

Research Report on Promoting Green Jobs for a Resilient Economic Recovery from COVID-19

APEC Human Resources Development Working Group

February 2024



**Asia-Pacific
Economic Cooperation**



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Executive Summary

The APEC's Putrajaya Vision 2040 states that a strong, balanced, secure, sustainable and inclusive growth is an important driving force. Facing the impact of the COVID-19, a green and sustainable development has become an important centerpiece of the economic recovery of the Asia-Pacific Region. In September 2020, China announced its goal of achieving a “carbon peaking” by 2030 and a “carbon neutrality” by 2060. Other APEC economies have also set their own strategic objectives and action plans for sustainable development.

Human resource development is an important element of the APEC cooperation and is one of the areas with the broadest consensus as well as the best basis for cooperation among member economies. The implementation of green sustainable development and of the resilient economic recovery in the post COVID-19 era cannot be achieved without the support of green human resources. It is important for economies to formulate and implement strategies and policies related to green jobs as well as to accelerate green human resource development. In this context, it is necessary to study and learn from the experiences of the economies in the field of green jobs within the framework of the forum of the APEC Human Resources Development Working Group, so as to promote jointly a resilient economic recovery in the post COVID-19 era.

Among the APEC economies, the definition of green jobs varies but mainly it is approached from the two perspectives: in a narrow sense and in a broad sense. The definition in a narrow sense takes into consideration the output of professional activities as a view of research to consider the entities that provide green products or services directly in a certain field as green jobs, with the emphasis on the actual effect and the direct contribution. The definition in a broad sense takes the green attribute of occupational activities as a view of research to regard those entities that promote the environmental protection or the natural resource saving in the course of economic activities as green jobs.

Most of the APEC economies enacted laws and regulations regarding the green jobs, for example, the Philippines and the United States. Most of the economies have applied different appropriate and sustainable regulations to the green economic development plans. Economies such as China; Peru; and Thailand have specific plans concerning the green development. The APEC economies all exerted great efforts in the field of green jobs classification. For example, China has labeled 134 jobs as "green jobs" in the domestic occupation classification system in 2022. In Indonesia, Green Jobs can be classified within several sectors, such as renewable energy, waste management, nature conservation, sustainable transportation, organic farming, as well as other green sectors. Korea; the Philippines; the United States and many other APEC economies established comprehensive classification systems of green jobs. While the green jobs and employment continue scaling, green jobs development also faces challenges, including uneven gender distribution, unmet demands and a skills gap.

Since the COVID-19 pandemic, APEC economies have suffered a heavy jolt. Meanwhile, people's awareness has been increasing of the importance of the natural environment for the human survival. The world economic development has begun to shift from focusing on GDP figures to improving the ecological and environmental governance and the sustainable development. Green recovery can not only meet people's needs for a green living environment, but also serve as the key to the

sustainable economic development in the post-COVID-19 era. The intrinsic logic of development and jobs for a resilient economic recovery after COVID-19 is in optimizing the labor market structure, promoting the sustainable development, accelerating the industrial transformation, enhancing the coordinated regional development, and promoting social inclusion as well as fair development.

Many APEC economies have already integrated green jobs-related elements to their economic recovery policies. To play the role of green jobs better in achieving a resilient economic recovery after COVID-19, it is necessary for the economies to improve relevant laws and regulations; strengthen systems, mechanisms and policy incentives; accelerate the green transition and development of enterprises; promote the innovation and development of green finance; as well as strengthen skills training and qualification certification.

By applying research methods of desk research, field studies, surveys, online and offline interviews and case studies, the research team completed the writing of this research report. The team distributed survey questions to all 21 APEC economies and conducted online and offline interviews with more than 20 interviewees from APEC economies. This research also involves five case reports from five economies with each report containing three or four case studies. For this publication, the research team picked one or two case studies from each report.

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I. Introduction

At present, in the international context of the increasingly prominent climate issues and an economic downturn, green jobs, as a kind of decent work dedicated to mitigating the environmental impact in the course of economic activities and ultimately achieving environmental, economic and social sustainability, have been given sustained attention and vigorously developed by economies around the world, and the green job market has gradually become diversified. In particular, due to the COVID-19 pandemic, the economies around the world have suffered a heavy blow. Meanwhile, people's awareness has been increasing of the importance of the natural environment for the human survival. The world economic development has begun to shift from focusing on GDP figures to improving the ecological and environmental governance and the sustainable development. Green recovery can not only meet people's needs for a green living environment, but also serve as the key to the sustainable economic development in the post-COVID-19 era. Therefore, in order to achieve a more sustainable and inclusive economic recovery, we must turn crises into opportunities, integrate green jobs into the economic recovery more closely, and build a greener and more resilient economic system.

On this basis, the internal logic of promoting green jobs for a resilient economic recovery from COVID-19 is to streamline the labor market structure, promote the sustainable development, accelerate the industrial transformation, enhance the coordinated regional development, and promote social inclusion and fair development. Specifically and primarily, the green jobs are inseparable from the sustainable development. Developing environmental protection industries and promoting the transition to a low-carbon economy can stimulate new investment and enterprise development, thereby creating more job opportunities and providing a long-term, stable foundation for economic development. Secondly, the green jobs lift up the energy reform and environmental protection demand. Investment in renewable energy, energy storage and low-carbon transportation can reduce dependence on the traditional energy and accelerate the process of industrial transformation and upgrading. Thirdly, promoting the development of green industries by green jobs can promote the optimization and upgrading of the regional economic structure. The promotion of regional development and competitiveness can not only promote the diversified and coordinated development of the regional economy, improve the ecology and environment as well as raise the resource utilization efficiency, but also promote cooperation and mutual benefits to various regions. In addition, green jobs can promote the social inclusion and fair development. The development of the green economy is characterized by high employment intensity, which can expand the opportunities for the vast labor force as well as reduce unemployment and poverty. Meanwhile, the focus on training and skill upgrading enables an ever-increasing number of people to work in green industries and share the dividends of economic growth.

To sum up, green jobs not only promote economic recovery and growth, but also have a positive impact on environmental and social sustainability as well as play an indispensable and important role in the economic development in the post-COVID-19 era. Attaching the importance to and supporting the development of green jobs would provide important support for a more prosperous and sustainable future.

II. Green Jobs

1. Definition and characteristics of green jobs

At present, scholars still are appreciating the meaning of green jobs, an emerging research field. Research on green jobs began as early as the 1980s, studying how to reduce the environmental costs in the process of employment. The term “green job” first appeared in the report entitled *Green Jobs in Industry* (1994) jointly issued by the Australian Conservation Foundation and the Australian Council of Trade Unions. Since then, an ever-increasing number of experts and scholars have applied this term in their reports and papers, and green jobs have received a broad attention. In 2008, the report *Green Jobs: Towards Decent Work in a Sustainable, Low-carbon World* (United Nations Environment Programme and International Labour Organization, 2008) defined green jobs as positions and occupations committed to protecting the ecosystem balance and the biodiversity, reducing energy consumption and the intensity of pollutant emissions. Scholars including CarlPope (2008), Cleary (2009) and Sulich (2020) have also demonstrated it from different angles that the significance of green jobs lies in reducing energy use and the depletion of the natural resources. It can be seen that the definition of green jobs by foreign scholars focuses on the environmental protection and the harmonious development of both man and nature.

Chinese scholars’ research on green jobs began in the early 21st century, mostly focusing on the introduction of the concept and theory of green jobs. Domestic scholars studied the concept of green jobs roughly in three dimensions: the energy conservation and environmental protection, economic development, and social governance. From the perspective of the environmental protection, Weng Donghui (2009), Wu Yanping (2009) and Zhao Chunxi (2017) respectively demonstrated that green jobs must be energy-saving and environmentally friendly from the two angles: investments in environmental protection facilities and the green technology to promote the development of the ecological and environmental protection industry. From the perspective of economic development, Xu Guang and Li Hung et al. reviewed the development of green and low-carbon jobs at home and abroad, believing that green jobs must have high added value and create economic benefits in order to achieve the sustainable development. From the perspective of social governance, You Jun et al. (2014) believed that green jobs should be decent, and their value should lie not only in providing dignity and security for employees, but also in maintaining social stability. To sum up, the above scholars have defined green jobs from different angles, revealed the value of green jobs, and demonstrated that the concept of green jobs has three meanings of environmental protection, economic development and social responsibility.

To understand the concept of green jobs, first of all, it is necessary to understand the characteristics or regularity of green jobs. First of all, green jobs refer specifically to the economic activities or labor of workers that contribute to environmental protection (You Jun and Zhang Libin, 2010), including the jobs related to the green economic activities such as reducing the energy and raw material consumption, protecting and restoring the ecosystems and environment. Secondly, green jobs are not limited to emerging jobs, but also build on the gradual transformation of existing jobs based on traditional professions and occupations, such as jobs in the electronic recycling field created by the proliferation of electronic waste. Finally, the proportion of green jobs in employment is closely related to the mode and level of the economic development. The more developed the economy is, the higher the level of green jobs is. The more extensive the mode of economic development is, the lower the level of green jobs is.

Generally speaking, scholars have studied green jobs from different angles and put forward a lot of valuable insights and data, from which it is not difficult to see that green jobs are keeping pace with the times, and the definition of green jobs does not classify jobs according to a single specific criterion. Based on these conclusions and the characteristics of the concept of green jobs, this paper holds that the definition of green jobs should start with the “green” or sustainable nature, and the traditional theories or definitions of green jobs should be improved on. It can be considered that green jobs are the jobs that have a positive effect on the environment, contribute to the energy conservation and carbon emission reduction, as well as have a higher unit output effect, lower pollutant emission intensity, and can provide employees with dignified and secure employment conditions.

2. Differences between green jobs and traditional jobs

Traditional jobs refer to jobs in traditional industries and fields or occupation, usually involving traditional manufacturing, the service industry, agriculture and other economic fields. Traditional jobs are characterized by the pursuit of economic benefits based on traditional skills, knowledge and working methods, and often rely on the existing market and industrial environment. Based on the definition and characteristics of green jobs, it is not difficult to find that green jobs, as a new type of employment, are quite different from traditional jobs. From the perspective of goals and orientation, green jobs are designed to promote sustainable development and environmental protection, with a focus on reducing the consumption of natural resources and the negative impact on the environment and enhancing social responsibility and development sustainability. Traditional jobs mainly focus on the economic growth and profit maximization, often at the cost of polluting the environment. To some extent, there is a “trade-off” between traditional jobs and the green and low-carbon development. From the perspective of job duties, green jobs emphasize environmental protection and sustainability, which usually involves such fields as renewable energy, clean technology, circular economy, and environmental protection. These specific fields related to the environmental protection and sustainable development require specific professional knowledge and skills, with the high barriers to entry. Traditional jobs cover a wide range of industries, including manufacturing, retail, and finance. These industries may not focus on the environmental protection and sustainability. In contrast, traditional jobs involve a wider range of skills and professional backgrounds, with low barriers to entry. From the perspective of development prospects, in the context of a rapid development of the green economy, with the increasing demand for environmental protection and sustainability, green jobs have gradually become an indispensable part of various industries, and the future of green jobs now is more clear and stable. Traditional jobs, however, depend more on the supply of resources and energy, and their development prospects may be affected by the fluctuations of the economic cycle, the market competition and other factors, so they are not as stable as green jobs in the long run.

In general, green jobs and traditional jobs are different in many respects, but this does not mean that they are the opponents. It should be pointed out that traditional jobs, as an important employment factor, provide a stable labor force and services for the economy and the society. Although green jobs and high-tech jobs have gained more attention with the rise of the green economy and the emerging industries, traditional jobs still play an important role and provide job opportunities for a large number of workers. In addition, traditional jobs are constantly developing and changing. With the technological progress and social change, traditional jobs have also been affected by emerging industries and new technologies. Some traditional industries are undergoing a transformation and renewal to adapt to new market demands and

technical requirements. The promotion and development of green jobs can boost the transformation and upgrading of traditional industries, improve employment quality, and bring more opportunities and challenges to the sustainable development of the society and the environment. Therefore, traditional jobs are not a static concept, but keep pace with the times and may change constantly with the times, which means that the interaction and mutual promotion between green and traditional jobs are inevitable. As green economy becomes one of the important trends of future economic development, the status and role of green jobs would be continuously enhanced and strengthened.

3. A status quo and the trend of green jobs

In the recent years, green jobs have gradually emerged worldwide and received more and more attention. Guided by various environmental policies, APEC economies have provided a series of strategies in support of green jobs, and all of them have achieved certain development results.

The project team designed survey questions and distributed them to the 21 APEC economies in May 2023. As of 31 August, responses to survey questionnaires have been received from seven economies. Based on the questionnaire and a literature research, we can have a preliminary understanding of the current development trends of green work and green employment in the APEC economies.

A status quo of green jobs

Green jobs continue to increase in number

The energy industry in the United States has witnessed a widespread growth in green jobs, with clean energy jobs accounting for over 40% of total energy jobs in 2022. From 2021 to 2022, the number of jobs in the sector of battery electric vehicles increased by 28,366 (+27%). Clean energy power technologies such as solar and wind power account for nearly 87% of the net new generation positions. From 2021 to 2022, the number of jobs related to clean energy vehicles increased by 38,232 (182,526 to 220,759).

In the Philippines, the Green Philippine Employment Forecast Model (PEPM) entitled "The Employment Impact of Philippine Green Policies" (2019) estimates that the annual growth rate of the employment demand from 2016 to 2030 is approximately 2.8%. Under this optimistic development scenario, this is equivalent to approximately 1.4 million new positions per year. According to predictions, by 2030, the green economy will require 3.9 million workers, accounting for approximately one-half (56.2%) of the current workforce.

According to the International Labour Organization (ILO) policy document "Employment Effects of Green Policies in the Philippines," approximately seven million Filipinos work in the green sector, accounting for approximately 17% of 2016 employment. Most of them (4.3 million) work in the service industry, 1.6 million are employed in the green business, and 1.3 million are engaged in the green agriculture.

The classification of green jobs is a priority

The classification of clean energy work in the United States includes the technical

work consistent with the "net zero" future, including the work related to renewable energy, grid technology and storage, traditional power transmission and distribution, nuclear energy, a subset of energy efficiency that does not involve fossil fuel combustion equipment, biofuels, and plug-in hybrid, battery electric, and hydrogen fuel cell vehicles and components. In Indonesia, green work can be divided into several sectors, such as renewable energy, waste management, nature conservation, sustainable transportation, organic agriculture, and other green sectors.

A status quo and problems of green employment

Uneven gender distribution

The survey results indicate that despite regional differences, women often have a lower position in the green energy market. The female employment rate for clean power generation (solar, wind, hydro, nuclear, and biomass) in the United States is 31.6%. The proportion of female labor force among founders of renewable energy enterprises and energy startups is 32% and 11%, respectively. On the other hand, compared to any other industry such as technology, management, or decision-making positions, female employees typically engage in the lower paying administrative professions. The gender income gap in this sector is expected to reach up to 31%, which is a symbol of inequality.

According to a survey by ECO Canada² among environmental workers based on 738 companies, 38% of workers are female while 60% are male. According to Statistics Canada³, the gender distribution of workers in the environmental and clean technology products sector remained stable from 2012 to 2019. The distribution of male workers dropped from 65% in 2012 to 63% in 2019, while female workers went up from 35% to 37%.

The demand for green employment continues to increase

In the United States, experts predict that the Creation of Incentives conducive to semiconductor production (CHIPS), the Science Act (2022) and the Inflation Reduction Act (2021) may stimulate the sustained growth of the green employment demand after the COVID-19 epidemic.

It is estimated that between 2016 and 2030, the gross domestic product (GDP) of the Philippines will grow by an average of 5.3%, and the average value added (GVA) in the green sub industry is PHP2.6 trillion. Between 2016 and 2030, the average global value was PHP9.5 trillion, and traditional sub industries will continue to surpass green sub industries. However, the compound average growth rate (CAGR) of the green sub sector is 22%, while the traditional sub sector is 19%. Although, the total added value has increased, it is expected that the demand for labor in agriculture will decrease. Between 2016 and 2030, the average employment in the agricultural green sector will reach 1 million, still far below the 8.9 million in traditional sectors.

The gap in green skills still exists

The skills gap is an important obstacle to the development of green employment, but

² https://eco.ca/wp-content/uploads/2023/09/ECA_Diversity_Gender_AUG2023_EN_FINAL_REV-2.pdf

³ <https://www150.statcan.gc.ca/n1/pub/16-508-x/16-508-x2022002-eng.htm>

the ability of the labor force cannot meet the specific job requirements. These issues have different manifestations in each economy. For the United States, the problem lies in the uneven geographical distribution of green-related employment opportunities. In addition, the polarization between the rich and the poor is still significant, so communities are unable to access the same level of resources and opportunities.

The skills gap in the Philippines lies in hardware and talent development, and many colleges and universities lack the facilities and technology needed to support their environmental education programs. On the other hand, technical and vocational schools are facing resource shortages, such as new structures, cutting-edge machinery, and other facilities, which make it difficult to implement new projects. In addition, higher education institutions must adjust their curricula to reflect the current global trends and needs.

Policies related to green work

Laws and regulations

APEC economies have taken measures and actions to promote the development of green employment. The United States has passed the 2022 Inflation Reduction Act, providing nearly USD370 billion in incentives for energy and climate-related projects. The Infrastructure Investment and Employment Act (2021), the Create Incentives for Semiconductor Production (CHIPS), and the Science Act (2022) have also made significant climate related changes to stimulate the creation of green employment.

Canada is increasingly using the term "sustainable work." This concept is the fundamental path to an environmentally friendly future, ensuring the successful transformation of the energy sector and providing high-quality work for Canadians. In the context of the recently released temporary plan of sustainable employment, Canada understands "sustainable work" as any work that is compatible with Canada's future path towards achieving net zero emissions and the climate adaptation.

Hong Kong, China, has launched the Green Employment Scheme to create approximately 1,000 job opportunities in 2022. Through the participation of green ambassadors and project support positions from various fields and organizations, green employment opportunities have been created.

In Peru, the Ministry of Labor and Employment Promotion and the International Labour Organization conducted a study on the conceptualization of green work in Peru, proposing a method for quantifying the green work and calculating work towards the green transformation.

The Ministry of Labor of Thailand encourages businesses to adopt green employment practices through tax incentives and provides a large number of green skills training programs. Indonesia has taken measures to promote the development of the green sector by formulating the supportive regulations and providing incentives to companies involved in the renewable energy sector and the environment. The distribution of green jobs in Indonesia may vary depending on geographical regions and the level of economic development in these regions.

The Philippines has announced two bills related to green employment programs. The first is Republic Act 10771, or the 2016 Green Jobs Act of the Philippines (RA 10771), which is the first piece of legislation in the economy specifically aimed at creating,

maintaining, and stimulating "green employment," including tax breaks for skills training and green work research and development (equivalent to 50% of total costs), as well as duty-free imports of capital equipment directly and specifically used to promote green work. The second item is the Green Employment Human Resources Development Plan for 2020-2030, which complies with Green Jobs Act of the Philippines (RA 10771). The 2016 Green Jobs Act of the Philippines (RA 10771) and provides a broad direction for creating and maintaining green employment as well as a roadmap for the stakeholders to develop and maintain human resources to ensure a fair transition, predict green skills, and minimize risks.

Japan attaches a great importance to the coordinated development of the environment and the economy. At the beginning of the 21st century, Japan published the draft policy of Green Economy and Social Change (Tetsuo Saito, 2009), endeavoring to create a large number of environmental protection-related jobs by implementing active environmental governance policies, so as to achieve the goal of protecting the environment. After the implementation of the draft, nearly 2.2 million green jobs were created, with remarkable results (Chen Liuqin, 2010).

As the eighth largest economy in the global energy market, Australia has promulgated a series of policies and acts to vigorously promote the green skills training, seek business opportunities and provide trainings with a view to narrowing the skills gap in the green job market and ultimately train "green collar talents" with new skills for the green and low-carbon economy.

Industry guidance

To assist young people in seizing green career opportunities in Hong Kong, China, the Environment and Ecology Bureau and the Environmental Protection Department (EPD) have been organizing summer internship and mentorship programmes for many years. During the COVID-19, the Graduates Subsidy Programme was launched to subsidize private companies and organizations to employ over 800 graduates in the environmental protection-related fields. In addition to subsidies, the GreenPro Training Programme also provides professional training courses on the environmental protection for these graduates. Besides, the EPD also collaborates with local professional associations to provide structured training opportunities in environmental engineering for engineering graduates.

The United States provides guidance on green employment policies through the Department of Labor. The Ministry of Labor cooperates with public agencies under contracts and as a part of financial assistance projects, and supports public agencies in establishing work quality standards, which involve many areas, including the green employment industry. They are also building a healthy workforce to benefit from the investment in the labor development, training, and apprenticeship programs, in order to achieve the equality in the field of green employment. The Ministry of Labor has also negotiated the employment rights of green employment workers. In addition, the Department of Justice is also involved in ensuring that the benefits of the climate change and clean energy investments would benefit the lower end of the society. The Inter Agency Working Group on Community and Economic Revitalization of Coal and Power Plants helps relevant professional workers overcome the social and economic impacts of decarbonization.

In the meantime, green jobs have been evolving for a long time in China. Since the 1980s, China has begun to develop environmental protection mechanisms and its

circular economy such as afforestation, solar energy and wind power generation has reached a considerable scale, creating some green jobs. In the 21st century, China has formulated a series of policies and regulations on energy conservation and emission reduction, which laid a foundation for the formation of laws and regulations on green jobs. In 2008, of the RMB4 trillion was invested in response to the global economic crisis, nearly RMB210 billion (about 5.25%) was invested in the energy conservation, emission reduction and ecological construction, which greatly increased the number of green jobs. In 2009, in order to reduce coal consumption and carbon dioxide emissions, the Standing Committee of the State Council decided to increase the investment in renewable energy in the next decade, creating tens of millions of new green jobs, and promote the development of the green economy and employment in China (Development and Reform Commission, 2009). In 2010, China held a seminar on green jobs (Ministry of Human Resources and Social Security, 2010), and the participating experts had in-depth discussions on the development status of green jobs in China and put forward policy opinions on the discussion results. Since the beginning of the new era, China's ecological progress has entered a critical period of focusing on carbon reduction, promoting the synergy of pollution reduction and carbon reduction, advancing the comprehensive green transformation of economic and social development, and improving the quality of the natural environment. Under the guidance of the development goal of carbon peaking and carbon neutrality, a large number of green jobs have sprung up in all the walks of life, expanding a new space for employment and development.

In addition to the aforementioned economies, other APEC economies are also committed to promoting the sustainable development and addressing the climate change. Through policy support, investment in green infrastructure, green skills training, and cooperation and exchange, more green employment opportunities have been created, achieving an efficient cycle of economic growth and environmental protection.

III. Resilient Economic Recovery

1. Definition and characteristics of a resilient economic recovery

Economic development on the whole can be regarded as a process of regular fluctuations, with troughs and peaks like sound waves. In economics, a trough is defined as a recession or a contraction, and a peak being an overheating or inflation. The development stage from a trough to a peak is a period of economic growth or recovery, which includes a series of positive changes in economic indicators and activities, such as the GDP growth, an increase in job opportunities, and an upgrading of the industrial structure. It can be seen that economic recovery usually means a reversal of economic stagnation or decline, a resumption of economic activities, a restoration of the confidence of enterprises and individuals, an increase in capital investment, and a rise in consumer demand. Economic recovery is of a great significance to ease the pressure on the social employment, promote the income growth and improve people's living standards. The economic recovery is not only related to the development of the economy itself, but is also closely related to the social stability and domestic development. Therefore, economies around the world would take appropriate measures to promote the economic recovery, such as implementing fiscal incentives, encouraging employment, and adjusting the industrial structure.

However, the process of economic recovery is often accompanied by such uncertainties as changes in the international economic situation, policy environment, financial crisis, and natural disasters, which may lead to an economic stagnation or even recession. When faced with external shocks or uncertainties in the process of economic recovery, the recovery model in which the economic system cannot adapt and adjust quickly may lead to violent economic fluctuations, a long-lasting and slow recovery, and a lack of flexibility and adaptability, which means that even small external shocks or internal distress may have a serious impact on the economy and lead to long-term economic problems. Maintaining a stable growth and avoiding excessive fluctuations and drastic fluctuations in the economic cycle require a resilient economic recovery. Understanding the characteristics of resilience is essential to building a resilient economic recovery model.

Resilience is a familiar concept that was originally intended to serve as a physical term, referring to the ability of an object to return to its original state after being pressed. Later on, the concept of resilience has been applied in a variety of fields including economics. Scholars including Hassink (2010), Edward (2012) and Brakman (2018) emphasized the fact that economic resilience refers to the ability of an economic system to recover after being disturbed, which is similar to the "market's self-correction mechanism" of mainstream economics. Su Hang (2015) emphasized that the economic resilience is the ability of all economic links including industries, the society and areas of an economy or region to adapt to the ever-changing environment. He Canfei and Chen Tao (2019) defined resilience as the recovery from crises, a self-renewal and reorientation of the whole process from the top-level design to the end governance in the economic system. According to the definition and research of the economic resilience by scholars, the economic resilience, as a "resilience", should be reflected in all aspects of the economic and social development. A resilient economic recovery should start with a flexible labor market, a diversified industrial structure, and a coordinated regional development layout, with a focus on sustainable development. These characteristics enable the economy to adapt to external changes and shocks, mitigate the risks to a single industry, facilitate the re-emergence of job opportunities, and provide a broad unified market. At the same time, a resilient

economic recovery should be integrated with the sustainable development goals, so as to balance the needs of the economic growth, the environmental protection and social justice, to achieve a long-term sustainability, and lay a foundation for a sustainable and high-quality economic and social development. Therefore, making the economic recovery more resilient is critical to achieving long-term prosperity and stability.

