward green development. They can represent workers in enterprise management and strengthen public surveillance over the enterprises' green restructuring and transformation. Trade unions can establish an employee surveillance group to identify weak sections and take measures to solve problems, reduce resource waste, improve resource use efficiency and promote environmental protection.

#### **4.4.4 Develop green entrepreneurship**

The transition to the green economy generally can create more job opportunities. However, some workers will lose their jobs during the transition to the green economy and it may be difficult to find new jobs. Technicians and most skilled workers are benefiting from the transition to the green economy. Technicians can retain stable employment while providing technical support for green entrepreneurship. They are the driving force of green development and the vital force of entrepreneurship. When provided with policy guidance, they will play a greater role in newly created green positions. This could contribute to solving the employment difficulties of college graduates, and many entrepreneurial youths with technical skills are encouraged to participate in the development of green industries.

## References

- All-China Federation of Trade Unions (ACFTU) Research Center. 2014. *The 7th survey on employee conditions in China* (Beijing, China Workers Press).
- Bissing-Olson, M.J.; Iyer, A.; Fielding, K.S.; Zacher, H. 2013. "Relationships between daily affect and pro-environmental behavior at work: The moderating role of pro-environmental attitude", in *Journal of Organizational Behavior*, No. 34, pp. 156–175.
- Blanco, M.I.; Rodrigues, G. 2009. "Direct Employment in the Wind Energy Sector: An EU Study", in *Energy Policy*, Vol. 37, Issue 8.
- Bowen, A. 2012. 'Green' growth, 'green' jobs and labor markets, Policy Research Working Paper 5950 (Washington D.C., World Bank Sustainable Development Network).
- China Cement Association 2015. *Cement and Coal Consumption Control Plan and Policy Research*, Feb.
- China Council for International Cooperation (CCICED). 2011. *Development mechanism of China green economy and policy innovation*, a report by CCICED working group, CCICED Annual Meeting, 15–17 Nov.
- China Machinery, Metallurgy and Building Materials Union; China Cement Association. 2014. *Report of a Joint Survey on Problems during Overcapacity Reduction in the Cement Industry*, July.
- China Metallurgy News. 2014. *No obvious growth in profits in iron and steel industries in 2014—Analysis on economic condition of iron and steel industries in 2013 and a prediction for 2014*. Version 4, 28 Jan.
- China Monthly Economic Indicators. 2015. *Employees in Analysis Industries and their total wages*, No. 4.
- Domask, J.J. 2007. "Achieving Goals in Higher Education: An Experiential Approach to Sustainability Studies", in *International Journal of Sustainability in Higher Education*, Vol. 8, Issue 1.
- European Commission; International Labour Organization (ILO). 2011. *Skills and occupational needs in renewable energy* (Geneva).
- European Renewable Energy Council. 2007. *Renewable energy technology roadmap up to 2020* (Brussels).
- European Wind Energy Association (EWEA). 2012. *Green growth: The impact of wind energy on jobs and the economy* (Brussels).
- Flavin, C. 2008. *Low-carbon energy: A roadmap*, Worldwatch Report 178 (Washington, D.C., Worldwatch Institute).
- Fuglestad, J.; Berntsen, T.; Myhre, G.; Rypdal, K.; Bieltvedt Skeie, R. 2007. "Climate forcing from the transport sectors", in *Proceedings of the National Academy of Sciences*, Vol. 105, No. 2.
- Govindarajulu, N.; Daily, B.F. 2004. "Motivating employees for environmental improvement", in *Industrial Management and Data Systems*, Vol. 104, Issue 4, pp. 364–372.
- Heavner, B.; Churchill, S. 2002. *Renewables work: Job growth from renewable energy development in California* (Sacramento, CA, CALPIRG Charitable Trust).
- Henan Daily*. 2015. "Number of Corporate Enterprises in the second and third industries increased by 45.8% in 5 years", 28 Mar.