2. A reduced economic resilience following the impact of COVID-19: the challenges and a road to recovery

Since the outbreak of COVID-19, the economy, employment and social well-being of all economies in the world have been hit hard, accompanied by the public health, economic and social crises. First of all, the outbreak and spread of COVID-19 has had an immeasurable negative impact on economic operation. With the large-scale lockdowns and bans imposed by economies due to the pandemic, the global trade and supply chains have been severely affected, and the global economic development has stagnated or even declined. According to *An Updated Assessment of the Economic Impact of COVID-19* (Asian Development Bank, 2020), the global economic impact of COVID-19 could reach USD5.8 trillion and USD8.8 trillion, which is equivalent to 6.4%~9.7% of the global GDP (see Table 1). With the continuation of COVID-19, the supply bottlenecks, a high inflation in major economies and intensified geopolitical conflicts combined with weakened fiscal support have led to drastic fluctuations in economic development trends, and the prospects for global economic recovery are facing some greater uncertainties, so it is urgent to find a new way out.

Table 1 Estimates of global and regional economic losses due to COVID-19

	Estimates of global and regional economic losses due to COVID-19				Estimates of global and regional economic losses due to COVID-19 (with policy measures)			
	USD 1 billion		Percentage of GDP		USD 1 billion		Percentage of GDP	
Pandemic prevention and control	3 months	6 months	3 months	6 months	3 months	6 months	3 months	6 months
Global	-5,796.9	-8,789.9	-6.4	-9.7	-4,095.8	-5,387.8	-4.5	-5.9
Asia	-1,667.8	-2,529.1	-6.2	-9.3	-1,328.6	-1,854.3	-4.9	-6.8
Australia/New Zealand	-91.2	-139.5	-4.6	-7.0	-81.0	-119.1	-4.1	-6.0
Central Asia	-21.1	-34.0	-3.4	-5.5	-11.4	-14.8	-1.8	-2.4
East Asia excluding China	-164.1	-256.7	-6	-9.3	-145.6	-220.0	-5.3	-8.0
China	-1,083.1	-1,623.4	-7.5	-11.2	-833.8	-1,126.8	-5.8	-7.8

Southeast Asia	-163.2	-252.9	-4.6	-7.2	-119.6	-166.3	-3.4	-4.7
South Asia	-141.9	-217.6	-3.9	-6.0	-134.3	-202.9	-3.7	-5.6
Pacific Region	-3.3	-5.0	-4.6	-7.0	-2.9	-4.3	-4.1	-6.0

Source: Asian Development Bank: *An Updated Assessment of the Economic Impact of COVID-19*

At the same time, the pandemic has had an impact on both supply and demand of the industrial development, bringing a tremendous structural pressure to the industrial development. On the supply side, on the one hand, problems such as limited personnel mobility and an insufficient labor supply have had a huge negative impact on the industrial recovery. The production output in the labor-intensive industries such as manufacturing and textile has been severely impacted, and the production and consumption in the service industries that rely on off-line scenarios have also weakened significantly. On the other hand, the pandemic has weakened the crisis resistance of micro, small and medium-sized enterprises, which not only led to a decline or even exhaustion of their income and business, but also brought about higher labor and production costs to small and medium-sized enterprises. The survival prospects of small and medium-sized enterprises are not optimistic. On the demand side, the pandemic has caused a serious decline in the demand for off-line business. It is difficult for tourism, retail, catering, film and other traditional industries that rely on off-line scenarios to recover in a short time from the huge blow of the pandemic. Some off-line stores were temporarily closed due to the pandemic prevention and control, and the market consumer demand was limited. Various industries have been hit by the pandemic, and the impetus for economic development has been weakened. The original industrial structure cannot resist external pressure and get from under the economic downturn.

In addition, the COVID-19 pandemic has had a huge impact on the labor market. Relevant data show that the working hours have been reduced by 8.8% globally in 2020, equivalent to a loss of 255 million full-time jobs. According to the data of China Institute for Employment Research (China Institute for Employment Research of Renmin University of China and Zhaopin, 2020), China's annual average observed urban unemployment rate was 5.6% in 2020, and a total number of the newly employed people in urban areas decreased by 1.66 million from the previous year. Against the backdrop of a weak employment recovery, the number of people living in extreme poverty is expected to remain well above the pre-pandemic level, poverty in the most vulnerable economies is expected to further aggravate, and vulnerabilities and imbalances in the global economy are increasing rapidly. As a result, employment, which is fundamental to people's well-being, should be placed at the center of the pandemic response and recovery plans in all economies.

To sum up, the impact of the pandemic has not only exacerbated the social unemployment and weakened the risk resistance of enterprises, but also had a negative impact on the overall economic growth and seriously reduced the resilience of the economic development. While the pandemic hindered economic development, it also implied some potential opportunities for high-quality development. First of all, the pandemic has created the demand for a digital transformation, which not only

improved the efficiency and resilience of enterprises, but also created new business opportunities and job opportunities. Secondly, the pandemic has exposed the vulnerability of supply chains, which will promote the industrial transformation and supply chain development, and bring about a more sustainable and stable supply chain system. Finally, such an impact has made people deeply appreciate the importance of a healthy natural environment to human survival, and the whole society has begun to shift from focusing on GDP figures to improving the ecological and environmental governance and sustainable development, which opened up the development opportunities for a renewable energy, ecological agriculture and other fields, and also promoted the rise in a greener and less-polluting economic model. To sum up, although the pandemic has reduced the economic resilience, by seizing these opportunities and innovating and adapting, we can achieve a higher-level and a higher-quality of the economic development.

3. Post-COVID-19 era: Exploring the green potential and improving the economic resilience

In contrast to the rapid onset of the COVID-19 crisis, the climate crisis imposes a stress on human and natural systems slowly and over time. The economic recovery period after the pandemic comes at a critical time to deal with the climate change. Incorporating climate change into economic incentives policies has become an important issue for all economies. Some greater opportunities for a green transformation have gradually matured in this process. In order to seize the opportunity to address the climate change and promote the high-quality development of the international society and economy, the United Nations, relevant departments and organizations of various economies are actively calling for the adoption of policies of a green and low-carbon economic recovery.

In 2020, at the 11th Petersburg Climate Dialogue jointly organized by the United Kingdom and Germany, the environmental ministries of more than 30 economies explored the ways to a more resilient and climate-friendly economic recovery for the global economy. The economies agreed that the economic recovery and incentives plans must be green and resilient, and steer the economic growth to a low-carbon and sustainable path by focusing on the environmentally friendly transition and a job creation.

The United States has boosted up its investment in green jobs and sustainability in the post-COVID-19 era. For example, it has proposed the Clean Energy Plan to encourage the development of renewable energy and promote the growth of green jobs. In addition, the United States has created a large number of green jobs in such fields as energy efficiency, environmental technology and sustainable buildings. Sweden has had great achievements in the fields of the environmental protection, renewable energy and waste treatment, and the enterprises are encouraged to innovate and develop green technologies through tax incentives, economic incentives and investment in research and development (R&D) foundations, thus promoting the growth in the green jobs. China has given a full play to the advantages of the socialist market economic system. Through the policy guidance and investment support, China has created a large number of green jobs in the fields of renewable energy, clean technology and new energy vehicles, and has become the largest new energy vehicle market in the world, promoting the rapid development of the electric vehicle industry, thus driving the employment growth of the related industrial chains. In fact, in the post-COVID-19 era, an ever-increasing number of economies have regarded the green economy and green jobs as important development fields and adopted various means and measures to promote their development, providing a new impetus for the

economic growth and benefiting both the environmental protection and social sustainability.

Therefore, promoting “green jobs” has become the best solution to promote the employment, improve the economic resilience and cope with the climate change. Specifically, its transmission logic can be summarized as providing new job opportunities and economic growth landmarks, reducing the dependence on the traditional energy-intensive and high-polluting industries, improving the resource utilization efficiency, reducing the environmental pressure and injecting new vitality into the economy by promoting the sustainable development and environmental protection industries. At the same time, green jobs can also foster new skills and talents, improve the quality and competitiveness of the labor force, promote social fairness and justice, as well as make the economy more resilient and adaptable.

IV. Promoting Green Jobs to Achieve a Resilient Economic Recovery

1. Green jobs optimize the employment structure of the labor force

The green development has spawned new green jobs

With the goal of carbon neutrality and carbon peaking put forward and being gradually implemented, we will usher in a new round of industrial and technological innovation represented by the green economy and a low-carbon technology. As an important tool to improve the economic resilience and cope with the climate change, the impact of the green economy on green jobs can be divided into the following three aspects: First, the elimination of traditional jobs, with the improvement of energy efficiency and the reduction in the total energy demand, the job demand of carbon emission and energy consumption-intensive industries represented by mining, construction and power plants will be greatly reduced. Secondly, the new jobs have emerged, that is, the number of jobs in the fields of renewable energy, manufacturing and the servicing of environmentally-friendly products and the green supply chain in a green economy has increased. Finally, there is a replacement of existing jobs, which means that with the breakthrough of the green technology, the existing jobs and manufacturing processes will be replaced by some cleaner and more environmentally friendly technologies.

According to the report data of the *Renewable Energy and Jobs* (2016) from the International Renewable Energy Agency (IRENA) of the energy sector as a focus of the impact of the green economy on jobs, it still brings positive net effects on jobs (as shown in Table 2). In addition, in 2015 alone, the global total investment in renewable energy was USD313 billion. The huge investment in renewable energy not only directly drives the green jobs in the energy sector, but also has a great potential for the indirect driving effect.

It can be seen that although the development of green economy and green jobs has a great impact on the traditional industries and modes of production, the industries such as renewable energy, clean transportation and clean production brought about by the green economy would absorb a large number of social laborers. The United Nations Development Programme (2022) revealed that if the world persists in developing the green economy and vigorously promotes green jobs, by 2050, the global GDP will increase by USD98 trillion, which is 2.4% higher than the benefits ensured by the current economic development. In the next 30 years, not only can the investment cost in public health be saved by eight times to prevent a repeat of the crisis, but also the number of jobs brought about by the renewable energy industry will quadruple to 42 million in the world. In addition, the circular economy characterized by recycling, reuse and reprocessing can provide six million jobs. In the word, in the post-COVID-19 era, green jobs will gradually replace traditional jobs that are related to a high pollution and a high energy consumption, and become a new kinetic energy to support the economic development.

Table 2 Number of jobs per million output value of the clean energy and the traditional energy

Economies	Number of jobs per million output value of the clean energy (people)	Number of jobs per million output value of the traditional energy (people)	Net effect ratio

Brazil	37.1	21.2	+75%
China	133.1	74.4	+79%
India	261.9	129.1	+103%
Indonesia	99.1	22.0	+350%
South Africa	70.6	33.1	+113%
The United States	8.7	3.7	+135%

Source: Renewable Energy and Jobs – Annual Review 2020

Green jobs have accelerated the structural transformation of labor force

The continuous promotion of green jobs would inevitably have an impact on the relevant regions and industries, thus promoting the transition of jobs to the technology-biased and environmentally friendly jobs. In the examples of coal, steel, electric power, oil and other energy resource industries, the carbon dioxide emissions of these industries account for over 90% of all industries. Under the huge pressure of carbon emissions, these industries need to turn to the low-carbon mode faster. Moreover, the labor force composition of these industries is generally characterized by an older age and a lower education level, which is extremely vulnerable to unexpected situations such as an economic downturn, the climate change and the COVID-19 pandemic.

In this context, the green transition of the industry has provided for economies, a large number of new types of green jobs. The ROK believes that the development of a new energy industry would create 2-3 times as many jobs as the manufacturing industry, especially the development of the solar energy and wind power generation industries, which will create eight times as many jobs as ordinary industries. According to the estimates of the research group of Institute of Urban Development and Environment, Chinese Academy of Social Sciences, the green investment would create 5.2-5.3 million job opportunities for the China's economy, of which the investment in the energy conservation and emission reduction as well as the ecological construction can bring about 2.084 million direct and indirect jobs, while investments in structural adjustment and technological transformation can drive 2.339 million people to find jobs, projects related to the well-being of rural residents (biogas digester construction) and can create nearly 90,000 related job opportunities, and the number of employees in environmental protection industry is expected to reach tens of millions. It can be predicted that green jobs can reduce the employment capacity of traditional industries with a high energy consumption and a high pollution, play the role of an "employment capacity expander" of the industries related to green jobs and thus fill the employment gap brought about by the reduction in the traditional employment, and accelerate the transition of labor from industries with high energy consumption and high pollution to green and low carbon industries, thus changing the former structure of the labor force.

On the other hand, green jobs have more skill requirements. The United Nations Environment Programme (UNEP) (2008) pointed it out in the research report that compared to the non-green jobs, green jobs required practitioners to master more advanced skills and have a higher education level and a richer work experience. Using renewable energy as an example, most of the practitioners in the field of renewable energy are workers with a higher educational background and a high professional skill level, and traditional energy workers will face higher professional restrictions if they wish to participate in the transition to the field of renewable energy. In addition, LinkedIn in its released *Global Green Skills Report 2022* (LinkedIn, 2022) pointed out that the proportion of green talents in the global labor force was gradually increasing, from 9.6% in 2015 to 13.3% in 2021, with a growth rate as high as 38.5%, and it was stipulated in about 10% of recruitment requirements that job seekers should have at least one green skill.

It can be seen that with the comprehensive development of green jobs, green talents with green skills are constantly emerging, which will reduce the number of low-skilled workers in energy-consuming industries. Besides, the development of low-carbon industries will usher in a broader development space and absorb more high-quality green talents, and their proportion in the labor structure would gradually increase.

For example, the European Union, in order to avoid mass unemployment and new social problems in the process of transition, has launched the *European Skills Agreement* two years ago, which has provided a manpower training support for 14 large partners in the European industrial ecosystem and helped them provide the skills needed for the labor force transition to carbon neutrality and digital economy. These partners promote coordinated actions by companies, workers, governments, social organizations, education and training providers and employment service agencies, and they jointly promised to help six million people improve their skills and provide a re-employment training.

In this regard, in November 2022, China issued a notice on the *Implementation Plan for the Construction of Education System for Green and Low-carbon Development*, with more attention paid to the basic education of green jobs and the future talent training, the targeted provision of the relevant skills-training services starting with the domestic level, the cooperation with enterprises, colleges and training institutions for coordinated development, the improvement in the existing labor level and the use of the existing labor force, the reserve of green talents for the future green development, and a better development of the society, and the realization of a smooth transition and the sustainable development of the green and low-carbon economy

In addition, with the “popularity” of green jobs, an ever-increasing number of enterprises have begun to take the initiative of assuming the environmental and social responsibilities, riding the tide of a low-carbon transition for the sake of “recruitment.” However, the talents who meet the requirements of green jobs are very limited. From 2016 to 2021, the demand for green skilled jobs at enterprises was increasing at an annual rate of 8%, while the average annual growth rate of green talent supply in the same period was only 6% (LinkedIn, 2022), showing a very obvious gap. In order to improve the competitiveness, almost all industries are seeking to establish a low-carbon operation talent pool to attract the green talents or encourage existing employees to improve their green skills through internal training and other employee development plans. In this way, with the entry of enterprises and capital, the overall scale and growth rate of green talents are constantly improving, and the emerging green talents are gradually becoming the main force in the development of all the walks of life. Their green concepts and green skills will also promote the industry to

continue the deepening of the green transition and continuously release the development potential of a green economy.

To sum up, the green development has broken the allocation of supply and demand in the original labor market, and spawned a large number of green jobs and the demand for talents for the green jobs. After these laborers with the high-level knowledge and skills enter the job market, they would have gradually eliminated or replaced low-skilled laborers, highlighting the characteristics of the talent dividends constantly and greatly improving the labor structure. Meanwhile, the deepening of green jobs has also led to the emergence of a large number of enterprises that pay attention to the environmental and social responsibility. These green enterprises have shown their demand for high-quality green talents through various channels, and continuously improved their employees' green skills through the "talent development." High-quality talents combined with green enterprises have jointly supported the resilient recovery of the economy and formed an effective cycle of economic development.

2. Green jobs promote the transformation and upgrading of traditional industries

Green jobs have driven the low-carbon transition of the industry

With the attention to the environmental protection and carbon emission, as well as the development of a low-carbon and green economy as well as green jobs, all economies have actively formulated environmental protection laws, adjusted the structure of agriculture, industry and the service sector, reduced the environmental pollution, improved the production efficiency, actively developed the new energy and invested in green industries, so as to realize their own economic development, achieve an increase in the employment rate and ensure the environmental protection. Liu Nanchang (2006) believed that the industrial policy and employment policy were closely related, so it could be said that the labor employment determined the type of the industrial structure. With the continuous popularization of green jobs, in the formulation and implementation of industrial policies, economies must consider the current situation of labor employment, and the industrial policies would promote the development of the target industries through the guidance of industrial development policies, which in turn affects employment. A correct use of industrial policies can promote the transition of industries to green, low-carbon and high-efficiency models as well as play an important role in increasing employment, optimizing the industrial structure and protecting the environment.

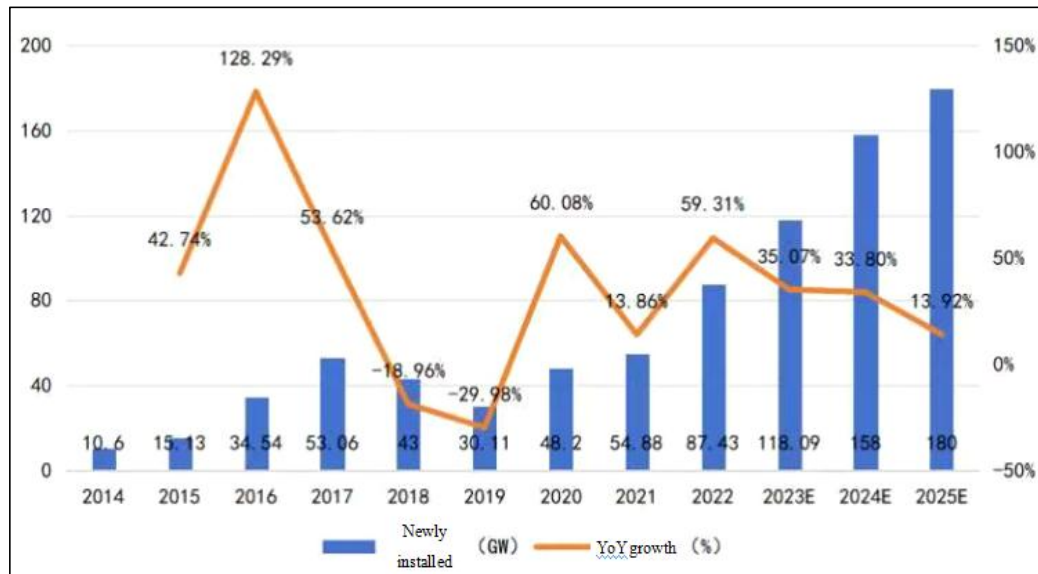
Using the agricultural production as an example, the development of a green industry and the implementation of a rural revitalization strategy have driven a large number of farmers to find jobs and advance the agricultural production to the forefront of the whole agricultural industrial chain. However, farmers in China are generally poorly educated, and their scientific and cultural levels restrict the application of the advanced technology and equipment in agricultural production, which also leads to the high agricultural production costs, low economic benefits, poor competitiveness and a small ability to resist risks, and a serious agricultural three-dimensional pollution. However, with the engagement of high-quality "new farmers" in the agricultural production and construction, the advanced green production knowledge and green scientific and technological means have been applied to traditional agriculture, and smart devices, big data, intelligent systems and water-saving systems have been used in the growth and management of farmland or plants, which is conducive to reducing the use of pesticides and fertilizers and saving the input resources, thus

providing conditions for helping the agriculture achieve a green and low-carbon development. In addition, the agricultural production can also expand to include the many branch industries, such as smart agriculture, sightseeing agriculture, and bio-agriculture and the carbon market, etc. These branch industries can transform the original one-way production mode into a multi-way production mode, forming new formats and new modes to reversely feed the green and low-carbon development format of agriculture.

In terms of new energy, the green economy is reshaping the global energy employment market, and an ever-increasing amount of attention by the international community has been paid to the development and utilization of renewable energy. China has provided an important policy support for promoting the energy transition. With the inclination of macroeconomic fiscal and financial policies to green and low-carbon industries, a large number of new energy companies related to the wind energy, photovoltaic solar energy, lithium battery and hydrogen energy have been spawned, which has promoted the clean and low-carbon transition of China's energy structure. Using photovoltaic industry as an example, in a situation of carbon peaking and the carbon neutrality, with the launch of other relevant policies, the economic benefits of the photovoltaic power generation are obvious which highlights the fact that the photovoltaic power generation industry plays an increasingly important role in China's energy structure and strategy. According to the data of the Energy Administration (2022), the newly installed capacity of photovoltaic power generation facilities in China has continued to grow since 2019. In 2022, the newly installed capacity in China was 87.43 million kilowatts, accounting for 32.28% of the newly installed capacities in the world, and it was predicted that it would reach 118.09 million kilowatts in 2023 (as shown in Graph 1).

In terms of the manufacturing industry, the gathering of green talents has accelerated the improvement in raw material/fuel substitution and the process technology around the low-carbon transition and the upgrading of the manufacturing industry, thus making breakthroughs in key low-carbon technologies such as the industrial energy conservation, zero-carbon electricity, industrial process optimization, carbon capture and carbon sink. The cement production industry is a big emitter of carbon dioxide. In the context of carbon reduction in China, it is bound to face a severe environmental protection ordeal. Conch Cement, as one of the benchmark manufacturing enterprises in China, has been strengthening research and development as well as promoted the emission reduction of carbon in production process, the reduction in carbon emissions in the course of the production energy consumption, the reduction in carbon emissions in new technologies and a new energy technology since the "Thirteenth Five-Year Plan." It has not only built the world's first project for cement kiln carbon capture demonstration and a dry ice production line, creating a precedent for the cement industry to capture carbon dioxide, but also actively laid out some new energy technologies to use in in the photovoltaic power generation, wind power generation and energy storage industries on the roofs and in open spaces of buildings and structures to achieve an emission reduction. Through tackling the key problems in green technology, Conch Cement successfully led and promoted the large-scale, intensive and green development of China's cement equipment technology, and promoted the achievement of the "dual carbon" goal at the cement industry enterprises as well as the development of China's green and low-carbon industry and circular economy.

Graph 1 2014-2025 China Forecast of the New Installed Capacity of Photovoltaic Power Generation



Source: Energy Administration

Green finance is gradually becoming an important guarantee to promote the green and low-carbon economic development. Green and low-carbon development often requires high cost and investment at the early stage, while the return period of green benefits at a later stage is relatively long, which easily leads to the unwillingness of traditional finance to support these relatively unfamiliar green projects. Furthermore, green technologies, green projects and green industries, which represent the new driving force of the green development and green economic transformation, will be eliminated in the course of the market competition because of financing bottlenecks. However, the increasing number of employed entrepreneurs in the green finance sector will improve this situation. All kinds of financial institutions, including banks, are channeling more social capital from high-pollution and high-emission industries to green industries, following the principles of a market economy, and effectively reduce the financing costs during the development of green industries, as well as ensure favorable conditions for the development of green industries such as the green upgrading of infrastructure, clean energy, energy conservation and environmental protection. In March 2022, Chongqing Bank, as an innovative institution, launched the “Emission Right Mortgage Loan,” which took the emission right of the chemical oxygen demand, ammonia nitrogen, sulfur dioxide and nitrogen oxides held by the company as collateral and granted it a loan of RMB100 million. It can be seen that as financial institutions continue to explore new products and models of financial support for green development, the “green assets” have also become a financing tool, which greatly relieves the financing pressure of enterprises. At the same time, finance, being the “blood” of the real economy, has played the dual roles in serving and guiding economic development. Green finance, an innovative model to promote sustainable economic development, has gradually become an important driving force to realize green development in China because it provides financial services for economic activities that support environmental improvement, cope with the climate change and efficiently save and use resources.

Green jobs have promoted the optimization of the industrial structure

The adjustment and optimization of the industrial structure is of a great significance to the low-carbon development of the industry. The international experience shows that, if the coordination between the transformation of the industrial added value share and the transfer of industrial employees' share cannot be properly handled, it will easily lead to a premature deindustrialization. Specifically, the reverse increase of the proportion of employees in the traditional primary industries and the secondary industries is achieved at the expense of the environment to improve the income level, which finally hinders the sustainable development of the economy. In order to promote the adjustment and optimization of the industrial structure, the development should be promoted of enterprises with a high conversion rate and a low energy consumption, while providing a perfect market exit mechanism for the enterprises with a backward production capacity and a high pollution, or promote the merger of enterprises with a high conversion rate and a low energy consumption and other backward enterprises, so as to achieve the smooth transition of the industrial structure.

Green jobs can promote the development of green industries. With the gradual expansion of the development scale of green industries such as renewable energy, emerging industries and high-tech industries characterized by low carbon emissions, green principles and the environmental protection, the industrial structure supporting the economic development has been optimized. That is, while the three major industries are undergoing a low carbon transformation, the primary and secondary industries with a low added value and a high energy consumption are transforming into the tertiary industry with a high added value and a low energy consumption. For example, in the process technology research and development aiming at improving the utilization rate of materials, more resources, including manpower and capital, are continuously invested. It often leads to the reduction of the production and supply of basic materials, which creates a favorable development environment for the service-oriented tertiary industry, as well as drives the development of investment departments, thus promoting the transformation of the economic structure from the primary industry to the tertiary industry.

It is evident that with the development of green jobs in the future, the development scale of the green industry and green economy will continue growing, and the proportion of low-carbon industries in the domestic economic development will gradually increase, while the impact on domestic economic development of high-carbon industries, especially heavy industries such as power generation, steel and automobiles, will continue to decrease. At the same time, the industrial development can also determine the scale, structure and flow trend of labor and employment at the industrial scale with due regard to the structure and future development prospects. With the upgrading of the industrial structure and the transformation of economic structure to the tertiary industry, the development of jobs related to the tertiary industry can be promoted. As a "reservoir" of green jobs, the tertiary industry can further play its employment recruitment role and provide a broader space for the promotion and popularization of green jobs. In a certain sense, the green jobs and the industrial structure optimization complement and promote each other, which ultimately provide support for the sustainable and high-quality development of the economy.