- Hillebrand, B.; Buttermann, H.G.; Behringer, J.M.; Bleuel, M. 2006. "The expansion of renewable energies and employment effects in Germany", in *Energy Policy*, Vol. 34.
- International Labour Organization (ILO). 2013. *Sustainable development, decent work and green jobs* (Geneva).
- International Trade Union Confederation (ITUC); Millennium Institute. 2012. *Growing green and decent jobs* (Brussels, ITUC).
- Jin, Y.; Li, Z. 2015. "How to Secure 1 Million Jobs during Overcapacity Reduction in Hebei", in *China Labour and Social Security News*, 15 June.
- Kammen, D. 2007. "Green Jobs Created by Global Warming Initiatives", testimony for hearing of the United States Senate Committee on Environment and Public Works, 25 Sep.
- Lehr, U.; Nitsch, J.; Kratzat, M.; Lutz, C.; Edler, D. 2008. "Renewable energy and employment in Germany", in *Energy Policy*, Vol. 36, Issue 1, pp. 108–117.
- Li Q. 2014. *Manufacturing Enterprises and Green Innovation: Factors Analysis of Enterprises' Performance*. Doctoral dissertation (Chengdu, China, Southwestern University of Finance and Economics).
- Lin, C.Y.; Ho, Y.H. 2010. "Determinants of Green Practice Adoption for Logistics Companies in China", in *Journal of Business Ethics*, Vol. 98, pp. 67–83.
- Mihyeon Jeon, C.; Amekudzi, A. 2005. "Addressing Sustainability in Transportation Systems, Definition, Indicators and Metrics", in *Journal of Infrastructure Systems*, March, pp. 31–50.
- Milfont, T.L.; Duckitt, J. 2010. "The Environmental Attitudes Inventory: A valid and Reliable Measure to Assess the Structure of Environmental Attitudes", in *Journal of Environmental Psychology*, Vol. 30, Issue 1, pp. 80–94.
- Ministry of Human Resources and Social Security (MoHRSS), Institute for Labor Studies. 2010. *Study on green employment in China* (Beijing, ILO Office for China and Mongolia).
- MoHRSS, Institute for Labor and Wage Studies. 2011. *Report on Development of Green Jobs in China*.
- MoHRSS, Institute for Labor and Wage Studies. 2012. *Employment Impact of Emerging Strategic Industries*, 1 Aug. Available at: <http://www.clssn.com/html/Home/report/62837-1.htm> [30 Nov. 2015].
- MoHRSS Labor Science Research Institute. No date. *Report on green job development in China*. Available at: <http://www.ilss.net.cn/n16/n1194/n1233/27793.html> [30 Nov. 2015].
- National Bureau of Statistics. 2014a. *Analysis on Economic Condition of Iron and Steel Industries in 2013*, 19 June.
- National Bureau of Statistics. 2014b. *Communiqué on Major Data of the Third National Economic Census of Beijing*, No. 4, 30 Dec.
- National Bureau of Statistics 2015a. *Communiqué on National Economy and Social Development Statistics in 2014*, 26 Feb.
- National Bureau of Statistics 2015b. *Communiqué on Major Data of the Third National Economic Census of Jiangsu*, No. 1, 22 Jan.