To sum up, the high standards and requirements of green jobs for employees have accelerated the innovation and application of green technology in all walks of life, changed the production methods of the traditional agriculture, industry and service industry, further stimulated the vitality and creativity of the domestic production,

improved the labor productivity and raised the resource utilization rate of traditional industries, effectively promoted the energy conservation and emission reduction as well as promoted the green development, and greatly enhanced the greening degree of the three major industries. In addition, green jobs also have catalyzed the migration and re-matching of various resources among industries, gradually making the existing factor distribution mode adapted to the needs of the industrial structure adjustment, which is of great significance for maintaining the sustainable, healthy and resilient development of the domestic economy.

3. Green jobs promote a coordinated development of the regional economy

Green jobs promote sustained increase of income

Employment is the foundation of people's livelihood. Especially in the recent years, with the acceleration of the construction of ecological civilization, the green jobs have become one of the main channels of employment for people in the ecological conservation areas, which is of a great significance for the economic prosperity and social harmony and stability of underdeveloped and poverty-stricken areas. Therefore, it is vital to unswervingly combine the construction of the natural environment with the promotion of farmers' employment and an income increase, and to further promote green jobs against the background of strengthening the construction of natural environment.

The population in poverty-stricken areas in China is mainly distributed in mountainous areas with an underdeveloped transportation, but these areas are generally rich in natural resources such as opportunities for photovoltaic power generation and the wind power. Qiao Linan and Lu Xiaoli (2022) further emphasized that the ecological civilization construction and the implementation of the dual carbon policy would undoubtedly drive the investment and business activities of local enterprises, thus further broadening the employment channels for local farmers. Theory and practice have proved that increasing employment is the most effective and direct way to get rid of poverty. As long as employment is stable, income can increase and people will have more confidence in their lives.

For example, relying on key ecological construction projects in forestry and rural areas in the underdeveloped and poverty-stricken areas, we will vigorously develop green jobs such as forest land keepers, plant maintainers, biogas station administrators and environmental monitors. While adhering to the principle of "proximity and locality," public-service jobs should be adjusted, optimized and established according to local conditions, and qualified poverty-stricken people should be hired, so that they can get employed and earn money nearby while guarding green mountains and clear water.

At the same time, the development of green jobs not only promotes the net growth of the total employment and the continuous improvement in the employment rate, but it also increases the wage income and the income from production and operation of the currently employed persons (Li Hong, 2011). Taking the ecological project of carbon sink targeted poverty alleviation in Liuzhou City, Guangxi Province as an example, under the pilot assistance project of carbon sink poverty alleviation in designated regions, the local characteristic fir tree is set as the unit of the carbon sink value index, and every poverty-stricken household can participate in the carbon sink project by

planting fir trees. It is estimated that it will bring thousands in extra income to poverty-stricken families every year. This initiative has created a new ecological poverty alleviation model integrating the Internet, ecological construction and targeted poverty alleviation, which not only increases farmers' income from the agricultural production and operations, but also contributes to environmental protection.

Green jobs help the coordinated regional development

The rise and promotion of green jobs cannot be separated from the vigorous development of green industries. The expansion of green industry scale can not only directly create many jobs, but also indirectly give birth to a large number of jobs derived from related industrial chains, and further play a role in increasing the employment rate. At the same time, the development of green industries is also an important part of promoting the high-quality economic development and high-quality coordinated regional development.

In China, the economically developed eastern coastal areas need a large amount of energy from the central and western regions, while the central and western regions need green technologies from the eastern region to improve the energy efficiency and develop clean energy facilities. Therefore, the vigorous rise of green jobs provides a feasible way for a coordinated regional development. It means that, by vigorously promoting green jobs, it promotes the inter-regional joint creation of high-end industrial chains with advanced technologies, a big amount of the added value and a low carbonization, as well as realizes the cross-regional industrial integration development and a low-carbon transformation of the industrial structure.

The inter-regional industrial cooperation is mainly based on platforms such as organizing the industrial transfer demonstration zones and cross-provincial cooperation parks, and also involves the industrial cooperation bases and deep processing bases of resources jointly built in the developed areas and underdeveloped areas, the environmental protection areas and the resource consumption areas. Using the Ningxia-Hunan cooperation as an example, Ningxia is rich in coal, wind energy, solar energy and other resources, while Hunan has a relatively insufficient amount of energy resources. It is located at the double end of the energy and power flow in China, and its dependence on the out-of-province energy is over 80%. In contrast to the abundant resource endowment and a sluggish economic development in Ningxia, there is a sustained and rapid growth in the electricity demand and a relatively mature resource development technology in Hunan. In 2021, Hunan and Ningxia Provinces in China started building the UHVDC transmission line project of "Electricity Input from Ningxia to Hunan," which is expected to increase the electricity consumption of Hunan by 1/6 after being put into operation, and make a full use of the scenery resources of the Gobi Desert and the desert in Ningxia to promote better, the cross-regional optimal allocation of clean energy in Ningxia, increase the proportion of the clean energy consumption in Hunan, effectively reduce carbon emissions and accelerate the construction of a clean and low-carbon energy supply system. The Xiangning New Energy Equipment Manufacturing Industrial Park and a large-scale wind and power photovoltaic base will create 5,000 new jobs and a tax revenue of RMB2.3 billion for the local area and accept about 230,000 poor people in the Xihaigu area to settle down there (*China Business Daily*, 2022).

The above cases show that the regional coordination can optimize the combination of resource elements and green technologies in a larger spatial range by giving a full play to the comparative advantages of each region, and optimizing the spatial layout

of industries. This can not only improve the efficiency of resource utilization, promote the diffusion of green technologies, solve the contradictions between supply and demand in the regional distribution of energy resources and green technologies, but also narrow the development gap between regions, promote a coordinated regional development and achieve win-win results.

To sum up, green jobs play a very important role in promoting the coordinated development of the regional economy. On the one hand, green jobs broaden the employment channels of people in poverty-stricken areas, promote the net increase in the total employment, and improve wage income and the income from production and operations through various channels, thus achieving a rise in both the amount and the quality of employment opportunities. On the other hand, green jobs connect the superior resources in poverty-stricken areas to the domestic green project trading market, which is conducive to narrowing the development gap between regions, realizing the green coordinated development and enhancing the sustainability of economic development between regions. At the same time, the inter-regional coordinated development can further unleash the economic vitality, while the high-quality economic development can provide a continuous impetus for green jobs, making the economic development and green jobs complementary to achieving a virtuous cycle.

4. Green jobs enhance the inclusiveness of the economic growth

Inherent requirements for the inclusive economic growth

In the recent decades, many developing economies have experienced a rapid economic growth, which has greatly reduced the number of people who are poor, but this has also caused a series of development problems. The most prominent problem is an unfair income distribution. While the incidence of absolute poverty has dropped significantly, the incidence of relative poverty has been increasing. According to an economic theory, the economic growth can alleviate poverty through the trickle-down effect, but the outcomes of the economic growth are not equally enjoyed by all members of the society, which means that most of the outcomes of the economic growth are enjoyed by a few people (Luo liangqing and Ping Weiyong, 2020). It is evident that the economic growth does not necessarily alleviate poverty. Therefore, many scholars and international organizations advocate attaching importance to the equal access to opportunities in the process of pursuing the economic growth, and the concept of “inclusive growth” came into being.

“Inclusive growth” is a developmental concept first put forward by the Asian Development Bank in its research report entitled *Toward a New Asian Development Bank in a New Asia* in 2007, and then gradually improved on by major international organizations. The concept of inclusive growth originally put forward by the Asian Development Bank focuses on the equal access to opportunities. Ali and Zhuang (2007) thought that the inclusive growth emphasized the equal access to opportunities and the sharing of development results on this basis, while Klasen (2008) thought that the inclusive growth must boost the growth of incomes of poverty-stricken people as compared to those of non-poverty-stricken people. Domestic scholars’ definition and connotations of the interpretation of this concept have basically elaborated on this idea. Zhang Jianhua (2010) pointed it out that as far as an economy is concerned, the inclusive growth should ensure that all social brackets can participate in and benefit from the development process on an equal footing. Wang Hongru (2010) further proposed that the inclusive growth should have

various meanings, including changes in the environmental protection, social harmony and many other aspects. Although the above-mentioned definitions and connotations of the inclusive growth have their own emphases, the basic points focus on equal access to opportunities, sharing the achievements and the sustainable development, which shows that the “inclusive growth is an economic growth paradigm that advocates equal access to opportunities. In a word, inclusive growth not only emphasizes the results of the economic growth, but also pays attention to the process of the economic growth. Its core essence is equal access to opportunities and the participation in the sharing: the concept strives to make all economic entities share in the fruits of the economic growth fairly and reasonably.

Green jobs and the inclusive economic growth

Promoting the inclusive growth is a realistic choice in the today's society. Taking the green jobs as a starting point, the economic recovery has made remarkable achievements in expanding the employment, focusing on poverty reduction and industrial optimization. However, the development of the inclusive growth in the field of economic and social development needs to be discussed further. To strengthen the recovery policies and their supporting methods aiming at the “inclusiveness” while paying more attention to the social well-being, happiness and equalization of social resources, green jobs will further contribute to the mainstream concepts of economic recovery such as promoting gender equality, caring for vulnerable groups and pursuing fairness and justice.

Women's equality and employment rights have always been the focus of social attention. The United Nations 2030 Agenda for Sustainable Development regards the achievement of gender equality and safeguarding women's employment rights as the fifth sustainable development goal. The United Nations Environment Programme (2021) pointed it out in its research report that women's unique sensitivity and crisis awareness can play an indispensable role in the natural environment protection, and promoting women's participation in green jobs will become an important means of promoting the inclusive growth and sustainable development. In addition, with the continuous advancement of the carbon reduction, the concept of ESG has been widely spread to capture the public awareness, and the job vacancies and talent demand in the related fields have greatly increased.

As ESG itself focuses on the gender equality, diversity and inclusion, as well as women's characteristics in physiology, psychology, personality and social roles, it makes it easier for women to develop an interest in such jobs. The results of the big data analysis for the wider green industry also confirm this view. The *Green Skills Report* (2022) of LinkedIn shows that since 2015, all economies and regions that were surveyed have increased the proportion of female green talents, from an average of 6.4% in 2016 to 8.9% in 2021, and in one-half of the economies surveyed, the gender gap has narrowed, and the growth rate in the proportion of female green talents is obviously greater than that of male green talents. In addition, women have some special advantages in the publicity and education of the green concept, and their own image characteristics will make the green concept accepted more easily by people and deeply rooted in the hearts of people.

Relevant data show that the representation of women at scientific institutions such as the Intergovernmental Panel on Climate Change (IPCC) has been low, but since the 1990s, the number of main female authors of IPCC reports has been growing slowly. In the latest IPCC assessment report, 33% of the authors are women, which is higher

than 21% in the previous assessment report. This means that with the promotion and popularization of green jobs, women's "green potential" is being continuously released. At the same time, in addition to providing more support to women in terms of policies and funds, some Western economies also constantly improve women's leadership through professional training, help women complete better when planning careers, and improve their participation rate in green jobs and green trainings, which is also an important link in the development of green jobs. It can be seen that green jobs can provide more jobs for women, which is conducive to ensuring the equal employment opportunities for women and the elimination of the gender discrimination, thereby increasing the employment rate of women and fully leveraging their role in the social and economic growth.

The development of green jobs needs the support of talents, and it is necessary to ensure the supply quantity and quality of the labor force of green jobs. Therefore, competent departments often take various measures to strengthen the green job education and training, so as to ensure that the green job labor force can better master the relevant industry skills. In this way, green jobs provide more employment and entrepreneurship opportunities for vulnerable groups in the society such as the elderly, the disabled and the laid-off workers. Yue Hongfei (2017) pointed it out that green jobs have stronger regional and social characteristics compared to the traditional jobs. Green jobs are easily gathered in a community or a village, which is conducive to local people's "nearby" participation in labor. It provides convenience in terms of both the time and space for local unemployed people with disabilities, coupled with the geographical clustering characteristics that help the local departments in providing professional guidance and support, and carrying out the employment and entrepreneurship trainings as well as providing employer training services, which can effectively improve the quality of employment for disabled people.

Using the Zanggai Village, Xinjie Hui Township, Guide County, Hainan Tibetan Autonomous Prefecture, as an example, 10 million poverty alleviation funds were allocated, built a 320-square-meter seed bank, set up a professional vegetable planting cooperative, vigorously developed the village-level green industries, liberated idle rural workers including older workers, the unemployed youth and disabled people, as well as drove thousands of poverty-stricken people to find jobs nearby. Owing to the setting up of a "new agricultural technology training class" in the village, all villagers are taught the practice of breeding and planting related agricultural technologies free of charge to improve farmers' own ability to become rich and drive more farmers to plant economic crops, such as vegetables, to achieve the goal of increasing farmers' income and the agricultural efficiency. In a word, green jobs can better eliminate poverty and improve the quality of social and economic development.

Green jobs enable more people to get decent work opportunities and a proper social security. In addition to reducing unemployment and promoting equal employment, improving employees' access to social security and welfare is an essential component of the sustainable and inclusive growth (Li Hong, 2011). Specifically, the inclusive growth should eradicate illegal recruitment such as forced labor and child labor to provide the employees with a fair income, a safe workplace, strong social security and better personal development prospects, as well as realize the concept of a "decent" employment. In this regard, the International Labour Office (2011) believes that increasing industry regulation and public support is the key to achieving decent green jobs. Compared to the traditional high-polluting industries, workers in low-carbon industries are less exposed to pollutants and dangerous working environments, so they have certain advantages in ensuring the safety and reducing health risks. This feature also enables disabled people to work more comfortably. In addition, as a new

employment field, the rapid development of green jobs has been supported by all sectors of the society. In particular, with the support of local governments, through the strengthening of the standardized management and providing basic medical care, education and social welfare, the work quality and workers' income of existing green jobs have been significantly improved, making their treatment better than that of the same "gray" employees in traditional industries. From this point of view, green jobs can provide people with high-quality employment opportunities that stimulate the economy without harming the environment as well as create high-quality conditions for a sustainable growth of the society.

In a word, the purpose of green jobs and the inclusive growth is essentially the same. Green jobs can bring about the important opportunities to reduce poverty and inequality, and this transformation of the mode of economic development can make a significant contribution to the inclusive growth. Furthermore, the two development strategies of the inclusive growth and green jobs can be coupled to open up a new model of "inclusive green growth." Specifically, while pursuing economic growth, it not only emphasizes the fact that all economic individuals participate in the process of economic growth equally and share in the outcomes of economic growth, but it also incorporates the resource and environmental carrying capacity and the environmental capacity into the economic system decision-making and emphasizes the resource efficiency improvement and the protection of the environment. In this way, the inclusiveness and the green growth can be taken into account at the same time, so as to fully reflect the requirements of sustainable development and enhance the resilience of the economic development in the post-COVID-19 era.

V. Needs and Challenges of Green Jobs in Promoting a Resilient Economic Recovery in the Post-COVID-19 Era

To solve the economic downward pressure caused by the impact of COVID-19 and achieve a resilient economic recovery in the post-COVID-19 era, the “green jobs” is a priority development field. Green jobs can promote the environmentally friendly development as a part of the economic development, environmental protection and employment promotion, while playing a positive role in accelerating the industrial transformation, improving the coordinated regional development and promoting the inclusive development.

Using China’s digital economy as an example and the strong development of the digital economy is an advantage here, many enterprises in China have shown their great resilience in responding to the pandemic. During the pandemic, 60% of enterprises in China maintained their production and business activities owing to their flexible modes of operation such as working from homes or having automated offices, and 20% of enterprises shifted to the on-line production. The carbon dioxide emissions in the two weeks after the Spring Festival in 2020 have decreased by at least 25% as compared to the same period of the last year (Bai Yating, 2020). It has been proven that a green production mode is not only an important measure to respond to the climate crisis, but also has a positive significance in improving the ability to respond to various crises and in enhancing the development resilience. Green jobs have formed a good link between the crisis response and the economic recovery, and it is a wise choice to take green jobs as a breakthrough point for achieving a resilient economic recovery in the post-COVID-19 era.

In the recent years, green jobs have gradually become a consensus in all respects, and a great progress has been made in the development of green jobs. Many economies and regions have implemented a series of positive policies and measures to energize the green jobs. Under the guidance and promotion regulated by various policies, a large number of new green jobs have emerged, the green transition of the existing jobs has been accelerated, and the green job system has gradually taken shape, in line with which, the number of workers with green skills is also growing. In this regard, China is at the forefront of the world, with a third of the world’s wind energy and a quarter of the world’s solar energy capacities. China is also a leader in low-carbon transportation such as the high-speed railroads, bike-sharing and electric vehicles. Six of the world’s top 10 solar panel manufacturers are Chinese enterprises, and four of the world’s top 10 wind turbine manufacturers are Chinese enterprises. Various policies conducive to the green development and carbon emissions reduction are also continuing to be effective.

However, it should be recognized that the development of green jobs is still insufficient and immature, and the further development of green jobs and the realization of long-term goals have put forward some new demands to all the aspects. Although the new policy measures have greatly promoted the green transition of employment, there is still much room for development and improvement in their adequacy and feasibility. Although the green job system can basically reflect the current market demands, it is still necessary to improve further its standardization and completeness. There is a big gap in the supply of labor with green skills, the mismatch of labor skills and insufficient skill levels, which are widespread and the response of the vocational education and training system to the green job demand lags behind. The long-term support system for the development of green jobs is not sufficient, and the green standard system needs to be established and improved. At the same time, due to the difficult expectations regarding the green transition themselves and the

downward pressure brought to bear by the impact of the pandemic, the development of green jobs is facing many challenges, including the difficulties in the job creation, the skills improvement, overcoming the development inertia, solving the problem of fairness in the transformation and reversing the social concepts. Facing the difficulties and challenges of development, more powerful countermeasures are needed.

Only by recognizing the current situation of green job development, analyzing the demand for green job development, and recognizing the potential challenges that green job development may face, can we better achieve the goal of the green job development and promote the resilient economic recovery after the pandemic.

1. The practice and new developments of green jobs

The top-level design of green jobs is improving

Given the increasingly acute contradiction among economy, environment and employment, the “green jobs” have become an important starting point for seeking a balance among economic development, environmental protection and employment promotion. The development of green jobs has a positive effect on improving the employment, promoting the industrial structure upgrading, promoting the coordinated regional development and achieving an inclusive growth, and the concept of green jobs has gradually become the consensus of all walks of life.

Guided by the green development concept, APEC member economies have implemented a series of supportive policies to promote the development of green jobs. Developed economies are relatively at the forefront with Australia; Japan; and the United States implementing a series of policies, bills and measures, which provide support for the rise and development of green jobs, creating a series of green jobs and providing green job skills trainings for the labor force. Developing economies have also implemented many policies and measures to promote the development of green jobs. For example, the Philippines enacted the *Green Jobs Act* in 2016, which created and incentivized the development of green jobs in the form of legislation. The act emphasizes the role of labor in the sustainable development and provides an important legal guarantee for the seamless and fair transition in the employment field. Peru, in its *Decent Job Plan*, emphasized the necessity of providing green jobs in the process of increasing the productivity and transitioning to a green economy. Thailand has implemented the *Labor and Human Resources Development Plan* related to the green job skills of the labor force, providing the labor force with opportunities to receive a labor skills training. Specific measures include the implementation of the *Skills Development Promotion Law* in 2002, aimed at providing a skills training for 100,000 to 200,000 people annually, and the establishment of the Manufacturing Automation and Robotics Academy (MARA) to provide a skills training required for the electric vehicle industry. China attaches a great importance to the development of green jobs, and green industries flourish with the support of relevant policies, which indirectly drives the development of green jobs. These policy measures include guiding documents such as the passage of the *Plan for Climate Change* in 2007, as well as some pieces of legislation such as the *Renewable Energy Act* in 2005 and the *Circular Economy Promotion Law* in 2009. In response to the impact of the pandemic, green jobs have also played a certain role. Using Hong Kong, China as an example, in order to mitigate the impact of COVID-19 and promote economic recovery, Hong Kong, China launched the Green Employment Scheme, which created about 1,000 jobs in 2022. During the COVID-19 pandemic, Hong Kong, China, launched the Graduates Subsidy Programme to subsidize private companies and organizations to

employ over 800 graduates to work in environmental protects-related areas, and provided them with professional training through the “GreenPro Training Programme.”

However, considering the various policies that have been introduced in various economies, the supporting measures for green jobs are still lacking, especially in the developing economies. Most economies have realized the importance of a sustainable development and implemented a series of policies and measures to promote the green development. However, many economies do not pay enough attention to green jobs. For example, Peru has promulgated the *Decent Job Plan* and mentioned green jobs, but it did not provide any specific measures for the development of green jobs. Although Indonesia has implemented various policies to promote the development of new and renewable energy, waste recovery and utilization, there is no policy that is directly related to employment. Although China has implemented a large number of green industrial development policies and achieved some effective results, indirectly promoting the great development of green jobs, the policies directly pointing to green jobs in the employment field are relatively lacking. The lack of green job policy may affect the green transition of jobs. As a result, green jobs become a weak link in the development of green economy. Following up the green measures in the employment field is an urgent need for green job development and even the overall development of the green economy.

In terms of policy implementation, there are also some problems with the existing policies. In the case of the Philippines, for example, the implementation of the *Green Jobs Act* has been weak due to a lack of policy coherence, budgetary and human resource constraints and a weak political will, which does not meet the policy vision of its enactment and implementation. The development of China’s photovoltaic industry is a more specific example. The photovoltaic industry is a strategic emerging industry supported by China. In 2009, China successively issued the *Notice on Issuing Guidelines on the Application for Solar Photovoltaic Building Application Demonstration Projects* and the *Interim Measures for the Administration of Financial Subsidies and Subsidies for Golden Sun Demonstration Project*, and implemented a series of subsidy policies. China’s photovoltaic industry thus entered its infancy period. However, due to the main methods of prior subsidies and direct allocation at this stage, some enterprises defrauded subsidies and sought rent, and there is a collective defrauding of financial subsidies in some areas. But it is undeniable that the policies at this stage have played a great role in promoting the development of the photovoltaic industry. In 2013, China’s photovoltaic industry entered a period of growth, and the industry began to develop on a large scale. However, the large subsidy gap and low-end products began to appear, so the subsidy policy has also turned to post-subsidies and differentiated subsidies. Since 2018, China’s photovoltaic industry has begun to transition to maturity, the negative impact of subsidies exceeding reasonable limits has been expanding, and even the adverse consequences of the paying for the development of the photovoltaic industry have also affected the subjective initiative of enterprise innovation to a certain extent, destroying the market rules. In general, the subsidy policy of the photovoltaic industry has a positive overall impact on the development of the photovoltaic industry, but the deviation in the implementation process also has some negative effects, which cannot achieve the ideal result of the policy promulgation and indirectly affects the potential of the photovoltaic industry to create jobs (Shi Yi et al., 2023).

It can be seen that the top-level design related to the development of green jobs is being established and improved gradually, and has played a positive role in the development of green jobs. However, it must be recognized that there is still room for improvement of the relevant policies and measures, and a more complete policy

system would be necessary to utilize the advantages of green jobs for the economic and social development.

A green job system is taking shape

Promoting the economic recovery and creating decent jobs through developing a green economy is the basic logic of developing green jobs in the post-COVID-19 era. Following the taking of various incentive measures, the green transition of the economy has begun, and a green job system suitable for the green economy is being established, reflecting the demand of green development for the labor market.

As demonstrated in the *2022 Global Green Skills Report* by LinkedIn, the demand for green technology jobs in enterprises is increasing at an annual rate of 8% (LinkedIn, 2022), and the number of green jobs is constantly increasing. The growing number of green jobs includes both new jobs created to protect the natural environment and existing jobs that have undergone a green transition. From 2016 to 2021, the five emerging green jobs with the fastest growth rate were: sustainable development managers, solar consultants, ecologists and environmental, health and safety experts. In addition, green jobs such as compliance managers, facility managers and project sales representatives are also growing rapidly (LinkedIn, 2022). It can be seen that a green job system that meets the needs of the green job development is gradually taking shape. The establishment of this system reflects the trend of the supply and demand relationship transformation in the human resource market, that is, the demand in the labor market will continue to shift from traditional jobs to green jobs. According to statistics, by 2019, the total number of urban green jobs in China has exceeded 45 million (Center for Labor Market Research, Beijing Normal University, 2021).

However, the large-scale transfer of labor force indicates that the existing job system cannot meet the needs of the future development. According to the International Labor Organization (ILO), by 2030, the development of the green economy will create 2,400 jobs, and the existing 1.2 billion jobs will be affected, of which 6 million jobs will be eliminated (International Labor Organization, 2018). In China, a total of 127 green jobs were marked in the 2015 version of the *Occupational Classification Code*, and the number increased to 133 in the 2022 version.

To sum up, the green job system that is compatible with the development of green jobs has begun to take shape, reflecting the current situation of the vigorous development of green jobs, but at the same time, the construction of the green job system is lagging behind and is insufficient. It is quite urgent to improve the green job system for giving full play to the role of green jobs in improving the labor structure and promoting the comprehensive, coordinated and sustainable development of the economy and the society.

Green job skills of the labor force have been improved

In line with the increasing demand for green jobs, the green job skills of the labor force are also continuously improving. According to the *Global Green Skills Report 2022* (LinkedIn, 2022) released by LinkedIn, from 2016 to 2021, the proportion of green talents in the global talents pool increased from 9.6% to 13.3%, with an annual growth rate of 6% and a cumulative growth rate of 38%. Policy initiatives related to skills upgrading for green jobs are also gaining momentum. For example, Australia has issued a series of long-term skills training strategies at the domestic level, such as the

action plan for the sustainable development of education and the domestic policy and action plan for the sustainable development of vocational education and training. In 2009, Australia's Prime Minister announced that 50,000 new green jobs and training opportunities would be provided to young people, especially the long-term unemployed persons and apprentices (Yang Hua, 2016). China attaches a great importance to the training of green talents. The Ministry of Education pointed it out in the *Work Plan for Strengthening the Construction of Carbon Peaking and Carbon Neutrality Higher Education Talent Training System* that it is necessary to strengthen the green and low-carbon education, promote professional transformation and upgrading, speed up the training of urgently needed talents, and deepen the integration of production and education, etc., providing strong talent security and intellectual support for achieving the goal of carbon peaking and carbon neutrality. In this context, an ever-increasing number of universities have laid out the field for "carbon neutrality" and set up relevant colleges and research institutes to explore the training mode of green talents.