- Neuwahl, F.; Löschel, A.; Mongelli, I.; Delgado, L. 2008. "Employment Impacts of EU Biofuels Policy: Combining bottom-up technology information and sectoral market simulations in an input-output framework", in *Ecological Economics*, No. 68.
- Pan, J.; Ma, H.; Zhang, Y. 2011. *Green Economy and green jobs in China: Current status and potentials for 2020*, Worldwatch Report 185 (Washington, D.C., Worldwatch Institute).
- Pinderhughes, R. 2007. *Green collar jobs: An analysis of the capacity of green businesses to provide high quality jobs for men and women with barriers to employment* (Berkeley, CA, Office of Energy and Sustainable Development).
- Pollin, R.; Garrett-Peltier, H.; Heintz, J.; Hendricks, B. 2014. *Green Growth: A U.S. Program for Controlling Climate Change and Expanding Job Opportunities* (Washington D.C., Center for American Progress and Amherst, MA, Political Economy Research Institute).
- Prasad, R.S. 2013. "Green HRM - Partner in Sustainable Competitive Growth", in *Journal of Management Science and Technology*, Vol. 1.
- Renewable Energy Policy Network for the 21st Century (REN21) 2013. *Renewables 2013 Global Status Report* (Paris: REN21 Secretariat).
- Rothenberg, S. 2003. "Knowledge Content and Worker Participation in Environmental Management at NUMMI", in *Journal of Management Studies*, Vol. 40, Issue 7.
- Sastresa, E.L.; Usón, A.A.; Bribián, I.Z.; Scarpellini, S. 2010. "Local impact of renewables on employment: Assessment methodology and case study", in *Renewable and Sustainable Energy Reviews*, Vol. 14, Issue 2, pp. 679–690.
- Singh V.; Fehrs J. 2001. *The Work That Goes into Renewable Energy*, REPP Research Report No. 13 (Washington, D.C., Renewable Energy Policy Project).
- Stanojevic, M.; Vranes, S.; Gokalp, I. 2010. "Green Accounting for Greener Energy", in *Renewable and Sustainable Energy Reviews*, Vol. 14, Issue 9, pp. 2473–2491.
- Stoddard, L.; Abiecunas, J.; O'Connell, R. 2006. *Economic, Energy and Environmental Benefits of Concentrating Solar Power in California* (Golden, CO, National Renewable Energy Laboratory).
- Summer, S.A.; Layde, P.M. 2010. "Expansion of renewable energy industries and implications for occupational health", in *Journal of the American Medical Association* (302).
- Sun Lin. 2012. *Research on integration of Chinese non-ferrous industries*, Doctoral thesis (Wuhan University of Technology).
- Thomas, I.; Sandri, O.; Hegarty, K. 2010. "Green jobs in Australia: A status report" in *Sustainability*, Vol. 2, Issue 12, pp. 3792–3811.
- Thornley P.; Rogers, J.; Huang, Y. 2008. "Quantification of employment from biomass power plants", in *Renewable and Sustainable Energy Reviews*, No. 33, Issue 8, pp. 1922–1927.
- United Nations Environment Programme (UNEP). 2010. *Green economy: Developing country success stories* (Nairobi).
- UNEP. 2011. *Towards a green economy: Pathways to sustainable development and poverty eradication* (Nairobi).

Wang, W.; Zheng G. (eds.). 2009. *Annual report on actions to address climate change* (Beijing, Social Sciences Academic Press).

Wang, X.; Wei, R. 2012. "Conditions of China Iron and Steel Industries in 2011", in *Metallurgy Economy and Management*, No. 2.

Wei, M.; Patadia, S.; Kammen, D.M. 2010. "Putting Renewable and Energy Efficiency to Work: How Many Jobs Can the Clean Energy Industry Generate in the US?", in *Energy Policy* (38) pp. 919–931.

World Bank. 2012. *Inclusive Green Growth: Pathways to Sustainable Development* (Washington, D.C.).

World Economy Research Center. 2012. *Green Economy and Green GDP Index in 200 Chinese provinces and cities* (Beijing, Beijing Technology and Business University).

Wu, C. 2014. "Green Job Potentials in China", in *Chizhou Institute Academy* (2).

Wu, J. et al. 2015. *China Economic Microtrends 2015* (Beijing, China Critic Press).

*Xin Hua Net*. 2010a. "670,000 Employees Working as Supervisors of Energy Saving and Emission Reduction all Over the Country", 4 Oct. Available at: [http://news.xinhuanet.com/society/2010-10/04/c\\_13541776.htm](http://news.xinhuanet.com/society/2010-10/04/c_13541776.htm) [30 Nov. 2015].

*Xin Hua Net*. 2010b. "Five Measures by Trade Unions for Energy Saving and Emission Reduction", 3 Oct. Available at: [http://news.xinhuanet.com/fortune/2010-10/03/c\\_12628148.htm](http://news.xinhuanet.com/fortune/2010-10/03/c_12628148.htm) [30 Nov. 2015].

Zhang, M.; Yang, H. 2015. "The State Speed up to Establish Green Financial System", in *Economic Information Daily*, 20 Apr.

Zheng, L.; Zou, T. 2014. "Future for Millions of Workers after Outdated Capacity Shutdown", in *Workers' Daily*, 8 Mar.