However, the gap of green job skills of the labor force still exists. The average annual growth rate of green talents is only 6%, which is somewhat lower than the average annual growth rate of 8% of green jobs (LinkedIn, 2022). The existing workers at green jobs also have insufficient skills. The *2022 "Dual Carbon" Talent Insight Report* (Climate Action Youth Alliance, 2022) shows that some workers temporarily decided to enter the low-carbon industry due to the favorable carbon reduction policies, and their mastery of relevant job skills is not sufficient. At the same time, the low skill level of labor force also affects the supply of green talents. Using China as an example, against the background of green job transition, nearly 100 million workers are facing cross-industry employment, accounting for 13% of China's initial employment level, among which low-skilled people account for 96%, which cannot meet the demand of green jobs. The impact of the pandemic makes this contradiction more prominent. The demand for low- and middle-skilled labor has dropped by about 19-27%, while the demand for high-skilled labor has only dropped by 15-18%. The number of low-skilled labor among the employed people affected by the pandemic is 18 times that of high-skilled labor (Zheng Xinzhu et al., 2021). And the supporting green job skills training system is not perfect. According to the *Future of Jobs Report 2023* of the World Economic Forum, by 2027, 60% of employees will need to receive training, but, at present, only one-half of employees can get enough training opportunities. At the same time, the report also pointed out that about 44% of each employee's skills need to be improved, indicating that vocational skills education and training have room for improvement and a motivation for development in the population covered and the quality of training.

The COVID-19 pandemic has had a negative impact on the vocational skills training, and the long-term actions to deal with the crisis have brought about a serious confusion to the education system, which not only hindered the transformation and development of vocational skills education, but also affected the operation of the existing vocational education and training institutions, causing an unprecedented delay and decrease in the number of graduates in the field of higher education (United Nations Environment Program and the United States Partnership for Sustainable Development Education, 2021). Reversing the existing chaos and gradually achieving green transition are the problems that should be solved in the current vocational and technical education and training system. At present, one-third of the young labor force in the world still lacks a set of basic job skills (International Labour Organization, 2023), especially in the field of green jobs. As a result, a large number of young labor force will flow to low-quality and low-level jobs, and even face unemployment, which has a negative impact on the social well-being.

Generally speaking, at present, the number of labor force with green skills is growing, and the green job skills of labor force are also improving, but the number of labor force with green skills cannot meet the demand of green jobs, while the labor skills of green practitioners are misplaced with the requirements of green jobs, the demand of green jobs for labor skill level structure is inconsistent with the existing labor skill level, and the education and training system that meets the requirements of improving green skills is not perfect. Many complex problems exist at the same time, becoming an obstacle to the development of green jobs. The impact of multiple crises such as COVID-19 has exacerbated these problems, affected the benign economic recovery from the pandemic, and intensified the risk expectations of green transition, unable to meet the needs of inclusive growth.

2. New demand for the green job development

An analysis of the labor market changes and green job demand after the COVID-19 pandemic

Under the background of COVID-19 pandemic, the traditional employment mode has been impacted, and technological progress has given birth to a new employment mode. The background of economic recovery after the COVID-19 pandemic provides an opportunity for the transition of the employment mode, while green job is the starting point of the transition. Realizing a more inclusive, just and sustainable transition is the main development field of the current job.

The changes brought by the COVID-19 pandemic to the labor market are mainly reflected in the following three aspects: Firstly, due to the economic downward pressure brought by the COVID-19 pandemic, various industries have been affected to varying degrees, and some enterprises, especially small and micro enterprises, have experienced difficulties. The demand for employment has decreased compared to that before the COVID-19 pandemic, directly leading to an increase in unemployment among workers. Secondly, the decrease in income and the heightened sense of crisis under the impact of the COVID-19 pandemic have affected consumer demand, further affecting the economic recovery after the COVID-19 pandemic. Thirdly, the development of on-line work and new employment mode has led to an increase in the demand for on-line and platform employment, which is a new development opportunity brought about by the COVID-19 pandemic. With the rapid popularization of Internet technology, the new employment mode represented by platform employment has been developed under the COVID-19 pandemic, and new employment modes such as rural e-commerce and on-line office have been rapidly popularized. Compared to the traditional employment mode, the new employment mode has unique advantages in promoting employment in the situation of the COVID-19 pandemic.

From the long-term impact of the COVID-19 pandemic, the differentiation of the labor force among different sectors may also be intensified, becoming a major problem that the labor market needs to face in the future, and the imbalance in the employment field is a problem that the future employment policy needs to focus on. First of all, there are obvious differences between industries affected by the COVID-19 pandemic. From the recruitment demand in the first quarter of 2020 in China, the cultural media industry and the service industry are the most affected, and the number of jobs has dropped by more than 40%. Followed by the cultural and sports education industry, IT Internet industry, financial industry and the trade wholesale and retail industries, the decline rate is between 30% and 40%. The decline rate in agriculture, forestry, animal

husbandry, fishery and manufacturing is between 20% and 30%, while real estate, transportation and business services were relatively less affected by the COVID-19 pandemic, ranging from 10% to 20%. The least affected industries are non-profit organizations and the energy and mineral industries, with a decrease of less than 10% number of jobs compared to 2019 (Lu Hai et al., 2020). For transition towards green jobs, it means that different industries face a different nature and degree of impact. For example, the energy and mineral industries that are greatly more affected by the transition, a smaller employment impact means a more stable transition environment, but it also means a huge challenge of labor skills transition. The green transition of the service industry is facing the problem of a large-scale adjustment and renewal of the labor force and the resettlement of the unemployed to a greater extent.

To sum up, the COVID-19 pandemic has brought negative effects to the labor market, such as the increased unemployment rate and unbalanced employment, but at the same time, the development of the COVID-19 pandemic has also provided development opportunities for the germination and maturity of a new employment mode. In this critical period of employment transition, it is necessary to determine the development strategy and select the transition direction. The transition of employment mode is in line with the development demand of green job, while the unbalanced development among industries brings different challenges or development opportunities to the development of green job, which plays an important role in realizing the resilient economic recovery after the COVID-19 pandemic. Taking green job as the development field, the key is to consider both the inherent development needs of green job itself, and to meet the needs of the post-COVID-19 era.

Green job demands a more comprehensive policy system

Green job is a starting point to promote industrial structure upgrading, coordinated regional development and inclusive growth, playing a pivotal role in the context of post-COVID-19 pandemic economic recovery. Strengthening the coordination of employment policies with the overall economic policies and industrial policies is an important policy direction for the green job. The integration of green job policy into macroeconomic policies such as the industrial structure upgrading is of a great significance for achieving not only sustainable economic development and inclusive growth goals, but also the coordinated development of economy and social environment. Therefore, it is necessary to attach some importance to the strategic significance of green job and take measures to promote the green job, which is also the inherent requirement of green job.

First of all, in terms of development stage and level, green job is still a new development field, which has a strong dependence on policy support. The development of green economy means the great reorganization and transfer of traditional industries. For the human resources market, it means that a considerable number of labor forces have transited from traditional industries and traditional jobs to the emerging industries and green jobs. Starting the transition process depends on the policy drive and support, and ensuring fairness and justice in the transition process requires institutional guarantees. For example, from 2017 to 2021, the share of green jobs in China showed a downward trend, but this trend reversed in 2021. In the recruitment market, the number of jobs requiring green skills has increased sharply, which accounts for 50% of the total jobs and far exceeds the global average. According to analysis, this may be related to the “dual carbon” goals (carbon peaking and carbon neutrality) announced by China in 2020 (LinkedIn, 2022). It can be seen that the current development of green jobs depends on the policy effect to a great extent, so perfecting the policy system related to green job plays a very key role in the

current development. Secondly, green jobs are concentrated in the areas such as high-cost and high-input energy industries, and increasing green jobs requires a significant concentration of resources. Policy stimulus is necessary for resources to shift towards green jobs. According to the experience of developed economies with early green jobs, the United States allocated USD125 million to support green job-related activities, and later invested USD100 billion to promote “green job”, directly promoting the development of green job, while attracting various green stakeholders to participate in the promotion of green job (Huang Mo and Tian Silu, 2013), and jointly promoting the rise of green job in the United States. It can be seen that the support policy for green jobs can bring good policy effects and stimulate the development of green job.

Therefore, perfecting the policy system is not only an objective requirement for the green jobs, but also a necessary measure to face the risk from the COVID-19 pandemic, and it is also the only way to achieve long-term inclusive growth. Paying more attention to the green jobs policy, systematically developing these policies, and providing good policy guarantee for the green job development are the perfect directions of green job policy. Forming the endogenous power of green development through the stimulation of various policies and measures is the ultimate goal of the green job policy.

Green jobs require labor forces with green skills

The labor force is of fundamental significance for economic development. In the context of the industrial structure upgrading and green economic transition, the green transition of employment structure is an inevitable trend in human resource allocation. The development of green jobs cannot be separated from the support of the labor force with green skills. Currently, the green job system that is suitable for the development of green jobs has begun to be established, and the number of labor force with green skills is also continuously increasing. However, this progress is still in the process of continuous promotion and development, and the further development of green jobs requires more labor force with green job skills.

The trend of supply and demand transfer indicates that against the background of green transition, the large-scale demand for labor force with green skills has been generated and will continue to grow in the future. In the future, the growth of green jobs will exceed that of non-green jobs, and the demand of the labor market will tilt towards green jobs. The demand for green talents and green labor force will continue to increase and it will have the advantages over the non-green labor force in the future. In other words, the development of green jobs has brought about a shift in demand, and the demand for the labor force with green job skills will continue to grow, while the growth of the labor force without green skills will slow down or even decrease. Based on the past experience, the International Labor Organization has calculated the industries most affected by the transition to sustainability in the energy sector (International Labor Organization, 2018), and the results show (as shown in Table 3) that following the green transition, the demand for sustainable jobs will increase, while the demand for non-sustainable jobs will decrease.

Table 3 Industries with the fastest growth and sharpest decline in employment demand

Industries with the fastest growth in	Industries with the sharpest decline in
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employment demand		employment demand	
Sector	Employment opportunities (million)	Sector	Employment opportunities (million)
Construction industry	6.5	Petroleum refining industry	-1.6
Electrical machinery and instrument manufacturing industry	2.5	Crude oil exploitation and related industries (excluding the measurement)	-1.4
Copper ore and instrument manufacturing industry	1.2	Coal power generation industry	-0.8
Hydropower industry	0.8	Coal and lignite mining and peat mining	-0.7
Vegetable/fruit/nut farming	0.8	Private family service personnel	-0.5
Solar photovoltaic power generation industry	0.8	Gas manufacturing industry and pipeline transportation of gas fuel	-0.3

Source: ILO, World Employment and Social Outlook 2018: Greening with Jobs

In the Asia-Pacific region, the trend of green transition in employment has also begun to emerge. The United States is the world leader in the supply of green jobs, with the number of jobs in its renewable energy and environmental industries growing by 237% in September 2021, outpacing the oil and gas industry, which only grew 19% in the same period (LinkedIn, 2022). This trend will further develop in the future. Taking China's energy industry as an example, it is expected that the wind power industry and the photovoltaic industry will provide 17.05 million and 19.25 million jobs respectively in 2050, of which the number of employment in the service industry will increase more, reaching 3 million and 2 million respectively, while the fossil energy industry will reduce 1.47 million jobs in 2050. Among them, 800,000 jobs will be reduced in the coal mining and washing industry, 500,000 jobs will be decreased in number in the coal power industry, and 170,000 jobs will be reduced in the gas power industry (Zhang Hongyu et al., 2021). Existing jobs are also facing the requirement of "greening" to adapt to the intensive production mode.

At present, affected by multiple crises such as the COVID-19 pandemic, the overall employment growth in the human resources market has slowed down, and the overall supply level of labor exceeds the market demand. According to the assessment of the

International Labor Organization, the global unemployed population reached 205 million in 2022, with unemployment rate as high as 5.8%. In addition to the unemployed population, there were 268 million people that had unsatisfied employment needs but were not included in the unemployment rate, and the overall employment gap rate reached 12.3%. (International Labor Organization, 2023) Against this background, the structural contradiction between supply and demand in the labor market is more prominent, and some workers may face the problem that they can neither be competent for green jobs nor get non-green jobs. Green jobs will be an important breakthrough for workers to find employment opportunities and an important direction for the human resources market to cope with the economic downward pressure.

To sum up, the development of green jobs means that the demand in the labor market is shifting towards the green skilled labor, and the labor market needs to adjust the labor supply structure in order to achieve the dual goals of employment recovery and sustainable economic development after the COVID-19 pandemic.

Green jobs put forward higher requirements for workers' skill levels

Green skills are the requirements of green jobs for laborers. According to statistics, the fastest growing skill categories from 2016 to 2021 include the pollution prevention, ecosystem management, environmental remediation, environmental audit, environmental policy and renewable energy (LinkedIn, 2022). It can be seen that green jobs put forward higher requirements for the skill level of green practitioners, and require the labor force to have higher professional skills and educational background. The report entitled “Skills for A Green Economy” issued by the UK (2011) offers a detailed analysis of the employment skills required for green job (as shown in Table 4) and is regarded as the most detailed list of green job skills. For green jobs practitioners, the high requirements of skill levels are reflected in the management level, technical level and compound skill level.

Table 4 Skills for the green economy

Skills for the Green Economy	Requirements for Skills
Skills to support the resource efficiency	<ul style="list-style-type: none"> • Establishing the strategic business management ability of resource-efficient business model, ensuring the final profitability and preparing for the adaptation to new regulations • Business/financial accounting services around the carbon accounting and environmental accounting • Skills in designing and adopting technologies, products and processes to improve the resource efficiency, including lean production • Project management skills with a clear understanding of resource efficiency • Actions at the operator level to maximize resource

	efficiency, such as reducing waste in production
Skills to support low-carbon industries	<ul style="list-style-type: none"> • Scientists and engineers who have received training in nuclear and renewable energy (including wind and marine energy) or possess transferable knowledge • Technical personnel who have received training or have the transferable knowledge to install energy-saving facilities and perform equipment upgrades at homes and in commercial buildings • Skills in designing and adopting technologies, products and processes to reduce carbon emissions • Actions at the operator level to minimize carbon emissions, such as fuel-efficient driving
Skills to support the climate adaptation	<ul style="list-style-type: none"> • Scientific and technical skills, such as modeling and interpreting climate change predictions • Risk management, such as an assessment of future resource availability • Skills in designing and adopting technologies, products and processes to improve the climate adaptability • Actions at the operator level to improve climate adaptability, such as transforming water-saving technologies at homes and commercial places
Skills to conserve and manage natural resources	<ul style="list-style-type: none"> • Natural environment accounting service • Understanding the Environmental Impact Assessment • Understanding and interpreting the environmental legislative objectives, ecosystem service design and management, and land use planning • Skills in designing and adopting technologies, products and processes to manage natural assets

Source: HM Government. Skills for the Green Economy: A report on the Evidence

One of the reasons for the high requirements for the skill level is that the development of green job is still in the initial stage, many new green jobs are being created from scratch, and some traditional jobs are being transformed into green jobs. At present, the development of green job is not only a process of producing green products and services with labor, but also a process of producing the green jobs. The work content faced by workers is not the simple duplication of labor. Instead, it is the establishment of production processes and industry norms, so more professional practitioners with higher skill levels are needed to solve the technical and institutional problems that arise in the process of job establishment. With the further development of the green

industry, the further expansion of its scale and the gradual maturity of industry norms, more employment opportunities will be created, the scale of the required labor force will be expanded, and the requirements for the skill level of the labor force will be extended to the middle and low skills. Workers with various educational backgrounds will be able to match the suitable jobs in the future green job market. Even so, the changes in the technology, process and production practice still require workers to update their labor skills. But generally speaking, green job means that the labor force gathers in jobs with higher production efficiency and higher resource utilization rate, and the requirements for the overall skill level of the labor force will exceed the skill demand under the previous extensive production mode, so it is necessary for the whole labor market to adjust the existing labor skills.

To sum up, for the economic recovery and the long-term development of green jobs in the post-COVID-19 era, in terms of the short-term demand and long-term prospects of the labor market, it is necessary and crucial to improve the skill level of workers. The existing labor skill structure is facing the need for renewal. For high-skilled people and low- and middle-skilled people, the requirements for skills renewal and upgrading are common. However, due to the weaker ability of low- and middle-skilled people to cope with shocks, the impact of the COVID-19 pandemic has made the skills renewal needs of low- and middle-skilled people more urgent. Moreover, it is more costly and difficult for low- and middle-skilled people to learn new skills, so more attention should be paid to the skills upgrading needs of low- and middle-skilled employees.

Promoting green job skills requires the establishment of green job skills training system

According to UNESCO, green skills education and training includes pre-service education and training, in-service learning and further training on environmental, economic and social sustainability issues, while meeting the needs of the industry and the individual learners (UNESCO, 2012). The vocational education and training system required by the development of green job should be a systematic project covering the whole process, field and population of employment.

The lack of the skills education and training system that matches the improvement of green job skills is an important factor affecting the improvement of the average green skills of the labor force. The lack of training opportunities leads to the difficulty of the labor force's transition to green jobs, which cannot meet the job requirements. It is imperative to establish a more complete green skills education and training system. Drawing on the effective experience, providing skills training opportunities is an important policy direction for many economies to promote the development of green job, such as the "Green Jobs and Training Opportunities" in the United States. The importance of the vocational education and training is self-evident.

For the vulnerable groups in the labor market, such as youth, women, people with disabilities and other impoverished populations, fair vocational skills training opportunities are more important. To achieve green transition, promote decent job, ensure fair transition in green transition, and achieve the inclusive growth goals, vocational education and training systems play an important role. Facing the future, the longer-term development vision of green jobs lies in achieving the greening of all jobs. Therefore, the coverage of green skills training should be broader, with a focus on the vulnerable groups in the workforce, a greater emphasis on fairness issues, and attention paid to the development of "soft" skills in the process of green skills training, that is, the cultivation of the concept of sustainable development.

For the above reasons, improving vocational education and training is an important field to support the development of green job. First of all, it is necessary to mobilize the enthusiasm of all parties and establish a market-oriented vocational education system based on vocational needs, such as establishing education and training institutions and improving vocational training of enterprises. Secondly, a public employment service system should be established to support green job, provide basic employment services, and provide service to meet the essential needs for vulnerable people. Finally, it is also necessary to integrate the cultivation of green skills and green concepts into basic education, so as to improve the sustainable development concepts and green skills of the whole society.

The long-term development of green jobs requires the support of green standard system

The development of the green economy means a comprehensive transition for existing industries and departments. The green standard system that meets the needs of green development is an important guarantee for green transition and long-term development, and the employment field is no exception. The further development of green job requires the establishment of a systematic green occupational standard system.

The lack of the green standards is also a practical dilemma faced by the development of green job at present. The lack of the occupational classification and standards, as well as the resulting chaos, has caused some negative impacts on the development of green job. The lack of the professional standard system first lies in the recognition of green jobs. Currently, although the definition of green jobs both at the domestic level and in academia is consistent in the general direction of resource conservation, ecological environment protection, and resource utilization rate, there are various deviations in the recognition of specific jobs. At present, there is a great lack of mandatory and authoritative professional standards. The absence of a unified standard foundation for identification, evaluation, statistics, supervision and other work directly leads to difficulties in evaluating the current development status of green jobs. Additionally, this lack hinders the effective implementation of green job policies.

Secondly, it lies in the unclear access qualifications of green jobs. For example, the job of “carbon emission administrator,” which arises under the background of the policy of “dual carbon” goals, still lacks a unified professional qualification certification. On the one hand, the reasons for this phenomenon are that there are still controversies over the recognition standards of green jobs. On the other hand, the implementation of policies is lagging behind, and the supporting facilities cannot keep up with the development of the industry. This will become an obstacle to the further development of green jobs, leading to a lack of necessary reference for establishing appropriate vocational skills training. It will also hinder workers from clarifying their skills needs, which is not conducive to enterprises' finding suitable talents according to standards.

Generally speaking, the establishment of green jobs standard system is of fundamental significance to promote the long-term sustainable development of green job. First of all, the recognition and access system of green jobs should be improved and the statistics and evaluation of green job-related fields strengthened. Secondly, the relevant training and services in the field of green job should be strengthened to help market players and workers participate in green job in a standardized manner. Finally, it is necessary to strengthen the supervision based on the green job standard

system to ensure the sustainable and stable development of green job and safeguard the legitimate rights and interests of workers.

3. The challenges faced by the development of green jobs

The cost of creating and converting green jobs is high

Compared to traditional non-green industries, green industries generally have higher production efficiency and need more capital and technology investment. The cost investment required to create green jobs will be much higher than that required to create non-green jobs. The high investment costs will bring great pressure to the public institutions and other investors, slow down the growth rate of green jobs and hinder the development of green jobs.

This problem is even more prominent in the sector of agriculture. Even though the proportion of agriculture in the domestic economy has declined in the past two decades, the agriculture remains the world's largest employment-absorbing sector, involving more than 1 billion global laborers, which is equivalent to that one out of every three workers is engaged in agricultural activities on average (International Labor Conference, 2013). Therefore, the green transition of agriculture has a fundamental impact on the whole transition to green jobs. At the same time, the agriculture is the biggest user of water and a major source of water pollution, and the green transition in the agricultural field has a great impact on achieving the goal of sustainable development. However, rural areas often have a backward infrastructure and low skill levels of the labor force. Realizing a green transition in agriculture faces large-scale infrastructure construction and skills training, which will require extremely high-cost investment. In the Asia-Pacific region, where the proportion of the agricultural land is 47.3% (World Bank), the challenge of green transition in agriculture will be even more severe. The challenges are consistent for sectors that are greatly affected by the sustainable development. Agriculture, forestry, fisheries, energy, resource-intensive manufacturing, recycling, construction and transportation employ more than half of the global labor force (International Labor Conference, 2013), which are also the eight sectors most closely related to sustainable development. The main work of green transition to jobs will focus on these eight sectors. However, the above sectors are generally faced with the problem of high input cost of transition, which is an important challenge for green jobs transition in the future.

To sum up, because the industries facing some great transition demands under the influence of sustainable development goals generally have the characteristics of large investment scale, and green transition often requires a higher technical level and better infrastructure, the cost of creating green jobs far exceeds that of traditional jobs. The characteristics of a high investment will affect the flow of social resources to green industries and green sectors, and become a major obstacle that must be overcome to create green jobs.

The labor force is highly dependent on traditional jobs

According to the data of the International Monetary Fund, the probability of a worker moving from pollution-intensive jobs to green-intensive jobs is between 4% and 7%. The probability of changing from jobs that are neither pollution-intensive nor green-intensive to green-intensive jobs is between 9% and 11%, and the probability of changing from green-intensive jobs to another green-intensive job is between 41% and 54% (International Monetary Fund, 2022). The employment of workers has

industry and post inertia, and it is difficult to change from pollution-intensive posts to green jobs. The reasons for this difficulty may include the mismatch of the labor skills, the low conceptual level of green jobs, the insufficient willingness to change the methods of employment, the not-smooth access to green jobs-related information channels and so on, all of which have led to the lag of the labor force's transition to green jobs.

The dependence of labor on non-green jobs stems in part from the expectation of employment difficulties that may be brought about by green transition. Using China as an example, the job market has borne some negative impacts of the efforts to save energy and reduce emissions and eliminate excess capacity. The research group of "*Research on Low-carbon Development and Green Jobs in China*" of Chinese Academy of Social Sciences calculated the employment impact caused by shutting down the small thermal power units. The research suggests that every 10,000 kilowatts of small thermal power units shut down in China will bring 62 people who need to be resettled for employment (Institute for Urban and Environmental Studies, China Academy of Social Sciences, 2010). The survey shows that only one-tenth of them can be re-employed in the auxiliary posts of newly established large units after the shutdown of small thermal power units, and most other employees face difficulties. It is estimated that 500,000 out of the 600,000 people whose employment was affected will have employment difficulties to varying degrees in 2020 (Institute of Labor Science, Ministry of Human Resources and Social Security of the People's Republic of China, 2010). However, for the green transition, eliminating backward excess capacities is only the beginning, and jobs will continue to develop in a greener direction. The span of job nature faced by the workers will be larger, and possible employment difficulties will lead workers to feel uneasy about green jobs.

In addition to the possible unemployment risks, in some industries and regions, green industries may cause workers to have to turn to lower-quality employment, affect workers' willingness to change jobs, and further discourage workers from transferring employment fields. "Green but not decent" is also an important issue in the development of green jobs at present. Using the recycling industry as an example, informal work accounts for a large proportion, and the working environment of workers often fails to meet the requirements of decent job. For many workers, the green transition may mean low-quality employment and lower income level (Li Chengyu et al., 2021).

At present, the employment scale of non-green industries still exceeds that of green industries, absorbing a large number of laborers. Using China's coal industry as an example, although the proportion of employment scale of the coal industry in industrial sectors has dropped from 8.4% in 1998 to 5% in 2021 (Division of Population and Employment Statistics of Bureau of Statistics of China and Department of Finance Planning of Ministry of Human Resources and Social Security of the People's Republic of China, 2021), this proportion is still quite large. A considerable number of laborers have maintained employment dependence on traditional industries due to the risk expectation brought by green transition and have lower ability and willingness for reemployment. According to the analysis of the International Monetary Fund, in order to achieve the carbon emission target before 2050, 1% of jobs will shift from high-carbon emission jobs to low-carbon emission jobs in the next 10 years, which is a huge challenge for the huge labor market. For emerging economies, the scale of this transition is even larger, reaching 2.5% (International Monetary Fund, 2022).

The potential low-quality employment risk and even the unemployment risk brought

by the lack of skills and job reduction in the process of transition will cause some laborers to rely on traditional non-green industries and lack endogenous motivation for green jobs. The contradiction between the large-scale transition demand under the background of green transition and the dependence of labor on traditional jobs may increase the difficulty of green transition.

The green jobs development faces potential social risks

The transition to green jobs plays a positive role in the sustainable development of employment. However, for some industries, sectors, regions and groups, green transition may cause some potential risks, including possible unemployment risks, low-quality employment risks and the risks of aggravating employment inequality. For the just transition in the employment field, the potential social risks may become a powerful obstacle to the transition.

Still using the coal industry as an example, technological change and energy transition have caused a strong employment impact on this industry, which may change with the policy intensity and technological change level. Table 5 predicts the employment scale changes of China's coal industry from 2020 to 2050 under different scenarios (Climate Change and Energy Transition Project Team of the Institute of Energy of Peking University and United Nations Development Programme, 2023). It can be seen that the employment impact brought by energy transition to the coal industry is almost devastating, and the challenge of changing jobs will sweep across most people in the coal industry, many of whom will face the unemployment risks.

Table 5 Total employment of the coal industry under different scenarios from 2020 to 2050 (10,000 people)

Coal production scenario	Technology scenario	Time					Changes in the employment scale from 2020 to 2050
		2020	2025	2030	2035	2050	
							-235.2 (90.4%)
Baseline scenario	Baseline technology scenario	260.0	184.5	124.4	85.9	24.8	-244.5 (94%)
	Optimized technology scenarios	260.0	184.5	124.4	76.4	15.5	-244.6 (94.1%)
Fossil energy exit scenario	Baseline technology scenario	260.0	175.8	117.0	81.6	15.4	-250.4 (96.3%)
	Optimized technology scenarios	260.0	175.8	117.0	72.5	9.6	-251.8 (96.8%)
Accelerated exit of fossil energy	Baseline technology	260.0	169.7	109.4	71.7	8.2	-251.8

scenario	scenario						(96.8%)
	Optimized technology scenarios	260.0	169.7	109.4	63.7	5.1	-254.8 (98%)

Source: Climate Change and the Energy Transition Project Team of the Institute of Energy of Peking University and United Nations Development Programme. *Navigating the Path to a Just Transition: Employment Implications of China's Green Transition*

At the same time, the changes in the coal industry will aggravate the inequality in the employment field. First of all, due to the characteristics of the coal industry, most of the professionals are concentrated in large coal enterprises, while the practitioners in small coal enterprises generally have lower skill level, and the transition will widen the human resources gap. Among workers of different genders, the risk of unemployment is also unequal. Even if the coal industry is dominated by men, 80% of the workers are male workers, and the unemployment risk faced by women is still higher than that of men. Against the background of the overall shrinking of the industry, the proportion of female workers has also declined. The shrinking of the coal industry will also have a certain impact on the guarantee of workers' rights and interests. It is estimated that about 20% of workers in the coal industry are in informal jobs (Climate Change and Energy Transition Project Team of the Institute of Energy of Peking University and United Nations Development Programme, 2023). Under the tide of coal transition, the guarantee of workers' rights and interests will face greater challenges.

Green jobs may have some negative effects such as unemployment, low-quality employment and employment inequality because of its own development characteristics. The impact of the COVID-19 pandemic and other crises aggravates this risk, which becomes an obstacle to the transition to green jobs, affects the just transition in green jobs, and cannot meet the inherent needs of inclusive growth. For vulnerable groups in the reemployment market, such as youth groups and women groups, the transition to green jobs means greater risks. Green jobs should be "decent jobs," and the existence of risks may threaten the realization of its goal of "decent job." If the social risks in the process of transition cannot be properly solved, the goal of "green jobs" cannot be fully realized.

There are some great obstacles to improving the green jobs skills of the labor force

Compared to traditional jobs, the skills required by green jobs have undergone great changes, which bring considerable challenges for workers to learn new labor skills. A global survey on green job skills conducted by the International Labor Organization (covering 21 economies, accounting for 60% of the world's population) shows that skills requirements within existing industries are about to change radically (UNESCO International Vocational and Technical Education and Training Center, 2012).

Most of the industries affected by environmental and sustainable development are characterized by low resource utilization and high pollution degree. Most of these industries belong to primary economic sectors, such as agriculture, forestry, fishery, construction, recycling, etc., so they are also key areas of a green transition. Improving the green skills of the labor force is the key to realize the green transition of polluting industries. However, the employees who are greatly affected have the characteristics of low skill level, so it will be difficult to improve the skills of green jobs

of the labor force. China's coal industry is a typical example. The analysis shows that the educational background and skill level of employees in China's coal industry are generally low. By 2019, the number of employees with a junior high school education or below accounts for nearly half of the total employment, and the number of employees with bachelor degree or above only accounts for about 10%, and most of them are in management positions. The proportion of employees with a junior high school education and technical school education in operation positions, especially in underground front-line positions, is even higher than 80% (Shi Lianxin, 2022). In terms of age structure, most workers engaged in front-line posts are over 45 years old, and workers aged between 40 and 50 account for about 40% (Song Shengwei et al., 2021). The problem that employees are not young enough is more prominent. The lower educational level and the higher age structure not only led to the lack of the old skill level of the labor force, but also affect the ability to learn new skills and upgrade the skill level, which has become an obstacle to the green transition of the energy industry. In addition, the low level of income and informal job faced by some workers will also lead to the problems of high input cost and low expected return of skills learning.

Facing the ever-changing labor market, the quick response ability of the education and training system is also challenged. The mode of obtaining a single skill to engage in a single job through simple training can no longer meet the development demands of the labor market. The disadvantages of the lack of lifelong learning, especially vocational skills training outside school, are gradually revealed. In the survey conducted by the OECD, the proportion of adults participating in vocational training varies from 18.2% to 67% by economy, and the training participation rate of low-skilled workers is particularly lacking (Organization for Economic Co-operation and Development, 2016), which is far from meeting the development demands.

There are many deficiencies in skills education and training for the development of green skills. On the one hand, the theoretical understanding of green skills is not sufficient, and the society lacks a unified understanding of green skills needed for green jobs, which makes it difficult to guide educational practice. On the other hand, the green concept and green skills have not been well integrated into school education and vocational education, and the green vocational skills training that has been carried out is not only insufficient in quantity but also uneven in quality, without strong standards and the effective management supervision. There is a lag between green skills education and training.

The society has a low awareness of green jobs

The conceptual level of green jobs in the whole society has a very important impact on the development of green jobs, which may not be direct enough and difficult to quantify. However, as the conceptual power of the green jobs development, it is of great significance to the development of green industry and the promotion of green skills. Accenture asked 29,500 young people aged between 15 and 39 from 18 economies the same question: Do you expect to work or pursue career development in the green economy in the next decade? In Europe and the United States, slightly more than half of the respondents gave positive answers, while, in the Asia-Pacific region, the proportion was 77% (Kong Jiafu et al., 2022). It is evident that the concept of green development has gradually gained popularity. However, the survey not only shows the imbalance of the concept of green jobs among regions, but also focuses on the youth groups who have not yet become the backbone of the labor market. Although it shows the long-term influence of the concept of green jobs, it cannot meet the display needs of the development of green jobs.

The green concept is the inevitable requirement of a green transition. For enterprises, the conceptual level of green concept directly affects the establishment of green jobs. A survey shows that there are some problems in the green operation of Chinese enterprises overseas, enterprises are not aware of environmental protection responsibilities, and many enterprises do not set up special environmental protection departments and environmental experts (KPMG, 2013). As the main body of the market, their green concepts will have a great driving effect on other participants. However, the lack of green awareness may be a common phenomenon for enterprises, and similar phenomena occur in many enterprises. An incomplete green awareness limits the full release of green jobs with development potential and becomes an invisible obstacle to the development of green jobs. Some workers' concepts of green jobs are not sufficient, while some workers are limited by the traditional employment concept, can't fully understand the strategic significance of green industry, can't fully understand the employment trend of green transition, or take a wait-and-see attitude towards the uncertainty caused by green jobs transition, and don't have the initiative consciousness of green jobs. Therefore, there is a series of problems such as insufficient understanding of green jobs-related information, weak initiative to learn and master green skills, and low willingness to enter or transfer to green jobs. On the one hand, it is not conducive to making up for the talent gap in green industries. On the other hand, it also aggravates the employment risks of workers themselves, which is not conducive to realizing the smooth and just transition to green jobs.

The lack of the green jobs concept leads to the failure of employment services related to green jobs to keep pace with the development of green jobs. There are deficiencies in the school education, social vocational education and other employment service fields. Fewer green jobs-related service institutions are established, which cannot meet the needs of the development of the green jobs development. The conceptual level of green jobs is also directly related to the atmosphere of social green jobs. As the soft power of the development of green jobs, the conceptual level of green jobs will directly affect the social evaluation of green job practitioners, the decent degree of green jobs, the enthusiasm of workers to learn green skills, and the positive degree of workers entering green jobs. A higher conceptual level of green jobs can form a social trend of green jobs, enhance the endogenous motivation of the development of green jobs, and form a virtuous circle of the development of the green jobs.

In the final analysis, the low conceptual level of green jobs is due to the immature development of green industry and the fact that green economy has not yet become the backbone of economic development. The relative backwardness of the vocational education and school education system also affects the educated to establish the concept of green jobs. The development of green industry, the enhancement of green education and publicity, and the improvement of green concept complement each other and promote each other. The improvement in the conceptual level of green jobs not only depends on industrial development and education system, but also promotes the development of green industry and the perfection of green education system.

VI. Implications for Promoting Green Jobs to Achieve a Resilient Economic Recovery in the Post-COVID-19 Era

In the post-COVID-19 era, the climate action and green development are the two most urgent and complex challenges faced by economies all over the world, and green jobs are one of the solutions⁴. The research team of the Institute for Urban and Environmental Studies, China Academy of Social Sciences estimated that green investment would create 5.2-5.3 million job opportunities for China's economy, of which energy conservation and pollution reduction and ecological construction investment could bring about 2.084 million direct and indirect jobs, and investment in structural adjustment and technological innovation could drive 2.339 million people to find jobs, and green jobs had bright prospects⁵. In order to achieve the economic recovery as soon as possible, major developed economies have taken active measures to promote green jobs related to climate change, environmental protection, low-carbon economy and clean energy to an important strategic height. In order to promote the full development of green jobs, it's necessary to introduce targeted policies to achieve coordinated development of economic development, environmental protection and employment promotion.

1. Improving relevant laws and regulations

Improving the legal system is an inevitable requirement for promoting the sustainable development of green jobs. Comprehensively safeguarding the legitimate rights and interests of all subjects in the process of green economy construction can encourage the public to actively participate in green jobs. To speed up the improvement of the legal system of green jobs, attention should be paid to the following two aspects.

Building a legal system to promote green jobs

Relevant departments should speed up the improvement of the relevant laws and regulations that can standardize and guide the development of green jobs, according to the needs of green job development. It is urgent for all economies to promulgate the *Green Jobs Law* and other laws and regulations to clarify the development goals, policies and measures, management systems and other contents of green jobs, to ensure the development of green jobs within the legal scope, and to ensure that relevant subjects can perform their responsibilities normally and enjoy their rights and interests legally⁶. For example, the *Green Jobs Act 2007* of the United States not only increased the loan credit line of the renewable power industry, but also required the Department of Labor to continue to allocate funds to training institutions in the fields of energy conservation and renewable energy, green technology and environmental protection, especially a higher-level training institutions⁴⁷. The *Green Jobs Act of the Philippines (RA 10771)* provides that qualified enterprises can deduct special funds from taxable income, which is equivalent to 50%⁸ of the total expenditure on skills

⁴ Stanef-Puică, Mihaela-Roberta, et al. "Green Jobs - A literature review." *International Journal of Environmental Research and Public Health* 19.13 (2022): 7998.

⁵ Institute for Urban and Environmental Studies, China Academy of Social Sciences. *Study on Low-carbon Development and Green Jobs in China*. ILO's website, 2010-04-01. http://www.ilo.org/beijing/what-we-do/publications/WCMS_155414/lang-zh/index.htm.

⁶ Pang Xiaoqin. Analysis of the Government's Channels for Expanding Green Jobs [J]. *People's Forum*, 2019 (32): 82-83.

⁷ The USA House Of Representatives. *Green Jobs Act of 2007*. <https://www.congress.gov/110/crpt/hrpt262/CRPT-110hrpt262.pdf>

⁸ The Congress of the Philippines. Republic Act No. 10771. <https://www.officialgazette.gov.ph/2016/04/29/republic-act-no-10771/>

training and R&D. On the basis of formulating the basic law of green jobs, it is necessary to establish a separate rule that is absent in corresponding fields. “Promoting green jobs” should be provided as the basic principle of civil law, and this principle is embodied in relevant regulations, which makes related industries realize the importance of transition to the green economy, and at the same time, they should realize that promoting green jobs is not only a right, but also their obligation, and actively provide more and better environment for the development of green jobs.

Accelerating the adaptation and revision of relevant laws and regulations

On the one hand, related laws should be optimized to standardize the development of green jobs with the help of the rule of law. In the United States, the *Infrastructure Investment and Jobs Act of 2021* proposes to provide USD7.5 billion for building the electric vehicle infrastructure. The *Inflation Reduction Act of 2022* provides a tax credit of USD7,500 for new electric vehicles and USD4,000 for used cars, and allows the tax credit to be transferred to car dealers at the time of sale. In addition, the *Inflation Reduction Act* also provides tax credits for clean energy projects, and the wind energy, solar energy and electric vehicle industries have achieved rapid development, creating new green jobs opportunities for electricians, technicians, mechanics and construction workers. It is estimated that these two acts will create hundreds of thousands of green jobs. Therefore, it is suggested to increase the support for green industries in relevant laws and regulations of employment. Using waste recycling and maintenance sites as an example, waste recycling and maintenance industries, especially those within a certain scale (such as those with an annual turnover of less than RMB1 million), should be exempt from compulsory registration and tax, and the development and employment of these industries should be explicitly encouraged.

On the other hand, the existing relevant regulations also need to “go green” in time. For example, the principle for promoting green jobs should be added to the laws and regulations related to environmental protection, and the rights and obligations of relevant management institutions and individuals for green jobs should be clarified. In addition, and in close connection with the development state and trend of green jobs, laws and regulations such as *Employment Promotion Law*, *Regulations on Unemployment Insurance* and *Regulations on Worker’s Compensation Insurance* should be revised and improved on time. For example, it should be set forth clearly in the laws and regulations related to social security that workers who have lost their original jobs due to enterprise transformation should be given relevant assistance, such as providing some opportunities for green jobs skills training, and the funds can come from special projects of the relevant departments or sponsorship from relevant welfare and charitable organizations.

Strengthening the implementation and supervision of laws and regulations

As the current development of green jobs is still under exploration, the relevant departments need to strengthen the implementation and supervision of laws and regulations related to green jobs, and timely revise laws according to development needs to provide a solid guarantee for the development of green jobs. For example, according to the data of the Bureau of Statistics of China, in terms of the average annual wage of employees in enterprises above the designated size in 2022, the average wage of the water conservancy, environment and public facilities management industry in 2022 is RMB53,099 per year, which greatly affects the enthusiasm of workers. In the developed economies, the average wage of green-intensive jobs is about 7% higher than that of pollution-intensive jobs.

Therefore, in view of the poor working environment, low wages and lack of social security in green jobs in developing economies at present, it is necessary to improve the laws and regulations related to environmental protection infrastructure construction and social security mechanism in time to protect the legitimate rights and interests of green employees.

2. Strengthening systems, mechanisms and policy incentives

As a new employment field, the substantial development of “green jobs” requires relevant departments to strengthen policy guidance, create an environment for the development of green jobs, and provide it with the necessary innovation support and factor guarantee. A survey by UN Women and the African Development Bank found that agriculture, construction, energy, tourism and waste management are the sectors most relevant to green jobs⁹. Therefore, relevant departments should actively promote the development potential and market space of these industries and create more green jobs.

The green transition of industries towards the emission goals

Green economic activities in green industries are the foundation of green jobs. The green transition of the economy has created new jobs and economic growth points for Europe. Europe’s economic transformation created 4.5 million green jobs in 2019, up from 3.2 million in 2000, according to EU statistics¹⁰. In the post-COVID-19 era, achieving the goal of economic recovery means putting forward the new requirements for the green reform of important pillar industries of the domestic economy. Therefore, relevant departments at all levels should dedicate themselves to promoting the green transition of industries and establishing a systematic and comprehensive green industrial system.

Promoting the green reform of the energy industry and the renewable energy. According to the report of the International Renewable Energy Agency (IRENA), investing in decarbonization projects will create greater social and economic benefits on a global scale, which is expected to save at least USD62 trillion by 2050, and may quadruple employment opportunities in the field of renewable energy (IRENA, 2020)¹¹. The European Commission predicts that by 2050, the green transition in the energy sector alone could create 3 million more jobs on the basis of 2020. Therefore, it is necessary to accelerate the green and low-carbon transition of the energy system, vigorously develop new energy sources, drive the vigorous development of new industries, new enterprises and new businesses, constantly improve the support and incentive policies for the new energy industry, provide special green fund subsidies for green clean energy, and further implement the policy of ensuring the stability of green jobs in the new energy field.

Vigorously developing the circular economy. The circular economy is an important part of green industries, which provides an industrial carrier for realizing green growth. According to OECD data, there are currently 3.5 million jobs related to the circular

⁹ UN Women and the African Development Bank (2021). Green jobs for women in Africa. https://africa.unwomen.org/sites/default/files/Field%20Office%20Africa/Attachments/Publications/2021/11/20211206_UN%20Women_Green%20Jobs_report_ENG%20webpages.pdf

¹⁰ Yuan Jingting. Enlightenment of EU's Talent Training System for Green and Low-carbon Industries to China. https://m.thepaper.cn/baijiahao_22039099

¹¹ International Renewable Energy Agency. 2020. Global renewables outlook: Energy transformation 2050. <https://www.irena.org/publications/2020/Apr/Global-Renewables-Outlook-2020>

economy in the EU. If the recycling rate is increased from the current 50% to 70% in the future, 500,000 jobs will be created as a whole¹². According to the report of Green Alliance, a British think tank, by reusing and repairing household goods such as washing machines and telephones, and recycling disposable consumer goods such as plastic bottles, the United Kingdom can create more than 450,000 jobs in the circular economy by 2035¹³. All economies need to increase financial funds for circular economy projects, expand the scope of direct investment, financial subsidies and loan with discounted interest for major projects of circular economy development, technology R&D and industrialization demonstration projects, improve the recycling level of industries such as industry, construction, transportation and public institutions, speed up the construction of a recycling system for waste materials.

Promoting the sustainable infrastructure construction. Sustainable infrastructure not only helps to reduce the carbon footprint and promote the development of renewable energy, but also promotes green jobs, green economic growth and eliminates inequality¹⁴. International Monetary Fund (IMF) research shows that green infrastructure investment and carbon pricing can increase global GDP by 0.7% every year in the next 15 years, and at the same time create millions of jobs. Therefore, sustainable infrastructure construction is of great significance to promote green jobs. The first is to prepare the sustainable infrastructure construction plans in the fields of energy, transportation, water conservancy and ecological environment, establish a major project library, and promote the formation of a sustainable infrastructure system with complete layout, efficient operation and strong support. The second is to innovate the operation mode of infrastructure construction. Taking natural environment infrastructure as an example, we can choose concentrated points or districts that conform to industrial policies and layout plans to build industrial “green islands”, agricultural “green islands” and service “green islands” to help small and micro enterprises solve pollution control problems. The third is to increase financial funds to guide sustainable infrastructure construction and innovate investment and financing mechanisms. For example, some geothermal power projects in the Philippines were financed through the issuance of climate bonds, and the Asian Development Bank played a key role in bond issuance by increasing investor interest through partial credit guarantees in local currency.

Accelerating the green transition of agriculture. Organic farming, sustainable agriculture and green food manufacturing are more labor-intensive than traditional production¹⁵. The green transition of agriculture helps create a large number of green jobs. Thailand’s Ministry of Agriculture and Cooperatives (MOAC) has set up four transition subcommittees, focusing on big data and governance technologies, smart agriculture, e-commerce and agribusiness (including manufacturing of agricultural equipment and supplies, production and marketing of agricultural products, manufacturing and processing, etc.), aiming to promote the development of agri-food industry through innovation in these fields. The Thailand has also launched the *Organic Agriculture Development Strategy (2017-2021)* and the *20-year Agricultural and Cooperative Strategy* to promote the sustainable development of agriculture by improving the productivity and quality standards of agricultural products,

¹² Zheng Bin. EU Promotes Green Economic Growth (International Perspective). People's Daily, 2020-11-16.

¹³ Green Alliance. 2021. Levelling up through circular economy jobs.

https://green-alliance.org.uk/wp-content/uploads/2021/11/Levelling_up_through_circular_economy_jobs.pdf

¹⁴ UNEA. International Good Practice Principles for Sustainable Infrastructure.

https://wedocs.unep.org/bitstream/handle/20.500.11822/34853/GPSI_CH.pdf

¹⁵ UNEP. Global Guidance for Education on Green Jobs. 2021.

<https://www.unccclearn.org/wp-content/uploads/library/Global-Guidance-for-Education-on-Green-Jobs-Chinese.pdf>

strengthening technological innovation in the agricultural sector, and balancing the sustainable management of agricultural resources and environment. All economies should also make greater efforts in the R&D, popularization and application of green technologies, green varieties, green equipment and green inputs, speed up independent innovation in science and technology, integrate and promote mature and applicable technology models, and accelerate the path of connotative development supported by scientific and technological progress.

Improving the green and low-carbon environmental policy system.

Environmental policy has a multifaceted role in promoting green employment. Through the guidance of environmental protection needs, technological innovation can develop in a green and sustainable direction, and promote technological breakthroughs and applications. For example, the development of the renewable energy technology, clean production technology and energy-saving and environmental protection technology not only provides solutions for environmental protection, but also promotes the development and innovation of related industries. At the same time, the development of environmental protection industries such as environmental monitoring, environmental protection engineering and waste treatment requires a large number of employees, which promotes the growth of employment. In addition, through environmental protection policies, the penalties for environmental violations are increased, enterprises are cracked down on for bad business practices, the fair and standardized market environment is promoted, and the competition among enterprises is facilitated. With the improvement of the environmental awareness, people's attention to environmental issues has also increased dramatically. Schools and training institutions have offered courses and majors related to environmental protection to cultivate more professionals for green jobs.

Strengthening the policy support and incentives

Implementing green jobs projects. Major projects are characterized by a wide coverage, large investment absorption, long industrial chain and many job opportunities, which can play a proper role in stimulating employment. For example, the UK has set the goal of "creating 2 million green jobs by 2030" in 2020 and launched a Green Job Task Force to meet the needs of high-skilled manpower development for the future low-carbon economy¹⁶. The UK announced a "Ten Point Plan" with a funding scale of GBP12 billion for the British Green Industrial Revolution, covering renewable energy, new energy vehicles, residential energy renovation, and carbon capture technology. It is estimated that 250,000 high-skilled green jobs will be created economy-wide by 2030¹⁷, and 180 trillion tons of carbon dioxide emissions will be reduced¹⁸. Besides, the Environment and Ecology Bureau of Hong Kong, China has launched the Green Employment Scheme for three consecutive years. More than 1,600 time-limited jobs, lasting from six months to one year, have been created or subsidized under the Scheme, suitable for people with different skills and academic qualifications. All economies should strengthen the mechanism of linkage between green upgrading projects in key industries and promoting green jobs, take increasing jobs and job quality as important indicators for evaluating projects, and

¹⁶ UK government launches taskforce to support drive for 2 million green jobs by 2030.

<https://www.gov.uk/government/news/uk-government-launches-taskforce-to-support-drive-for-2-million-green-jobs-by-2030>

¹⁷ PM outlines his Ten Point Plan for a Green Industrial Revolution for 250,000 jobs.

<https://www.gov.uk/government/news/pm-outlines-his-ten-point-plan-for-a-green-industrial-revolution-for-250000-jobs>

¹⁸ UK HM Treasury. Spending Review 2020.

<https://www.gov.uk/government/publications/spending-review-2020-documents/spending-review-2020>

fully release policy dividends.

Enhancing the support of green fiscal and tax policies. In terms of the financial guidance, a special “Green Jobs Innovation Fund” has been set up. For instance, in order to reduce the impact of COVID-19 on small and micro enterprises and private enterprises, the Germany launched the “Protecting Apprenticeship Posts” program in July 2020. The program provides the financial support to small and micro enterprises affected by the COVID-19 pandemic, encourages enterprises to continue training apprentices, and rewards small and micro enterprises that receive apprentices from bankrupt enterprises and continue to provide training for them. In terms of tax regulations, it is important to build a green tax system framework with a combination of systematic tax incentives such as value-added tax (VAT) and enterprise income tax (EIT), expand the scope of preferential catalogs of green enterprise income tax such as environmental protection, energy conservation and water saving, and implement tax support policies in the fields of environmental protection and comprehensive resources utilization. In green procurement, the priority procurement and compulsory procurement system for energy-saving and environmental protection products should be established, and the scope and scale of green product procurement should be expanded.

Increasing the financial support and incentives for enterprises. It is necessary to implement the supportive and incentive policies related to promotion of “green jobs”, including lowering the threshold and costs of green entrepreneurship through the provision of preferential policies such as tax reduction and exemption, venue arrangement, small guaranteed loans and interest subsidies, so as to stimulate green entrepreneurship enthusiasm and vitality. Eligible enterprises can be selected as green enterprises, and those that meet the criteria for the number of green jobs can enjoy policy subsidies, financial support for skills training, etc. For example, Singapore’s Ministry of Trade and Industry (MTI) and SkillsFuture Singapore have jointly set up the Green Skills Committee to provide sustainable development projects such as ESG training for senior and intermediate professionals of enterprises, with up to 70% of the costs subsidized by companies¹⁹. The UK has established the Oil and Gas Transformation Training Fund to reskill workers in these sectors for greener jobs²⁰.