## **Annex I.**

### Research letter of field study to local trade unions for coordination

#### **Office of provincial trade union:**

The fourth plenary session of 18th CPPCC called for “accelerating the establishment of eco-civilization legal mechanisms to effectively restrict the practices of developers and promote green development, circular economy and low-carbon development, and strengthen the legal responsibilities to protect the environment of the workers”. In order to understand the employment impacts of the enterprises’ transition toward the green economy, the ACFTU established a joint research team on green employment led by the Research Institute of Chinese Workers’ Movements Studies and joined by the Economics and Skills Department of ACFTU, the China Energy Chemistry Trade Union, China Machinery, Metallurgy and Building Materials Trade Union and other relevant industries and departments. The research team carried out a study on the ongoing work and situation of promoting green development, intensifying energy-savings and emissions reduction, and advocating for decent work by the Government, trade unions and enterprises.

#### **Research methodology, time and content:**

##### **(I) Local workshops (group discussions)**

1. Time: DD/MM/2015 (tbd)

2. Participants:

- 1) Representatives from local Legal Department, Reform and Development Commission, Economics and Information Commission, Science and Technology Commission, Bureau of Finance, Bureau of Human Resources and Social Security, Bureau of Environmental Protection, Bureau of Construction, local Corporation of Enterprises and trade unions etc.
- 2) Representatives of local industrial associations (SMEs)
- 3) Representatives of local leading enterprises (SMEs)

3. Content of local stakeholders workshops (group discussions):

- 1) Local situation in promoting industry upgrading (impacts on GDP and employment by carbon emissions reduction, job creation in the green industries and so on).
- 2) Local legislation, policies, measures, experiences, lessons learned, issues and challenges as well as next-step planning in promoting industrial upgrading.
- 3) Basic situations of local SMEs, including practices, lessons learned, issues and next-step planning in reducing energy consumption, improving energy efficiency and protecting environment.
- 4) Impact on workers by the industrial transition and upgrading (positive-negative, short-, medium- and long-term impact, including employment opportunities, income levels, stability, working conditions, social security/ protection, technical and skills upgrading, career development).

##### **(II) Enterprises’ investigation**

Select three to four enterprises with replicable experiences in industrial upgrading and green development and conduct case study. It is suggested that industries/sectors, ownership types, scale and local economic development should all be considered for the selection.



**The case study methodology includes:**

**1. Workshops/group discussions:**

Participants: Directors/managers of enterprises, staff in charge of production technology upgrading and reform, energy savings and emissions reduction, and staff training, representatives of enterprise unions

**Content of enterprise workshops (group discussions):**

- 1) Practices of the enterprises in improving energy efficiency, protecting environment and promoting decent work.
- 2) The impact of local industrial upgrading policies on the enterprises.
- 3) Practices of the enterprises in investing in new technologies and adjusting production process (including the reasons, motivations, funding and technical sources as well as government subsidies for such practices).
- 4) After enterprise transition, the changes in labour productivity, production costs, number of positions, workers employed, working conditions, income, staff training and education, and career development.
- 5) When positions are reduced or workers transferred, how did the enterprises communicate with workers' congress, trade unions and workers and provide aid to workers who lost their jobs during the transition process?

**2. Site visits and workplace investigation at enterprises**

Visit and investigate the projects which have significant and replicable effects in green production (through technical upgrading, technology reform, stricter implementation of environmental protection standards etc.), energy-savings and emissions reduction etc.

**3. Interviews with workers**

**Participants:**

- 1) Management, technical and professional staff who participated in concrete work of enterprise technology upgrading/reform, energy savings and emissions reduction.
- 2) Workers whose positions experienced technology upgrading/reform, energy savings and emissions reduction in the past two years.
- 3) Workers who experienced job transfer due to enterprise technology upgrading/reform, energy savings and emissions reduction.

**Content of interviews:**

Comprehend the understanding, experiences and recommendations by workers concerning enterprises' green development.