Improving the employment service and the security system. On the one hand, relevant departments of employment, labor and education should actively advocate the green skills training agenda, improve the mechanism for training and introducing talents related to the green industry. In terms of the vocational education, it is more responsive to market demand, provides targeted vocational training, as well as promotes the all-round and effective connection between the supply side and the industrial demand side of green skills training. For instance, the European Commission introduced the *European Skills Agenda for Sustainable Competitiveness, Social Equity and Resilience*. On the other hand, strengthen employment guidance, vocational training and social security for unemployed or transferred workers. Thus, we can help them achieve re-employment as soon as possible, remove workers’ concerns about green jobs, and better cope with possible social problems that may arise in the transition process. During the transition process in Germany, both its relatively well-developed unemployment insurance and its pension system have played a vital role in safeguarding the affected groups. In order to support the aging

¹⁹ MTI COS 2023 - Supporting businesses and workers in our journey to a green economy.

²⁰ Scottish Government. Just Transition Commission. Retrieved from <https://www.gov.scot/groups/just-transition-commission/>

population who have lost their jobs in job transition and find it difficult to re-enter the labor market, the Germany has set up a special fund of EUR5 billion to assist the elderly employees in the coal industry to take an early retirement, with employees over the age of 58 receiving compensation for up to 5 years²¹.

Increasing job opportunities for women. In the course of industrial transformation and upgrading, women tend to confront more unemployment risks. Moreover, men move into green jobs faster than women.²² Using the coal industry as an example, the data show that the proportion of women employed in the industry has dropped from 21.9% in 2003 to 13.3% in 2020, while the share of men has increased from 78.1% to 86.7%. This suggests that female workers are more vulnerable and at higher risk of losing their jobs when the coal industry shrinks.²³ In addition, the International Renewable Energy Agency (IRENA) survey on women's participation in renewable energy found that women account for only 32% of the renewable energy labor force, and nearly half of them hold administrative positions, with less than one third in STEM (Science, Technology, Engineering and Mathematics) positions. Therefore, it is necessary to provide women with special resources to protect their rights and interests in employment and entrepreneurship, career development, skills training, etc., such as the "Women in the Frontline Program" initiated by the United Nations Sustainable Energy for All Initiative, the African Women's Participation in Energy Development Initiative, and the "Women Empower Women" program in Germany. In Zambia, the "Green Jobs Program" not only provides women with green technology to build houses, but also facilitates them with training in assembling and installing solar panels to cope with the power gap in the economy.

Promoting the full employment for young people. Young people have less work experience, assets and social connections than older people, and the impact of the pandemic has put increasing pressure on the employment of this group. For this reason, some economies and regions have formulated green job strategies targeting young people. During COVID-19 pandemic, the Graduates Subsidy Programme was launched by Hong Kong, China to subsidize private companies and organizations for employing new graduates to work in environment-related jobs, and over 800 graduates have been employed from 2020 to 2023. The EU has also invested almost EUR30 billion to support the transformation and diversification development of green education in relevant regions. Through education and training, it would improve the ability of specific regions and people to adapt to the development of green economy and society, and push forward local schools to update green campus facilities, as well as promote the green transformation of education.

Improving the establishment of green job service institutions and platforms

The development of green jobs cannot be separated from the support of various departments. For example, Washington, D.C., has set up a Green Collar Employment Advisory Committee, which includes members from the municipal level institutions, private enterprises, non-profit organizations and academics, etc., to provide

²¹ European Monitoring Centre on Change. Germany: Coal phase-out. <https://www.eurofound.europa.eu/observatories/emcc/erm/legislation/germany-coal-phase-out#:~:text=There%20will%20be%20compensations%20for,aid%2C%20up%20to%20five%20years.>

²² LinkedIn. Global Green Skills Report 2022. <https://economicgraph.linkedin.com/content/dam/me/economicgraph/en-us/global-green-skills-report/global-green-skills-report-pdf/li-green-economy-report-2022.pdf>

²³ UNDP. 2023. Navigating the Path to a Just Transition: Employment Implications of China's Green Transition. https://www.undp.org/sites/g/files/zskgke326/files/2023-08/paiban9gao0807_cn_zouxianggongzhengzhuanxingdeweilaizhongguolusezhuanxingduijuyedeyingxiang.pdf

information, and recommendations on issues related to green collar employment and enterprise development. It is necessary for all economies to set up task forces for green jobs or expand the scope of work of existing coordination mechanisms.

Secondly, relevant departments should strengthen their cooperation with enterprises to build a resource platform for skilled personnel and cultivate green skilled personnel. The “Closing the Skills Gap Accelerator” released at the World Economic Forum in 2020 is a model of domestic public-private partnership platform, aiming at solving the skills gap between economies and industries and preparing for the future work of economies. Within one year of its establishment, the platform has supported more than 50 million people to shift from declining industries and occupations to growing industries and positions.²⁴

Finally, the relevant departments can promote modern information service and management, provide more information-based, social and mobile whole-process service modes and application scenarios by establishing green job websites, job fairs, talent markets and other platforms, and gather job hunting, recruitment, training, job requirements and other businesses on the same platform to provide efficient and convenient services for all parties. For example, there are green, safe and efficient job-seeking platforms designed for fresh graduates of environmental protection in China, such as Beijing-Tianjin-Hebei Universities and Colleges Eco-Environmental Employment Platform.

3. Accelerating the green transition and the development of enterprises

Enterprises are an important force for the development of green jobs. The relevant enterprises can seize the dividends of the era of green industry development, increase investment in green industries, and create larger employment scale and richer variety of jobs.

Accelerating the green transition of enterprises

In the context of the goals of carbon peaking and carbon neutrality, the green transition of enterprises has become an important strategic task. In particular, enterprises’ strong investment in green industries can create a larger employment scale and a richer variety of jobs. The two mega kilowatt-level pumped storage power stations in Meizhou and Yangjiang, Guangdong Province, built by China Southern Power Grid Company Limited, have been put into operation at the same time, with a total investment of about RMB15 billion, attracting an investment of about RMB30 billion in the upstream and downstream industrial chains and creating about 74,000 jobs²⁵. At the same time, the green transition will also bring about the upgrading and integration of the whole value chain, creating millions of new high-quality jobs. In the case of Drax, a leading technology provider for carbon capture in the UK, the company’s green industry initiative is expected to support and create 49,000 jobs in

²⁴ World Economic Forum. Investment in Upskilling Could Boost Global GDP by \$6.5 trillion by 2030. <https://www.weforum.org/press/2021/01/investment-in-upskilling-could-boost-global-gdp-by-6-5-trillion-by-2030/>

²⁵ Song Chao, Wang Yaoguang. Two Million Kilowatt Pumped Storage Power Stations in Guangdong-Hong Kong-Macau Greater Bay Area Are Put Into Full Operation. https://m.thepaper.cn/baijiahao_18328435

Humber, UK and 205,000 jobs economy-wide under the guidance of policy.²⁶

On the one hand, appropriate steps should be taken for strategic planning and the industrial layout. Enterprises should adhere to the principle of a comprehensive deployment and orderly promotion, with the goal of achieving green and intelligent production and management mode, and gradually advance the path of green transition in stages. When adding new investment and new projects, investment and project management departments at all levels, as well as employment, labor, education and other departments work together to release job information, organizing recruitment and skills training according to the number and skill requirements of the project, and carry out order-based, job-oriented and post-fixing training, providing “one-stop” services for recruitment, training and appraisal for key projects, providing training subsidies and job stabilization subsidies, encouraging enterprises to carry out pre-job skills training, and improving the level of green skills and job quality of workers.

On the other hand, attention should be paid to the leading role of the scientific and technological innovation. Enterprises must rely on the technological innovation to promote green process innovation, and combine greening with digital and intelligent development, enhancing productivity and innovation. On the premise of combing the carbon footprint of their own production and operation activities and scientifically setting short-term, medium-and long-term energy conservation and carbon-reducing targets, enterprises should invest in a planned, step-by-step and efficient way to accelerate the research and development, popularization and application of advanced technologies for energy conservation and carbon-reducing. At the same time, enterprises should increase cooperation with universities and research institutes, build an innovative R&D platform and a green technology innovation system, and provide personnel training and reserve, making the resource allocation more efficient and achievement transformation smoother.

Incorporating ESG management into the corporate governance system

Since the concept of ESG was proposed by the United Nations in 2004, ESG elements have become an important consideration for the implementation of sustainable development strategies by relevant departments, enterprises, investors, financial institutions and other stakeholders. Enterprises with a good ESG have advantages in expanding the scale of production and operation, improving innovation performance and reducing investors’ perceived risks²⁷. Therefore, enterprises should consider ESG as an important starting point for high-quality development and integrate it into corporate governance, corporate culture and business system, disclosing it to accelerate the promotion of green and sustainable development. On the one hand, by building an ESG management organization system with deep high-level participation, horizontal coordination and vertical linkage, the institutional foundation of ESG management is constantly improved, and a series of sustainable development policy systems, internal control systems, and management mechanisms and processes are gradually established and improved. On the other hand, by means of the system optimization, clear division of responsibilities and establishment of

²⁶ McKinsey & Company. Capturing Carbon at Drax: Delivering Jobs, Clean growth and levelling up the Humber. 2020.

<https://www.vivideconomics.com/wp-content/uploads/2020/11/Capturing-Carbon-at-Drax-Delivering-Jobs-Clean-Growth-and-Levelling-Up-the-Humber.pdf>.

²⁷ Mao Qilin, Wang Yueqing. Research on Employment Effect of ESG: Evidence from Chinese Listed Companies [J]. Economic Research, 2023, 58 (07): 86-103.

relevant mechanisms, the internal control system of green management in enterprises should be improved.

Promoting the development of the green supply chain

Based on the traditional supply chain management, green supply chain management incorporates such concepts as whole life cycle and extension of producer responsibility. Relying on the supply relationship between upstream and downstream enterprises, taking core enterprises as the fulcrum, enterprises on the chain are continuously promoted to improve their environmental performance mainly through green supplier management, green procurement and green recycling. The implementation of the green supply chain has built an efficient, clean, low-carbon and circular green manufacturing system, promoted the transformation and upgrading of traditional industries, and improved economic quality and efficiency and coordinated green development, achieving the overall improvement of the environmental quality. The emphasis is on the cooperation between enterprises and local communities and stakeholders to promote the development of green industrial chain. The Lenovo Group actively explores and builds a green supply chain system to drive upstream and downstream enterprises in the industrial chain to carry out energy conservation and environmental protection. In the green production process, in addition to complying with the *Electronic Industry Citizenship Coalition (EICC) Code of Conduct* and all applicable rules, Lenovo also pays attention to the energy consumption issues in the production process, reducing carbon emissions in the first and second areas of its business activities, increasing the use of renewable energy and strengthening the development and promotion of green processes to reduce emissions. In the supplier management process, Lenovo has developed a comprehensive supplier ethics code and continues to monitor the environmental performance of suppliers. In the green logistics sector, Lenovo is committed to using more environmentally friendly transportation methods, reducing greenhouse gas emissions from transportation equipment, and hiring external regulatory agencies to implement improvement measures. In the green recycling process, Lenovo expects to minimize the environmental impact of the product lifecycle, increase the recycling of reusable products and accessories and extend the service life of products as much as possible, providing comprehensive and thoughtful recycling services for products whose life cycle is coming to an end at the same time. In the green packaging process, Lenovo is committed to providing green packaging for products, and creating green packaging by increasing the types of recycled materials and the proportion of recyclable materials in packaging, reducing packaging size, promoting various measures such as industrial (all-in-one) packaging and reusable packaging. At the same time, Lenovo has built a green information disclosure platform to showcase and publish Lenovo's environmental protection principles, policies, measures and achievements.

Enhancing the green skills training for employees

Firstly, provide training and skills enhancement opportunities to groups in need. In the process of enterprise transformation, it is necessary to pay attention to resettlement and support for employment affected groups. In this respect, the ENEL Group provides a very good example. In response to the impact of the closure of large coal-fired power plants or the development of new power plants, all directly affected employees have been properly resettled as of 2019 after the Future project was launched in 2015. The main measures taken include offering early retirement incentives for elderly workers; implementing an apprenticeship recruitment plan to ensure that older workers impart knowledge to younger workers; establishing a

resettlement agreement between companies, workers and their representatives; and improving skills through training to ensure that workers have certain qualifications and employability during the recruitment phase and throughout their entire careers²⁸.

Secondly, accelerate the dynamic adaptation of enterprise human resource management. With the development of green jobs, enterprises on the one hand are faced with the rapid changes of job skills and the demand for rapid change of production organization structure. On the other hand, they are faced with a shortage of green talents, the transformation of staff skills and even jobs, and some changes in employment. Therefore, it is necessary to enhance the skills of managers and develop new perspectives, awareness and management capabilities to meet the needs of management talents for the green transition and development of enterprises.

4. Promoting the innovation and development of green finance

Compared to traditional industries, green jobs require higher capital, technology, time investment and risk cost. Financial institutions must enhance their awareness of green investment, seize the opportunities of green industry development and transformation and upgrading of traditional industries, make full use of various tools to innovate, and effectively realize the green optimal allocation of resources.

Increasing the support for green projects

The financial industry should take the increasing job opportunities and the job quality as important indicators for evaluating projects, continuously optimize the investment structure of funds, continuously increase support for key areas and weak links of green projects, and build an effective financial support system and mechanism for the real economy. For example, as of now, the People's Bank of China has supported a total of RMB300 billion in special re-loans for clean and efficient utilization of coal²⁹. China Merchants Bank recently issued the first issue of green finance bonds in 2022, which is also the first time that commercial banks within China have issued green finance bonds with the theme of rural revitalization. All the raised funds will be used for green industry projects within the county, especially clean energy projects such as wind power and photovoltaics, which will help strengthen support for rural revitalization of financial services³⁰. At the same time, innovative products and services should be increased by all economies necessarily. When designing sustainable development linked bonds, the number of retained employees can be set as a key performance indicator to encourage enterprises to utilize employees in the transition. Meanwhile, the experience of the European Union can be used for reference, and special funds for transition can be established, so as to invest in vulnerable and more negatively affected regions and enterprises.

Enriching the green financial products

Green finance is an important driving force for economic recovery. It's necessary for all economies to accelerate the integration of regional carbon financial markets, and

²⁸ World Resources Institute. Italy: Enel's Just Transition Framework and Futur-e project. <https://www.wri.org/update/italy-enels-just-transition-framework-and-futur-e-project>

²⁹ Another RMB100 billion is added to the special refinancing of the central bank to support clean and efficient utilization of coal, totaling RMB300 billion. <https://t.y.net.cn/baijia/32714214.html>

³⁰ China Merchants Bank builds a green world and vigorously supports investment and financing of low-carbon industries. <https://baijiahao.baidu.com/s?id=1734395430051846082&wfr=spider&for=pc>

more funds should be mobilized to flow to the fields such as low-carbon development, environmental protection, and renewable energy to support green development. In addition, the development of carbon trading market should further be strengthened and the R&D and design of carbon market trading tools, carbon market financing tools and carbon market support tools should be enriched, helping enterprises reduce the risks they bear and face in the green transition, guiding industrial upgrading, promoting green innovation and changes in energy structure, industrial structure, green technology and other fields, and providing financial support for green jobs.

Actively exploring the application of ESG evaluation results

In China, ESG has been included in the documents such as Guidelines for Green Finance in Banking and Insurance Industry and Guiding Opinions on Promoting Climate Response Investment and Financing. The financial institutions of all economies should make full use of the evaluation reports of credit institutions and ESG rating agencies, study ESG evaluation system methods and models relying on their own financial technology capabilities, and actively explore the application of ESG evaluation results in financial product innovation and financial risk management, attracting more medium- and long-term professional investment institutions such as publicly offered funds, insurance institutions and social security funds to participate in ESG investment and guide investment institutions to increase green and low-carbon investment. At the same time, large, medium and small enterprises should be guided to actively disclose ESG information through green credit and green investment, obtaining more inclusive, accurate and efficient financial services.

5. Strengthening skills training and qualification certification

Compared with the rich early explorations in the training of green skilled talents in developed economies, green jobs in some developing economies have started relatively late, the training mode of professional talents is still being explored currently, there are no targeted majors in colleges and universities, the education structure and talent training methods lag behind social needs, and the reserve of outstanding talents is insufficient to meet the explosive demand for the green development. A sound labor market policy and the effective cooperation with private sectors in technical and vocational education and training institutions can promote society's faster adaptation to constantly changing skill needs.

Improving the green talent training system

It is necessary to make the overall use of all kinds of education and training resources to build and optimize a multi-industry, multi-level, multi-subject and multi-form green talent training system with relevant departments, vocational skills training colleges, enterprises, professional associations and training institutions as the carrier. For example, the EU has successively issued some policy documents such as the *European Skills Agenda for Sustainable Competitiveness, Social Equity, and Resilience* and the *University Vision for the European Green Deal* to fund citizens to improve their knowledge and skills in tackling climate change and teachers to improve their green education skills. The European Social Fund will help the European labor force acquire the skills necessary for industrial transition, and update the European Skills Agenda and Youth Protection Plan to improve the employability of the people in the green economy. Developing economies should focus on the training of urgently needed talents, as well as the changes in the demand for green skills in different stages of green and low-carbon development, providing skills reshaping and

upgrading for the labor force according to the needs of ecological transition, building green skills talents integrating production and education ecological chain, and realizing the transition of re-employment and capacity improvement training.

Improving the ability of the green skills training

LinkedIn released the *Global Green Skills Report 2022*. Driven by the new climate policies and commitments, the global demand for green skills and talents is increasing significantly. It is estimated that over one million green jobs will be created in the next decade, and the supply of green talents is in short supply. Therefore, it is necessary to unite better the consensus of industry associations, enterprises, training institutions and other relevant departments, form joint efforts to speed up the construction of green job skills training institutions, and build a number of demonstration, leading and driving green training programs around green and low-carbon pillar industries, emerging industries, digital economy industries, modern service industries and other fields to promote the integration of vocational skills training chains with industrial chains.

It is worth noting that non-profit organizations can play an important role in green skills training. For example, Grid Alternatives, a non-profit organization headquartered in Oakland, California, US, strives to build community driven solutions that promote economic and environmental justice through renewable energy. The organization enhances employment opportunities by providing solar energy training in vulnerable communities.

Strengthening the connection between curriculum system and professional standards

At present, some APEC economies have carried out the classification and labeling of green jobs. For example, 134 “green jobs” in the *Occupational Classification Code of the People’s Republic of China* have been issued to strengthen the training of green job skills, cultivate more “green collar” skilled talents, and provide sufficient skilled talents support for green, low-carbon and high-quality development. All economies should encourage vocational and technical colleges to set up professional courses related to the green economy and green industries, and hire full-time theoretical course teachers and part-time job skills trainers to share the teaching work together, exporting green job labor force with profound theoretical knowledge and strong application ability for green enterprises.

Improving the qualifications standards

The key is to improve the relevant qualification certification standards and set different qualification requirements for different green jobs in their industries. It is important to ensure that employees in green industries hold certificates, improve the overall quality of green job labor force, and promote the gradual improvement of green job quality. For example, in Germany, the rapid adjustment of training system and the introduction of new green certification courses in the early stage have greatly promoted the greening of the construction industry³¹. At the same time, it is vital to strengthen the supervision and maintain the social environment of green skills education and training,

³¹ Cedefop (2019). Skills for green jobs – 2018 update: European synthesis report. Luxembourg: Publications Office. Cedefop reference series; No 109.

ensure fair competition, and prevent and eliminate monopoly and speculation.

Establishing a green job survey and research mechanism

Statistics on green job data, such as job scale, job creation and loss, industry distribution and vocational skills, will not only help to better evaluate the impact of green economic transition, but also help to provide a basis for relevant departments to make labor market decisions. Therefore, all economies should strengthen the green job survey, draw on the relevant experience of the US Bureau of Labor Statistics and that in relevant economies, and scientifically develop the methods and tools for green job measurement, statistics and forecasting. It is vital to dynamically understand and master the types, duties, employees' scale and basic characteristics, wage, ability requirements, regional distribution, industry distribution, supply and demand situation, etc. of green jobs, and timely release green skills demand information to the society according to the survey and statistical results.

VII. The General Code of Occupational Classification of the People's Republic of China

1. Definition, Determination and Identification of Green Jobs

Definition of green jobs

The term “green job” first appeared in the report entitled *Green Jobs: Towards Decent Work in a Low-carbon, Sustainable World* jointly issued by the United Nations Environment Programme (UNEP) and the International Labor Organization (ILO). The UNEP defines “green jobs” as “positions in agriculture, manufacturing, scientific research and development, public service and service industries, etc. with the purpose of mitigating the environmental hazards faced by human beings.”

Green jobs are defined in a narrow or a broad sense in different economies around the world. The definition in a narrow sense takes into consideration the output of professional activities as a view of research to consider the entities that provide green products or services directly in a certain field as green jobs, with the emphasis on the actual effect and the direct contribution. The definition in a broad sense takes the green attribute of occupational activities as view of research to regard those that benefit environmental protection or natural resources saving in economic activities as green jobs.

The green jobs in China is defined in a broad sense as “an occupation whose main task is to provide green products or services in green economic activities”, including the jobs that provide green products and services and those that provide products and services for the subjects producing green products and services.

Determination of green jobs

Green jobs in China are determined based on the “definition” and “main tasks” of these occupations in the *General Code of Occupational Classification of the People's Republic of China* (hereinafter referred to as “the Code”), when their occupational activities are included in green economy industrial activities³² and they could provide green products or services in a direct or an indirect form after all or part of the tasks are completed. The direct form refers to the concept that the occupational activities provide green products or services, while the indirect form means that occupational activities provide products or services partially providing green products and services.

According to the different results of how a green economy affects occupations, green jobs can be divided into three categories: green emerging type, demand growing type and skill changing type. **(1) Green emerging type.** This refers to a certain employment group born under the influence of green economic activities to have its main tasks distinct from those of other occupations in the same occupational classification system, and meet the necessary conditions for becoming an independent occupation. **(2) Demand growing type.** This refers to an existing occupation in the field of green economic activities with no fundamental change in its

³² In accordance with *the Green Industry Guidance Catalogue (2019 Edition)* jointly issued by seven ministries and commissions including the National Development and Reform Commission, the fields of green economy industrial activities include: energy conservation and environmental protection, clean production, clean energy, ecological environment, green services and green upgrading of infrastructure.

main tasks but having the trend of its number of employees increased significantly due to the growth of the demand. Generally speaking, the expansion of green economic activities is positively correlated with the growth in the number of employees, with differences only in the growth margin. **(3) Skill changing type.** This refers to an existing occupation whose main tasks are changed due to the changes in production service technology and labor organization mode under the influence of green economic activities, so that new requirements for the knowledge and skills of its employees arise.

Identification of green jobs

The identification of green jobs in China can be traced back to the time before 2000, when the 1999 edition of the Code systematically divided and classified social occupations, with “wild plant protector”, “waste gas processor” and others in green fields included but not identified as green jobs until the first-time identification in the 2015 edition. The 2015 edition of the Code identified some socially well recognized occupations with significant green characteristics as green jobs (identified as L) after the research and analysis conducted on occupational activities that are “environment-friendly, low-carbon and recycling” on the basis of both full consideration of the characteristics of social division of labor during the transformation period of Chinese society and the lessons drawn from the advanced experience of other economies, with a total of 125 green jobs. The 2022 edition of the Code canceled 6 green jobs and added another 15 after the re-examination of the original ones, with a total of 134 green jobs accounting for approximately 8% of all occupations.³³

2. Application of the Rules of Determination of Green Jobs

China's green job identification adopts the one-by-one identification method, in which the definitions and main tasks of the occupations in the Code are analyzed one by one to decide whether they are green jobs. This paper selects the typical representatives of the three green jobs, including green emerging type, demand growing type and skill changing type, and analyzes the process of their identification as green jobs respectively.

Example 1: Carbon Management Engineering Technician (2-02-27-07)

On 22 September, 2020, President Xi Jinping delivered an important speech at the General Debate of the 75th General Assembly of the United Nations, announcing that China will adopt stronger policies and measures to strive to peak its carbon dioxide emissions by 2030 and achieve the carbon neutrality by 2060. The *Interim Rules for Carbon Emissions Trading Management* (B. L. 2020 No.19), the *Notice on Strengthening the Management of Greenhouse Gas Emission Reports of Firms* (H. B. Q. H. [2021] No.9) and other documents were printed and distributed by the Ministry of Ecology and Environment to start the construction of the domestic carbon market, which will gradually cover eight key emission industries including power generating, petrochemical, chemical engineering and iron and steel, and to organize key emission firms to carry out a series of work, such as carbon emission accounting, reporting, verification, emission monitoring and evaluation. The above policies put forward some new requirements for carbon emission management in firms and organizations where

³³ Ministry of Human Resources and Social Security. (2022). Promotion of green development and continuation of green job identification. *Occupation* (21), 10.

specialized personnel began to be arranged to manage and study all the affairs related to carbon emission, hence a new occupation, carbon emission management engineering technician, was created and a relatively stable employment group took shape. According to statistics, there are 5,000 carbon emission management engineering technicians in China, and this number is expected to increase by 8,000 in the next 20 years.

The work requirements for carbon emission management engineering technicians are standardized, and their job content is becoming stable. From 2015 to 2017, the Development and Reform Commission issued three batches of the carbon emission accounting methods and reporting guidelines involving companies in 24 industries. From 2016 to 2019, the Standards Commission introduced 11 domestic standards for carbon emission accounting and verification in industries. From 2017 to 2021, the Ministry of Ecology and Environment released a series of documents related to the construction of the carbon emission trade market, the management of key emission units, and the verification of carbon emissions, gradually clarifying the job requirements, methods and objectives of carbon emission management engineering technicians. With policies changed and relevant work progressing, the requirements for carbon emission management engineering technicians have been upgraded to being able to comprehensively apply the knowledge of energy management, environmental management, production and operation management of related industries in combination with that of statistics, evaluation, trading, etc. to systematically carry out the research, development and formulation of technologies, equipment, materials and standards for carbon emission management in firms and organizations. So far, the job content of carbon emission management engineering technicians has been stable.

In 2022, the job of a carbon management engineering technician was listed in the Code and marked as a green job, belonging to the green service field referred to in the *Green Industry Guidance Catalogue (2019 Edition)*. According to the definition and the main tasks of the occupation, a carbon management engineering technician can research and develop technologies, equipment, materials and standards for carbon emission monitoring, statistical accounting and verification; analyze and mine the data of carbon emission and evaluate the status of it; formulate carbon emission verification procedures; formulate and implement carbon emission and carbon neutralization plans for firms and organizations, and plan, design and manage carbon neutralization projects; formulate carbon emission rights trading schemes for firms and organizations, trade carbon emission rights, and manage carbon assets; help relevant departments responsible for managing carbon emissions in their efforts to reduce carbon emissions, making contributions to achieving peak carbon emissions and carbon neutrality. This green job is a newly bred job against the background of "dual carbon" goals, with its main tasks all related to global climate change and carbon emissions and distinct from the job content of other occupations in the same occupational classification system, hence it belongs to the green emerging type.

Table 6 Green Identification of Carbon Management Engineering Technicians

Occupation Name and Code	Occupation Definition	Main Tasks	Rule of Determination	Specific Circumstances
Carbon management engineering	Engineering technicians engaged in the	1. Track and analyze the development and	Field to which it belongs	Green service Direct provision

<p>technician (2-02-27-07)</p>	<p>research, development, design and evaluation of implementation of the strategies, plans, methods and technologies for emission reduction and negative emission management of greenhouse gases such as carbon dioxide.</p>	<p>changes of policies, technologies, industries, finance, markets and other fields about climate change, and study global climate governance models and mechanisms;</p> <p>2. Research and design the management strategy and the plan towards peak carbon dioxide emissions and carbon neutrality;</p> <p>3. Research, develop and design the carbon emission reduction management technologies, management methods, implementation plans, standards and norms;</p> <p>4. Research, develop and design carbon sinks and CCUS and other negative emission technologies, management methods, implementation plans, standards and norms ;</p> <p>5. Carry out investment, financing of carbon emission management projects and risk assessment;</p> <p>6. Evaluate and optimize the management methods, implementation plan and operation</p>	<p>Products and services provided</p> <p>Green job category</p>	<p>of services</p> <p>Green emerging type</p>
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Example 2: Biogas Worker (5-05-03-01)

In 1999, the job of "biogas production worker" was listed in the Code. In 2010, China invested RMB5.2 billion to subsidize the construction of biogas projects in rural areas, resulting in 3.2 million households of new biogas users and more than 1,000 medium-sized and large biogas projects. The new requirements and goals for rural biogas projects increased the demand for "biogas workers" and a professional team for biogas design, biogas project construction, biogas equipment manufacturing, biogas service provision and comprehensive utilization of "biogas, biogas slurry and biogas residue". In 2015, the job of biogas worker was officially listed in the Code and marked as a green job, with two categories: A "biogas production worker" and "biogas operation and maintenance technician." The economic activities of this occupation belong to the field of clean energy industry referred to in the *Green Industry Guidance Catalogue (2019 Edition)*. According to the definition and main tasks of the job, a biogas worker can "build, install, operate and maintain biogas digester units and biogas projects" and directly provide green products and services. The construction and operation of biogas digester units, involve effective utilization of livestock manure, straw and other agricultural production wastes, which not only reduces the discharge of agricultural wastes and the non-point source pollution caused by excessive application of chemical fertilizers and pesticides, but also plays an important role in improving the quality and safety of agricultural products, promoting the production of green and organic agricultural products, realizing agricultural cost saving and efficiency improvement, and changing the agricultural development mode. Following the large-scale biogas projects in rural areas in 2010, biogas application in rural areas began to be transformed and upgraded in 2015, with its developing focus changed from household use to that in large scale, its functions expanded from single to diversified, and the concern of constructive projects turned from individual parts to integration and overall planning of the whole industrial chain. The industrial development inevitably affects career development. From the scale construction in 2010 to the improvement of quality and efficiency in 2015, the demand for "biogas workers" is increasing, and this occupation belongs to the demand growing type of green jobs.

Table 7 Green Job Identification of Biogas Workers

Occupation Name and Code	Occupation Definition	Main Tasks	Rule of Determination	Specific Circumstances
Biogas worker (5-05-03-01) (2015)	Personnel engaged in the construction, equipment installation, operation and maintenance, technical guidance, production and operation and other work concerning household biogas digesters and biogas projects.	1. Select the construction site, prepare the construction machines, materials and equipment, excavate the foundation trench, and build structures to store biogas slurry and biogas residue to lay the foundation for construction and equipment; 2. Build biogas digesters, install anaerobic digestion devices, gas storage devices, purification	Fields to which it belongs	Clean energy industry
			Products and services provided	Direct provision of products and services

		<p>devices, delivery pumps, mixers, transmission and distribution networks, flow meters, monitoring devices, cookers, devices for the production and utilization of biogas slurry and residue, etc.;</p> <p>3. Debug equipment, test pressure and water, and debug system operation;</p> <p>4. Pretreat raw materials, blend fermentation raw materials, put in inoculum, and stock materials in and out of warehouses;</p> <p>5. Regulate and control the parameters of the composition, temperature, pressure, gas production, gas composition, pH value and other aspects of the raw material in the anaerobic digestion device;</p> <p>6. Repair and maintain the equipment for gas storage, purification, transmission and distribution network, biogas pipeline, biogas utilization and other purposes, and regularly replace wearing parts;</p> <p>7. Operate biogas-powered machinery and energy generators, detect and analyze the composition of inlet and outlet liquid and gas, check and record daily safety, firefighting and hygiene conditions, troubleshoot and maintain equipment;</p> <p>8. Carry out the technical guidance and training, guide users in safe production and use of biogas and comprehensive utilization of biogas slurry and biogas residue.</p> <p>This occupation includes but is not limited to the following types of work: biogas production worker and biogas operation and maintenance technician</p>		
Biogas production worker (5-99-02-01)	Personnel engaged in the construction, installation, equipment	1. Make and assemble templates, make steel skeleton, prepare and pour concrete, make	Green job category	Demand growing type

(1999)	commissioning and maintenance of rural household biogas digesters, urban domestic sewage purification biogas devices, medium-sized and large biogas projects, and biogas production management.	biogas digesters and arches; 2. Make water seal, air seal and heat insulation layer; 3. Make desulfurization tanks, gas storage hoods and other equipment; 4. Install and debug the gas transmission and distribution pipeline system, electric, water and gas instruments, combustion appliances, biogas-powered machinery and energy generators; 5. Prepare, add and discharge the materials in the biogas fermentation tank, and monitor the temperature, pH value, gas and feed liquid status in the biogas fermentation tank; 6. Operate biogas-powered machinery and energy generators, and detect and analyze the quality of inlet and outlet feed liquid and gas; 7. Maintain the machinery and electrical equipment; 8. Comprehensively utilize fermentation residues.		
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Example 3: Automotive Dismantler and Recycler (6-22-02-02)

In 2015, "automotive dismantler and recycler" was listed in the Code and marked as the green job. However, the automotive recycling industry in China has always been labor-intensive, with simple process of recycling, a lack of advanced technologies and specialized equipment for dismantling and majorly simple manual tasks for the dismantlers. Its low proficiency in automotive dismantling and recycling and low recycling rate results in the need for improvement in intensive utilization of resources and energy and in environmental protection.

In the recent years, technologies in automotive recycling and dismantling have been gradually improved, hence new requirements for the workers have been put forward. For example, the recycling of non-ferrous metals in scrapped automobiles has changed from recycling parts to recycling raw materials, which requires the workers to chop the body of scrapped automobiles with a chopper, and then remove impurities and separate them through mechanized and semi-automatic methods for respective

recycling of different raw materials. Therefore, it is necessary for the employees to master the technologies for mechanical automatic crushing and sorting of scrapped automobile bodies, the recycling technology of steel, plastic, rubber and other materials, and the subtle and nondestructive dismantling and treatment of main parts of scrapped automobiles, so as to improve the level of automation of and the proficiency in automotive dismantling and recycling.

With the changes in requirements for knowledge and skills, the occupation of automotive dismantler and recycler was marked as the skill changing type during the evaluation of green jobs for the 2022 edition of the Code. The economic activities of this occupation belong to the field of energy-saving and environmental protection industry referred to in the *Green Industry Guidance Catalogue (2019 Edition)*. According to the definition and main tasks of the job, an automotive dismantler and recycler can carry out hazard-free treatment of scrapped automobiles, and accurately reuse them through dismantling, indirectly providing green products.

Table 8 Green Job Identification of Automobile Recycling and Dismantling Worker

Occupation Name and Code	Occupation Definition	Main Tasks	Rule of Determination	Specific Circumstances
Automotive dismantler and recycler L (6-22-02-02)	Automotive dismantler and recycler L Personnel using special equipment or tooling, tools to recycle scrapped automobiles, evaluate residual value, and carry out hazard-free treatment and dismantling of scrapped automobiles.	1. Use the special equipment or tooling and tools to recycle scrapped automobiles and evaluate residual value; 2. Use the special equipment or tooling and tools to carry out hazard-free treatment of scrapped cars, dismantle parts and main assemblies, and decompose and store them according to material types; 3. Use the special equipment or tooling and tools to flatten or cut the body and structural parts of scrapped automobiles; 4. Maintain equipment and troubleshoot. This occupation includes but is not limited to the following types of work: automotive recycler and	Fields to which it belongs	Energy saving and environmental protection industry
			Products and services provided	Indirect provision of products and services
			Green job category	Skill changing type

		automotive dismantler		
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3. Main Experience of the Green Job Identification

Building a green job classification system in line with the trend of international development

In 2008, the report *Green Jobs: Towards Decent Work in a Low-carbon, Sustainable World* issued by the UNEP and the ILO put forward the concept of "green job" for the first time. In 2009, the US Department of Labor officially announced 204 green jobs and their classification system in economic activities. At the end of 2010, the Ministry of Human Resources and Social Security of China initiated the revision of the Code, which was completed and officially released to the public in 2015. The 2015 edition of the Code identified 125 green jobs for the first time, and the identification of green jobs continued to be updated with the development of the times and social changes. There were 134 green jobs in the 2022 edition of the Code, with new occupations added and some of the original ones canceled. So far, China and the United States are the only two economies that have established green job classification systems.

Forming green job identification ideas by drawing on advanced experience of other economies

A clear concept and meaning of green jobs is the starting point for appropriate identification. Based on the lessons drawn from the concepts of green jobs in academic circles at home and abroad, international organizations and other economies, China has adopted the broad concept, which defines the occupations directly or indirectly providing green products and services as green jobs. On the basis of that, a basic identification method has been decided to analyze all occupations included in the Code one by one according to their definitions and main tasks in the Code to clarify their green economy industrial activities, tell whether they can provide green products and services, and categorize them.

Determining the fields of green jobs based on the actual development situation in China

According to the *Green Industry Guidance Catalogue* (2019 Edition) jointly issued by seven ministries and commissions including the Development and Reform Commission, the Code divides the green jobs into six major fields: energy conservation and environmental protection, clean production, clean energy, ecological environment, green service and green upgrading of infrastructure, which is a scientific division based on the actual situation of China's industrial development. Compared to the 12 fields identified by the US Department of Labor, China's division is clearer, showing the greenness of the whole process from infrastructure to production to products and services. At the same time, the division in China also basically includes the 12 fields divided in the US. A specific comparison is shown in the following table.

Table 9 Comparison of Green Economy between China and the United States

Green Job Fields in China	Green Job Fields in the US

Energy conservation and environmental protection	Manufacturing
Clean production	Recycling and reduction of waste
Clean energy	Renewable energy power generation Energy efficiency Energy trade Energy and carbon capture
Ecological environment	Agriculture and forestry Environmental protection
Green upgrading of infrastructure	Green construction Transport industry
Green service	Research, design and consulting services Administrative services by the government and regulators

Adjusting and updating the number of green jobs based on the characteristics of the industrial change

With the deepening of high-quality economic development, China's economic structure has been continuously adjusted, and its industrial structure is characterized by digitalization, intelligence and low carbonization. Taking carbon-related occupations as an example. High-quality economic development signifies that greenness becomes a common factor, with the promotion of peak carbon dioxide emissions and carbon neutrality being a necessity. To achieve the "dual carbon" goals, the important means is the active cultivation of new formats, new models and new industries with low carbon, zero carbon and negative carbon for the green and low-carbon transformation of traditional industries. In this context, the demand for carbon-related employees in the labor market is increasing, the scale of carbon-related employees is gradually expanding, and the level of specialization and professionalism is constantly improving. More and more carbon-related occupations have been identified as new jobs. At the same time, the 2022 edition of the Code has identified three new green jobs for the first time, including "carbon emission management engineering technician", "carbon sink metro-logical assessor" and "carbon emission manager."

4. Prospects for Green Job Development

Establishing a green job observation station to dynamically update green jobs and their skill requirements

Dynamic updating of the types and number of green jobs is successfully adopted in China and also commonly practiced around the globe. In France, the domestic observation station for green jobs and skills regularly evaluates employment trends in the green economy and releases relevant reports. In the United States, the state government plays an active role in determining the demand for green transformation skills. In Thailand, occupational trend reports are regularly issued by the Employment Department of the Ministry of Labor (Thailand) to identify the occupational needs, including occupations related to the green sector; the human resources or business strategy departments of private companies determine the labor demand, and the employer association forms an industry demand report on the basis of that³⁴. For future development, China can draw on advanced international experience to further subtilize the green job identification and updating tasks, promote the establishment of green job observation stations in firms, industry associations and advanced provinces in green transformation, guide employers and industry associations to collect relevant data regularly, and learn about the extent of the match between the employment demand of firms and the supply of labor resources in the human resources market, the changes of employers' requirements for workers' skills, and the emergence of new occupations, etc., so as to lay a scientific foundation for the updating of occupations and their skill requirements in the Code.

Building skilled talent teams and promoting high-quality green employment

The green job identification is the first step to improve the social recognition of employees and give full play to the role of green jobs in employment pressure relief and new job provision. To have green jobs stabilize employment and promote high-quality employment, efforts should be made in terms of occupational standards development and skills training improvement to strengthen the construction of green job employee teams and increase their proficiency. For one thing, domestic skill standards for green jobs should be developed. So far, ROK, Thailand and other economies have had some experience in the development of green transformation skill standards, and the development of vocational skill standards in China has also been steadily progressing. For the future development, it is important to take the identification of green jobs as an opportunity to speed up the compilation of domestic skill standards for green jobs, put forward higher requirements for the proficiency of green-job-related employees, and provide a smoother path for their career. For another, skilled talents for green jobs should be trained. First of all, governments at all levels, industry associations and employers should carry out targeted skills training based on vocational skill standards and their own actual situations of conducting green economic activities, so as to train people in practice. Secondly, vocational and technical colleges should further the construction of disciplines corresponding to green jobs, and train a group of skilled workers who protect, manage and beautify the ecological environment, produce new energy for efficient transportation and recycle waste according to the *Guidelines for Corresponding Information of Vocational Information and Education and Training Projects (Specialties)* issued by the Ministry of Human Resources and Social Security. At the same time, a "one-stop career service network" and other websites should be built to enable students to accurately

³⁴ Yan Zhongxing. (2020). Lessons from foreign experience of green job skill development for the training of green job skills in China. *China Training* (06), 83-85. doi: 10.14149/j.cnki.ct.2020.06.038.

learn about the career market dynamics matching their green skills.³⁵

Giving play to the role of specialized technical personnel to accelerate the achievement of the 2030 Sustainable Development Goals

To implement the green and low-carbon transformation and achieve the 2030 Sustainable Development Goals, we will not only rely on a large number of skilled workers with green skills, but also more importantly on a large number of high-level green talents for technological innovation. For one thing, it is key to improve the training system of high-level green talents, promoting the establishment of applied and research degree programs, the construction of green laboratories and the organization of more international academic exchanges and cooperation in colleges and universities³⁶⁵ to train a group of green talents who can engage in scientific research, technology development, design and planning for the acceleration of the research, development and promotion of green and low-carbon technologies, as well as the advancement of green and low-carbon industries. For another, promote a mutual recognition of green job qualifications should be further strengthened. International organizations should play an active role in promoting the construction of a unified green vocational skill evaluation system and mutual recognition of qualifications among economies in order to open up the channels for green talents to work internationally, so that they can make more contributions to the development of the world green economy.

³⁵ Zhang Ping. (2022). Internal driving force, international experiences and practical paths for the development of green vocational education. *Chinese Vocational and Technical Education* (34), 44-48.

³⁶ Zhou Weiwei. (2020). Research on attributions of green job development and characteristics of relevant education and training in the United States. *Vocational & Technical Education Forum* (10), 161-166.

VIII. Green Jobs in Hong Kong, China: Take the Environmental, Social and Governance (ESG) Reporting and Certification Services as an Example³⁷

1. Introduction

According to the definition of the United Nations Environment Programme (UNEP), Green Jobs refer to those jobs that have a positive impact on the environment³⁸, which can not only help reduce energy consumption, but also reduce carbon emissions and maintain species diversification, covering a wide range.

This research takes the environmental, social and governance (ESG) Reporting and green certification services in Hong Kong, China as an example to describe the development of the three most directly related green jobs in Hong Kong, China, and suggestions for improvement are put forward. These three green jobs are: (1) third-party ESG consultants, who mainly assist companies listed in Hong Kong, China to prepare ESG reports that meet the requirements of Hong Kong Exchanges and Clearing Limited (HKEx); (2) verifiers of green financial certification bodies, who mainly issue various green certifications to commercial companies so that these companies can obtain financing at low cost; and (3) employees of sustainable development departments of listed companies. These green jobs contribute to the implementation of environmental, social and governance responsibilities of enterprises.

The research adopts the methods of a literature review and the in-depth interview. We reviewed the literature of major institutions, deconstructed the development context of ESG reports and green financial certification services in Hong Kong, China, and focused on the changing process of regulatory requirements of HKEx. Through in-depth interviews, we learned about the above three types of green jobs, job establishment and job content in different organizations and enterprises, as well as entry and promotion requirements, etc., and tried to estimate the number of green jobs on this basis. The interviewees cover accounting firms and certification bodies of different sizes, as well as listed companies with different market capitalization.

In this research, it's pointed out that many listed companies in Hong Kong, China implement ESG reports mainly to meet the regulatory needs of the listing code-we call it "Mandatory-Driven"; while on the other hand, some company managers will actively implement ESG work for potential development opportunities and even apply for various certification even if there is no listing rule requirement -we call it "Value-Creation-Driven". Whether it is "Mandatory-Driven" or "Value-Creation-Driven." with the improvement of regulatory requirements and the deepening of enterprises' understanding of ESG, more green jobs will be created. In addition, we should be fully aware that the original intention of practitioners of green jobs is often not only for salary, but also for pursuing broader social goals-environmental protection and sustainable development. Therefore, when the relevant institutions select and train these practitioners, the consideration of public service motivation (PSM) is very important (Perry and Wise, 1990). PSM measures the desire and motivation of individuals to serve the public interest at work, and this intrinsic motivation is crucial to promoting goals of environmental protection and sustainable development (Rainey

³⁷ This research report is part of the Hong Kong, China case reported by the APEC project "Promoting Green Jobs for a Resilient Economic Recovery from COVID-19" of the Chinese Academy of Personnel Science. For any comments on this report, please email: sushkhub@cityu.edu.hk.

³⁸ Source: "Emissions Gap Report 2021", United Nations Environment Programme, UNEP, UNEP Copenhagen Climate Centre (UNEP-CCC), 2022 (<https://www.unep.org/resources/emissions-gap-report-2021>).

and Steinbauer, 1999; Fu, Hsieh, and Wang, 2019). To this end, cultivating and retaining the practitioners with strong PSM by shaping unique internal culture and adopting more transformational management methods should be put on the agenda of enterprises. Such changes would not only help enterprises meet regulatory requirements, but also promote environmental protection and sustainable development in Hong Kong, China and even the whole world in a long-term and steady manner. Based on the results of the study, this paper will provide policy recommendations to support the sustainable growth of green jobs in Hong Kong, China.

The Changes to ESG Reporting Rules of Listed Companies in Hong Kong, China and the Scale of Green Financing

Hong Kong, China, is an international financial center and an ideal place for many enterprises to go public and raise funds. The Hong Kong Exchanges and Clearing Limited (HKEx) is the only recognized securities market and futures market in Hong Kong, China. Companies registered in Hong Kong, China or overseas who intend to be listed and traded on the HKEx must abide by the *Listing Rules* formulated by the HKEx³⁹.

HKE is a major financial market stakeholder in the world, and has been committed to promoting the sustainable development of the world for many years. Establishing and improving the ESG Reporting system is an important means for HKEx to promote listed companies to implement their social responsibilities. The promotion of ESG reporting system by HKEx can be divided into four stages: voluntary reporting system, semi-compulsory reporting system, compulsory reporting system and improvement of compulsory reporting system.

Table 10 HKEx Promotes ESG Reporting System

Date	Stages
December 2012	Encourage voluntary disclosure of ESG reports
December 2015	Semi-mandatory reporting
July 2020	The mandatory disclosure of corporate governance and climate-related reports
July 2022	The mandatory simultaneous publication of annual report and ESG report

As early as 2012, HKEx issued the *ESG Reporting Guide*, which provided template suggestions for listed companies to voluntarily disclose ESG. Besides, since 2016, some suggestions in the *Reporting Guide* have been raised to the level of a semi-mandatory disclosure, and the "complete or explain" requirement has been implemented, among which the equivalent of greenhouse gases emitted by enterprises and the energy consumption indicators of companies are listed. In

³⁹ For details, please refer to the "Listing Supervision" page of the HKEx: (https://www.hkex.com.hk/Listing/How-We-Regulate/Overview?sc_lang=zh-HK).

September 2018, Hong Kong, China published the *Green Finance Strategy Framework*, the main purpose of which is to strengthen the environmental information disclosure of listed companies, especially climate-related information. In the following year, HKEx issued a consultation document proposing to improve the *Reporting Guide* according to the *Framework*, and the relevant consultation was completed at the end of the same year.

Following several years of preparation, in the financial year starting from 1 July , 2020 or later, HKEx requires Hong Kong, China listed companies to disclose more information in ESG reports, and the time limit for publishing reports is shortened to five months after the end of the financial year, and from July 2022, the time limit is shortened again to synchronize with the annual report.

According to the current *Listing Rules*, the provisions regulating how companies listed on the Main Board implement ESG reports are mainly contained in Appendix 27 of the Rules, while the disclosure requirements for Growth Enterprise Market (GEM) are contained in Appendix 20 of the Rules. The requirements of the two appendices are not much different. For the purposes of Appendix 27 to the *Listing Rules* of the Main Board, the disclosures cover four major areas and 12 aspects.

Table 11 Appendix 27 of the Rules of the Main Board

Major Areas, Aspects, General Disclosures and KPIs	
Environmental	Aspect A1: Emissions
	Aspect A2: Use of Resources
	Aspect A3: The Environment and Natural Resources
	Aspect A4: Climate Change
Employment and Labour Practices	Aspect B1: Employment
	Aspect B2: Health and Safety
	Aspect B3: Development and Training
	Aspect B4: Labour Standards
Operating Practices	Aspect B5: Supply Chain Management
	Aspect B6: Product Responsibility
	Aspect B7: Anti-corruption
Community	Aspect B8: Community Investment

Source: HKEx (2023 a), *HKEX Listing Rules and Guidance: Appendix 27 The Environmental, Social and Governance Reporting Guide*.

The ESG report is a global trend. In 2015, the Financial Stability Board (FSB), which is composed of G20 members, set up the Task Force on Climate-related Financial Disclosure (TCFD), requiring domestic regulators to urge enterprises to improve and strengthen the reporting of climate-related financial information. After years of research, HKEx issued the Climate Information Disclosure Guide in 2021 according to TCFD recommendations for the reference of listed issuers. Especially for those enterprises that have not yet completed the disclosure of climate information effectively, the Guide provides some operational suggestions. In order to speed up the integration with the world, the Hong Kong Green and Sustainable Finance Cross-Agency Steering Group initiated by the Hong Kong Monetary Authority (HKMA) and the Securities & Futures Commission of Hong Kong (SFC) proposed in 2020 to force enterprises to disclose climate-related information according to TCFD' recommendations by 2025 or earlier ⁴⁰.

It is evident from the above regulatory development context that HKEx has more and more stringent requirements for ESG reports of listed companies. As of July 2023, there were 2,606 companies listed on HKEx. The large numbers of listed companies and increasingly stringent regulatory requirements have created a certain number of green jobs in ESG reporting in Hong Kong, China.

Table 12 Number of Listed Companies (Main Board and GEM)

	Jul 2022	End 2022	Jul 2023
Listed company	2,579	2,597	2,606
H shares	304	316	323
Red chips	174	174	276
Private enterprises in the Mainland of China	906	919	933
Newly listed companies	16	90	6
Total market value (USD1 billion)	35,888.6	35,666.8	36,045.1

Source: HKEx (2023 b), *Market Profile-“Monthly Market Information”*

In addition to equity financing through listing, enterprises in Hong Kong, China can also obtain some debt financing through financial institutions approved by the HKMA and the SFC. The main channels include borrowing from banks and issuing bonds to institutional or individual retail investors. Since 2010s, Hong Kong, China has been determined to become a green financial center in Asia. By 2022, the green bonds issued and green loans facilitated in Hong Kong, China have accumulated more than USD80 billion. There are also 177 ESG funds authorized by SFC, with Asset under Management (AUM) exceeding USD140 billion.

Table 13 The Scale of Green Debt Financing in Hong Kong, China

⁴⁰ Please refer to the website "ESG in Practice" of HKEx: (https://www.hkex.com.hk/Listing/Sustainability/ESG-Academy/ESG-in-Practice/Climate-Change?sc_lang=en).

	As of 2022
Green bonds and loans	USD80.5 billion
Size of assets under management of the ESG funds	USD142 billion

Source: Hong Kong Monetary Authority (2023). *Sustainability Report 2022*

The so-called green bonds are generally fixed-rate products issued by the relevant departments, banks and enterprises, and the holders who buy such green bonds can get regular interest returns. Different from general bonds, the funds raised by green bonds will be specially used for the development of green projects, such as renewable energy, sewage treatment and forest protection. As for green loans, the funds borrowed by enterprises from financial institutions are also limited to the application in green projects. The interest rates of green bonds and green loans are generally lower than those of traditional bonds and loans because the funds are subject to limited use and used in areas beneficial to the Earth.