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## **Annex II.**

### Outline of workshops/group discussions and interviews

#### **I. Industrial/local workshops (group discussions)**

##### (1) Participants

1. Representatives from local Bureau of Human Resources and Social Security, Bureau of Environmental Protection etc.
2. Representatives of local industrial associations
3. Representatives of local leading enterprises
4. Representatives of local unions and local industrial/sectoral unions

##### (2) Content of local stakeholders workshops (group discussions)

1. Basic situation of the specific industries (market, employment, industrial distribution/layout)
2. Practices, experiences, lessons learned and issues/challenges in reducing energy consumption, improving energy efficiency and protecting environment in the respective industries
3. Understanding of the respective industries of industrial transition/upgrading and production greening (by applying new technologies and better environmental protection standards etc.).
4. Impact on workers by the industrial transition and upgrading (positive-negative, short-, medium- and long-term impact, including employment opportunities, income levels, stability, working conditions, technical and skills upgrading, career development).
5. Main issues and next-step responses/actions in industrial transition/upgrading and production greening.

#### **II. Enterprise workshops (group discussions)**

##### (1) Participants

1. Directors/managers of enterprises
2. Staff in charge of production technology upgrading and reform, energy savings and emissions reduction, and staff training
3. Representatives of enterprise unions

##### (2) Content of enterprise workshops (group discussions)

1. Basic situation of the enterprises (position in the industry and value chain)
2. Practices of the enterprises in implementing national energy policies, improving energy efficiency and protecting environment (in particular regarding water conservation, improving industry water efficiency, improving industrial wastewater processing and satisfying higher environmental protection standards); using alternative energy (clean coal).
3. Practices of the enterprises in investing in new technologies and adjusting production process as well as the reasons, motivations, funding and technical sources of such practices.
4. After enterprise transition, the changes in labour productivity, workers employed, income, positions, staff training and education, and career development.
5. Employment impact of enterprise transition, technology upgrading and production greening (positions created, positions disappeared, placement of workers, communication with the unions and workers in the process).
6. Practices of enterprises in quickly identifying skills demands through survey and other methods.
7. Supportive measures by enterprises for laid-off workers through compensation and buffering their income pressures in the adjustment process.

8. Support to laid-off workers by providing employment information on suitable jobs, compensating their losses during the transition process and providing aid to workers in need.

### **III. Interviews with workers**

#### **(1) Interviewees**

1. Lower and middle level management staff who participated in enterprise technology upgrading/reform, energy savings and emissions reduction.
2. Workers closely involved in enterprise technology upgrading/reform, energy savings and emissions reduction in the past two years.
3. Workers who experienced job transfer or difficulties due to enterprise technology upgrading/reform, energy savings and emissions reduction.

#### **(2) Content of interviews**

1. How do you see the enterprise transition and production greening (technology upgrading and applying stricter environmental protection standards)?
2. How have you been affected by the enterprise transition and production greening (employment opportunities, income levels, stability, working conditions, technical and skills upgrading, career development)?
3. How do you see the functions of the staff associations and unions in the enterprise transition and production greening process (have the staff associations and unions played a role when the reform plan involves job transfers and reassignments)? What are your recommendations?
4. When enterprise transition and upgrading is implemented, have there been labour disputes and conflicts (i.e. the workers have different opinions and requirements from the enterprise)? How did the enterprise settle this?
5. Can workers duly share the benefits of enterprise development through collective bargaining on wages and democratic management etc.?

Employment impacts of enterprise restructuring in the transition to the green economy: A case study based on metallurgy, building materials and energy enterprises in China. A study by the Green Jobs Programme for Asia and the Pacific.

Many Chinese enterprises are shifting toward the green economy by shutting down outdated production facilities, decreasing overcapacity, saving energy, reducing emissions, updating equipment and technologies, and improving capacity to innovate while the Government has taken measures to change the economic development track and adjust the economic structure, as well as to promote public awareness of green(er) consumption. The transition to the green economy in China is seen as directly influencing job opportunities and employment quality in relevant sectors, while also influencing the scale and structure of employment throughout the whole economy.

This research, undertaken by the ILO Green Jobs Programme for Asia and the Pacific (Green Jobs-AP) in China through the ILO Country Office for China and Mongolia and the All-China Federation of Trade Unions (ACFTU) covers enterprises of different ownership systems and scales within the metallurgy, building materials and energy sectors. This paper provides further evidence and case studies pertaining to the employment implications of enterprise restructuring in the transition to the green economy. It promotes a better understanding of the impact on workers and presents practicable approaches undertaken by governments (national and local), industry and enterprises, as well as trade unions in response to possible negative impacts and maximizes the potential for workers to benefit from the transition.



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