As for which institutions are eligible to issue green bonds or borrow green loans; and what projects are green, it depends on the third-party certification. Through the conformity assessment by the independent and impartial third-party institutions, the issuance of green and sustainable financial certificates and certification marks can help issuers attract more potential investors or borrowers and lenders; and enable more issuers, investors, industry and the public to know the concept of green and sustainable finance. In this process of certification, there are also jobs engaged in green financial certification.

2. Jobs Created by ESG Report and Green Finance Certification

"Financial services" and "professional services and other industrial and commercial support services" are the four major industries in Hong Kong, China, with a total employment of over 660,000, accounting for more than one-fifth of the total employment in Hong Kong, China (Table 5). However, currently there are no official statistics on how many of these jobs are green jobs.

Table 14 Employment in Financial and Professional Services in Hong Kong, China

	2020	2021
1. Financial Services	276,000	277,000
2. Professional Services and Other Industrial and Commercial Support Services	565,000	569,000
	841,000	846,000
Total Employment in Hong Kong, China	3.89 million (21.6%)	3.87 million (21.9%)

Source: Census and Statistics Department (2023), *Statistics-Four Key Industries and Other Selected Industries*

This research focuses on the green jobs most directly related to ESG Reporting and Green Finance Certification. It includes three types of jobs: a) Professional third-party ESG consultants; b) Certification staff of certification institutions; and c) Employees of Department of Sustainable Development in listed companies. Through interviews with five relevant institutions, we examined the job content, establishment, entry and promotion requirements of Hong Kong ESG report and the green finance certification; and roughly estimated the number of relevant green jobs based on these.

Table 15 Five Cases of Three Major Green Jobs

ESG Green Job Types	Institutional Research Object
a) Professional third-party ESG consultants	1. Large-sized accounting firm (one of the top four) 2. Medium-sized accounting firms
b) Certification staff of certification institutions	3. Leading non-profit professional certification institutions
c) Employees of Department of Sustainable Development in listed companies	4. Large-sized and medium-sized listed companies 5. Small and medium-sized listed companies

Professional third-party ESG consultants

The third-party ESG consultant here refers to the professionals who write ESG reports and provide ESG implementation strategies for listed companies. There are many private and non-profit institutions that provide third-party ESG consultancy services. We choose accounting firms as the cases because accounting firms have a relatively high market share. The main reason is that accounting firms have been providing professional services such as auditing to listed companies. When listed companies encounter difficulties in writing ESG reports, accounting firms will naturally become their consultants. To understand the ESG teams of various accounting firms, we selected two accounting firms of different sizes to investigate (hereinafter referred to as Firm A and Firm B).

Table 16 The Comparison of ESG Consultant Teams between Two Accounting Firms

	(Firm A) Large-sized Accounting Firm	(Firm B) Medium-sized Accounting Firm
Carry out work	2021	2020
Number of employees	50 employees	10 to 15 employees

	(Still expanding)	(Depending on the staff mobility)
Service objects	Mainly large-sized listed enterprises (Retail, manufacturing, energy and auto industries)	50 small and medium-sized listed companies (Retail, manufacturing, energy and auto industries)

Source: Interview results

As one of the four major accounting firms, Firm A possesses a full-time ESG team established in 2021 with 50 team members and is still expanding. This team mainly serves large-sized listed companies. Aside from assisting the listed companies in writing ESG reports, it will also provide other ESG-related consulting services, such as how to save energy and reduce emissions; check the greenhouse emission equivalents of upstream and downstream suppliers; and carry out community care activities.

As for the medium-sized Firm B, its ESG team possesses only 10 to 15 members. It should be noted that this ESG team also does other traditional accounting consulting businesses, such as risk management, forensic accounting, etc., and the business related to ESG was developed in 2020. The ESG service of Firm B team is mainly aimed at small- and medium-sized listed companies, and its content is mainly to assist in writing ESG reports.

Although the team sizes are different, the personnel promotion structures of Firm A and Firm B are similar. Newcomers will start as assistants or senior assistants, and after accumulating several years of experience, they will be promoted to manager level according to performance. To be promoted from manager to director or partner, it requires considerable seniority and outstanding contributions.

Table 17 Personnel Structure

	Posts
Management	Partner
	Director
Middle layer	Senior Manager
	Manager
Junior position	Senior Associate
	Associate

Source: Interview results

As for joining an accounting firm to become an ESG consultant, there is still no clear requirement. Both accounting firms said that anyone with a bachelor degree can apply. ESG team managers of Firm A pointed out that at the early stage of ESG regulatory

development, they would prefer to hire people with scientific background because of the complicated formula calculation of carbon emissions. But up to now, the enterprises served by the team cover all walks of life, so they need talents with more diversified backgrounds instead.

Whether the team is large-sized or small-sized, as a third-party consultant, writing ESG reports for customers can be divided into three stages. The first stage is for the team to collect information from the corporate customers, such as business classification, operating amount, energy consumption, corporate governance structure, and number of employees. In the process, team members need to ensure the completeness of the data (completeness), such as whether the months covered are complete, whether the information submitted is sufficient and accurate (accuracy), whether there are signs of false reporting of numbers; and ensure the rationality of the data (rationality): whether the data is logical, for example, the company's turnover this year is higher than last year, but its energy consumption is less, which needs further explanation.

At the second stage, team members assist listed companies in writing ESG reports according to the requirements listed by HKEx, which involves many model settings, and they need to calculate carbon emission values with different formulas for different industries. The consultant team should also prepare a list to check the report and the requirements of HKEx one by one to ensure that it complies with regulatory ordinances. At this stage, the team will maintain communication with listed companies. However, unlike the listing audit, when listed companies are unwilling to provide some ESG information, consultants have no authority to express "reservations".

Table 18 The Working Process of ESG Consultant

	Responsibilities
1. Collecting information	The data is provided by the customer, and the consultant needs to ensure its completeness, accuracy and rationality
2. Writing reports	Write ESG reports in accordance with Main Board Appendix 27 and GEM Appendix 20 of the <i>Listing Rules</i> of HKEx
3. Giving advice (Optional)	If the enterprise requests, the customers can be provided with suggestions on energy conservation, emission reduction or improvement of the company

Source: Interview results

After completing the ESG report, the consultant team will also provide some improvement suggestions depending on the wishes of customers. However, the executives of Firm A and Firm B admitted frankly that whether the recommendations are needed or whether they will be implemented depends entirely on the management of the enterprises, and the consultants have no right to ask them.

Certification staff of the green finance certification institutions

Many third-party institutions in Hong Kong, China, provide ESG green finance certification services, which can be roughly divided into two categories. The first

category involves Debt Financing, in which the certified enterprises can obtain funds from financial institutions or investors by issuing bonds or borrowing loans at a lower interest cost; the other category involves Equity Financing, in which certified enterprises can attract more investors and obtain more financial support through some methods such as increase of capital. Some certification schemes fall between these two categories, which can be used to facilitate both debt financing and equity financing.

The following table lists the green and sustainable finance certification schemes offered by two larger-sized non-profit institutions in Hong Kong, China. After screening, we select Institution H as the object of in-depth research. Institution H is the earliest non-profit institution providing comprehensive certification services in Hong Kong, China, and it is also the pioneer of the green finance certification. It has started relevant work as early as 2016. The green certification service of Institution H is also recognized by all walks of life, and many large-sized banks have signed green finance recognition agreements with it. Hang Seng Index Services Limited, which is responsible for compiling the Hang Seng Index in Hong Kong, China, has also commissioned institution H to assist in compiling ESG-related indexes. Therefore, Institution H is quite representative.

Table 19 The Green and Sustainable Finance Certification Scheme

	Institution H	Institution C
Certification Category I (Debt Financing)	<ul style="list-style-type: none"> Evaluation of green loans for small and medium-sized enterprises 	<ul style="list-style-type: none"> Green loan Sustainable development performance is linked with loans
	<ul style="list-style-type: none"> The Green and Sustainable Finance Certification 	<ul style="list-style-type: none"> Sustainable development performance is linked with financial instruments Other green financial instruments
Certification Category II (Equity Financing)	<ul style="list-style-type: none"> Green finance certification. ESG fund Green finance certification. Green fund 	

Source: Interview results

Institution H, established in the late 1980s, was funded to assist Hong Kong, China's industrial and commercial sectors in improving product quality, promoting environmental safety and hygiene, improving management systems and providing comprehensive conformity assessment services for the market. At the inception of its establishment, it was mainly responsible for the audit of quality measurement system (ISO9000), and its main customers were public departments. There were only 20 to 30 members in Institution H.

With the continuous development of the business, the audit services of Institution H

are becoming increasingly diversified. In 2016, the research on green finance certification scheme was carried out, and the certification for debt financing was launched two years later, which was quickly recognized by seven large-sized banks, and cooperation agreements were signed with them, and another eight enterprises were successfully awarded certification. By 2020, Institution H launched the green finance for equity financing, the ESG fund and green fund plan. In 2022, small- and medium-sized enterprises were hit by the epidemic, and Institution H launched a green assessment service for loans of them, which became a bridge between small- and medium-sized enterprises and banks, enabling qualified small- and medium-sized enterprises to obtain financing at a cheaper cost.

With a series of expansions, the number of members of Institution H has expanded to more than 100, of which the number of the certification team accounts for about half. To become the junior staff in the certification team, the basic condition is to graduate from university. Although there is no discipline requirement, graduates from environmental science, engineering, finance and business will have an advantage. After joining the company, the institution will improve the professional level of its members through comprehensive training and assessment mechanism. The promotion ladder of the certification team is also very clear, but many members will change jobs on the way, and many of them have become the targets of the certificated enterprises because of their excellent work.

Table 20 Personnel Structure within the Certification Institution

Management	Controller
Middle layer	Project Manager Assistant Project Manager
Junior Staff	Auditor Project Officer Assistant Project Officer

Source: Interview results

The certification team approves the green finance certification according to a number of international standards and principles, including proposals for the International Capital Markets Association (ICMA), the Loan Market Association (LMA), the Asia-Pacific Loan Market Association (APLMA), Loan Syndications and Trading Association (LSTA), the European Union Green Bond Standard, and the announcements and guidelines of the People's Bank of China and the China Securities Regulatory Commission. After the certification team issues the certification to the enterprise, it would also determine the approved financial products according to the requirements of individual customers and financial institutions, and write an impact report after the project is implemented for a certain period of time to examine whether the certified enterprise has acted according to the original terms.

Figure 1 The Flow Chart of ESG Finance Certification

1. Submit an application
2. Evaluate → Failure (go through process once again or withdraw)
3. Issue certificates
4. Identify financial products → Failed to find a match (go through process once or twice again)
5. Write an impact report → Failed to complete the request (terminate the certification)

Source: Interview with the author

Although Institution H is a non-profit institution, it would also charge the fees according to market prices, and its revenue exceeded HKD100 million in 2022. This development model of continuous expanding services not only enriches the staffing establishment of Institution H, but also benefits other private certification institution in disguised form because many certification processes will be outsourced to the market.

Employees of Department of ESG Sustainable Development at listed companies

The ESG report and green finance certification can be said to be the summary of ESG work achievements of an enterprise. Therefore, in the ESG work of the whole enterprise, the Department of Sustainable Development and its dedicated team in the enterprise play an important role, and they are also the counterparts of the aforementioned third-party ESG consultants and green certification staff. Therefore, we conducted in-depth visits to two listed companies with a different market capitalization to understand the operation of the ESG dedicated team within the companies.

Table 21 The Comparison of ESG Teams of Two Listed Companies Interviewed

	Enterprise D (Listed companies with medium and large-sized market capitalization)	Enterprise E (Listed companies with small and medium-sized market capitalization)
Market capitalization (As of August,	HKD26 billion	HKD1.4 billion

2023)		
Turnover (Last fiscal year)	HKD78.5 billion	HKD3.7 billion
Industry	Catering and retail industries	Manufacturing industry
ESG dedicated team	About 20 employees	1-2 employees (Served concurrently by the supervisors of human resources and administrative departments)

Source: Interview results

Enterprise D is a listed company with a market capitalization of HKD26.1 billion, which meets the definition of medium and large-sized market capitalization of Hang Seng Index Service Company, with its annual turnover exceeding HKD78.5 billion and its total number of employees more than 10,000, among which the ESG dedicated team at its headquarters possesses about 20 employees. For the listed companies with a considerable scale, although ESG report is only one part of the work of the whole ESG team, it is an important step for enterprises to build their image and add value, and the performance indicators attached to the report are also the driving force for promoting ESG work of enterprises.

Members of the ESG team of Enterprise D give an example to point out that when the ESG report requires the disclosure of greenhouse gas emissions and energy conservation and emission reduction data, the ESG team will formulate some measures to save paper and reduce electricity consumption; for example, when the ESG report requires the disclosure of community work, the team will also organize some community activities for this purpose, and remind colleagues to pay attention to the source of raw materials, product packaging and publicity statements in daily work, so as to avoid "stepping on thunder" in terms of gender, race and politics.

Unlike the large-sized listed company D, Enterprise E has a relatively small scale, with a market capitalization of only HKD1.4 billion and an annual turnover of HKD3.7 billion, which is less than one-twentieth of that of Enterprise A. In addition, the enterprise mainly manufactures and sells hardware and plastic products; as well as adopts OEM for electronic instruments, which belongs to the highly labour-intensive industry and its gross profit margin is not high.

Enterprise E has more than 1,000 employees, but there is no dedicated ESG team, which is served concurrently by supervisors and employees of human resources and administrative departments. According to the supervisor of the relevant department of Enterprise E, the Human Resources and Administration Department was renamed as the Sustainable Development Department in 2020, because HKEx forced all listed companies to submit ESG reports in that year, and the management of the company assigned the Human Resources and Administration Department to complete it together. In order to be "justified," the department name was changed. However, after the department changed its name, employees' number was not increased accordingly. In the absence of sufficient resources, the annual preparation of ESG reports was "outsourced" to the professional third-party ESG consultant. As for other ESG-related

work that Enterprise D would do, Enterprise E did nothing.

From the comparison between the two listed companies, it can be seen that the resources invested by enterprises of different sizes in ESG work vary greatly. The focus of the enterprise's ESG team is more like meeting the requirements of the listing regulation. Based on this, the ESG team of Enterprise D has a clear staffing structure, and there is a complete career path: from joining to be a project director to being promoted to manager and even department supervisor. On the contrary, the Department of Sustainable Development in Enterprise E remains in a name only.

The estimation of the number of ESG green Jobs

According to our interview cases, including two accounting firms, one certification institution and two listed companies, there are about 147 green jobs directly related to ESG report and green finance certification. If the number of green jobs of the survey objects were multiplied by the number of institutions similar to the survey objects, we can roughly estimate that there are more than 7,500 green jobs. Combined with the assumption of an up-and-down 50% deviation rate, the number of related jobs ranges from 3,791 to 11,000.

Table 22 Estimating the Number of Green Jobs Based on Survey Objects

	Survey Object	Number of Green Jobs	Similar Institutions	Estimating the Number of Green Jobs	Up-and-Down 50% Deviation
a) Third-party ESG consultants	1. Firm A	50	4	200 employees	100-300 employees
	2. Firm B	10-15	8	120 employees	60-180 employees
b) Certification staff	3. Institution H	50-60	2	120 employees	60-180 employees
c) Employees in the Sustainable Development Sector	4. Enterprise D	20	317 *	6,340 employees	3,170-9,510 employees
	5. Enterprise E	1-2	401 **	802 employees	401-1,203 employees
		147		7,582 employees	3,791-11,373 employees

Note: * There are 317 Hang Seng Composite LargeCap & MidCap Indexes; and 401 Hang Seng Composite MidCap & SmallCap Indexes

There are several aspects that need to be pointed out. First, this is a rough estimation based on our studied cases. However, in the absence of the relevant official statistics, this can be regarded as a starting point for reference and provide a basis for further study in the future.

Second, the 147 green jobs calculated from the cases are directly related to ESG report and the green finance certification, but some of them are multi-faceted and does not focus solely on the work content of ESG report.

Third, the three green jobs mentioned are all directly related to ESG report and green finance certification, especially the ESG consultants of two accounting firms and the certification staff of institution H. There should be many green jobs related to enterprise ESG, such as engineers who design and implement emission reduction measures for enterprises, personnel who help enterprises promote community or childcare works, etc. We are not ignoring the existence of these jobs, but rather focusing on discussing the three ESG green jobs mentioned in this paper with the limited resources.

3. "Mandatory-Driven" VS "Value-Creation-Driven"

According to the description of green jobs in Section 3, it can be roughly divided into "Mandatory-Driven" and "Value-Creation-Driven" paths. The so-called "Mandatory-Driven" path refers to the implementation of the ESG reports by listed companies, mainly to cope with the Listing Code; while the "Value-Creation-Driven" path means that the management of companies actively implements the ESG task without regulatory requirements for potential development opportunities.

In the cases we investigated, Firm A, Firm B and Enterprise E are all inclined towards the "Mandatory-Driven" path. In the Enterprise E as a medium-small size listed company, the head of its Department of Sustainable Development does not deny that the ESG report is only written to cope with regulation. With the limited resources, they have no choice but to outsource the work of writing reports to third-party consultants. A third-party ESG consultant team undertaking the "outsourced" report pointed out that this "outsourcing" of small and medium-sized listed enterprises is a rational choice. If a listed company wants to hire extra staff to complete the ESG report, it will cost RMB360,000 a year based on a monthly salary of RMB30,000, and the cost may reach RMB400,000 plus the expenses of MPF and medical insurance. However, the annual cost of outsourcing the ESG reports to the third-party consultants can be as low as RMB50,000 to RMB100,000.

In addition, the director of Firm A pointed out that whenever HKEx requires the coverage of the ESG report to be expanded, new demand will appear in the market. For example, the ESG report required by the current Listing Code offers the disclosure of four aspects of indicators in the "climate", namely emissions, resource utilization, environment and natural resources, and climate change. For the time being, these four levels only need to be disclosed according to the standards of Scope 1 and Scope 2, namely energy consumption in relation to enterprises themselves and the resulting gas emissions. At present, many Western economies have extended the disclosure level to Scope 3, that is, the emissions of upstream and downstream industrial supply chains related to enterprises should be disclosed together⁴¹.

If HKEx brings Scope 3 into the disclosure requirements, a garment enterprise will have to disclose the gas emissions of upstream raw material suppliers and downstream garment retail stores at the same time, which will greatly increase the difficulty of compiling ESG reports. However, because of this, the ESG team of the

⁴¹ In April 2023, the HKEx launched a consultation on the optimization of climate information disclosure under the ESG framework, which is expected to be implemented in fiscal year 2024 with a two-year transition period. For details, see the HKEx (2023 d).

enterprise may need to be expanded, and the third-party ESG consultants will get more job opportunities.

Compared to the "Mandatory-Driven" path of the ESG report, green financial certification may be biased toward the "Value-Creation-Driven" path. There is no law in Hong Kong, China that requires enterprises to obtain green certification before they can make debt or equity financing, nor does it require financial institutions and investors to lend money to certified enterprises at lower interest rates. However, the scale of green finance in Hong Kong, China is increasing every year. This reflects that some market participants are affecting the behaviours of enterprises through spontaneous actions, thus better implementing the ESG strategy and the concept of sustainable development.

In addition, the ESG team of Enterprise D as a listed company has also done a lot of work beyond the scope of disclosure required by the Listing Code, including environmental conservation, volunteer services and food safety promotion. In their view, the ESG task can enhance the company's image, thus forming a buffer. When a company has a crisis, these positive jobs that have been done, precipitated and accumulated in the past can often become a means to save the company's public relations.

It is worth mentioning that when talking about green jobs in Hong Kong, China, we usually focus on the sustainable development of enterprises in the environment, society and governance (ESG) field and their performance in this field. How companies implement their ESG targets is often scrutinized by regulators to ensure they comply with regulations and environmental requirements. Although, the regulation is an important means to ensure that enterprises comply with environmental laws and regulations, the essence of green jobs goes far beyond this (Pelozo and Shang, 2011). It involves a deeper motivation, namely the aforementioned public service motivation (PSM).

In promoting the sustainable development of green jobs, we must recognize that people of these jobs need to have an important quality besides professional skills: the inherent motivation to truly serve the public interest (Brewer and Selden, 1998). This is the core concept emphasized by PSM. Practitioners of green jobs don't just work for a salary or career development. They work for larger social goals – environmental protection and sustainable development (Aguinis and Glavas, 2012). Therefore, when selecting these green practitioners, we need to consider their PSM level. PSM measurement can help us identify those individuals who are truly internally driven and have a strong sense of public interest. They will be more likely to commit themselves to achieving the goals of environmental protection.

In addition to focusing on PSM in the selection process, we also need to adopt innovative methods in daily work design to stimulate PSM of existing employees (Perry, Hondeghem, and Wise, 2010; Moynihan and Pandey, 2007; Andersen and Pedersen, 2013). This may include providing employees with the opportunity to participate in the environmental protection projects or creating incentive plans that encourage public service motivation. Through these measures, we can help employees build a stronger PSM to enable them to pay more attention to environmental and social responsibility in their work, instead of just pursuing economic interests (Bouckaert and Van de Walle, 2003). Behind the green jobs, after all, is a broader social goal: promoting sustainable development and protecting our planet. Although, the supervision is intended to ensure that enterprises comply with

regulations, reliance on regulation alone is not sufficient to achieve this goal (Schwartz, 1977). Only by cultivating and attracting talents with strong PSM can we promote environmental protection and achieve the ESG goals in a tangible and sustainable manner. (Den Hond and de Bakker, 2007).

To sum up, green jobs in Hong Kong, China are not only designed to meet regulatory requirements but also to pursue social goals of sustainable development and environmental protection. The introduction and nurturing of PSM would be a key factor in achieving these goals, thus ensuring that our actions not only comply with laws and regulations but also meet the urgent needs of public interest and environmental protection. By identifying and cultivating green practitioners with PSM, we can make greater contributions to the sustainable future of Hong Kong, China and the world.

4. Summary and Recommendations

From the above discussion, it can be seen that the ESG report and green financial certification service are creating green jobs for Hong Kong, China in "Mandatory-Driven" and "Value-Creation-Driven" directions. Based on this, enterprises, relevant departments and all sectors of society should work together to ensure that the intrinsic pro-social motivation of practitioners of green jobs can be maintained forever and will not be consumed or constrained by explicit or implicit rules in organizational or bureaucratic reality. For example, policy makers should introduce clearer support/incentive measures to help enterprises better cultivate and maintain the PSM of employees. In other words, to develop and further deepen green jobs continuously, we have the following suggestions:

Continuously improving the ESG reporting system

From the literature review and comprehensive interviews, we can draw a conclusion that when the HKEx has more detailed requirements for ESG reporting, the listed institutions will need to invest more resources to complete their work, and the number of green jobs will be increased accordingly. For example, the climate disclosure reform that is being proposed by HKEx requires companies to disclose the impact of their own and ancillary businesses on the climate in more detail, which will greatly increase the related workload.

The premise of promoting the development of ESG reporting is not only to create jobs, but to believe that ESG reporting essentially brings benefits to the sustainable development of enterprises and the whole society, thus forming a virtuous circle. Fidelity, an international investment company, quoted a survey by Friede, Busch & Bassen to analyze 157 large international enterprises, finding that positive ESG screening can help improve returns and reduce overall volatility. CICC Global Institute also found that during the pandemic period, the greater the decline in the risk of A-share listed companies on the day of the outbreak, the lower the overall ESG ratings.

More and more similar researches constantly remind us from both positive and negative aspects that investing additional resources to promote ESG itself is an investment in future sustainable development.

Considering granting the ESG reporting "Required Certificate for Review" (assurance)

From our interview, we found that one of the loopholes in the current ESG reporting system in Hong Kong, China was that the authenticity of the report was needed to be subject to compulsory review. Therefore, some interviewees think that the ESG report can be improved into a report with "required granted certificate for review". The person in charge of writing the report needs to take greater responsibility, so as to improve the quality of ESG report and prevent the reporting from "going through the motions". In addition, when the report requires visa approval, it can also lead the ESG reporting field to a more professional development path.

However, in order to implement the above recommendations, the following risks need to be considered: a.) If the mandatory verification is required, that is, the relevant persons are responsible for the report, which indirectly increases the risks of employees; b.) ESG report still belongs to a relatively new field, and the reference standards in each place are different. If the mandatory verification is required at this time, the chances of going wrong may be higher; c.) For small and medium-sized listed companies, this will be an additional expense; d.) Who can sign the verification report and how to obtain relevant professional qualifications are all issues that need to be envisioned and solved in advance.

Appointing responsible persons for ESG reporting

Our interviewees pointed out that whether an enterprise's ESG work can be completed according to the original set goals depends on whether there is a principal responsible person. Although the reform of ESG report of HKEx proposes that the Board of Directors should appoint a specific person in charge, the appointed person may not have the power to use the company's resources.

Therefore, we suggest that the Company's Chief Financial Officer (CFO) should be uniformly appointed as the designated executor of ESG reports. According to some consultants involved in the review of the ESG report, the resource allocation can only be guaranteed when the ESG plan is regarded by the CFO as part of the company's strategy. If ESG is not an indicator for assessing CFO, any investment to improve high carbon emissions will only be regarded as increasing the cost of the company, which will affect the CFO's intention to implement. Therefore, it is advisable to link CFO's performance with ESG.

Setting reporting templates by industry and company size

In the previous research, we quoted a survey and found that the performance of ESG reporting in Hong Kong, China was inferior to that in other capital markets, and many management layers of listed companies also reported that ESG reporting did not substantially improve the level of corporate governance. HKEx even pointed out that most listed companies did not carefully examine the relationship between their operating conditions and ESG, which led to the failure to give full play to the role of ESG reporting in promoting enterprise growth and social sustainable development.

Therefore, we suggest that HKEx may consider proposing different report focus areas based on the business nature and scale of listed companies, making it easier for listed companies to adapt. At the same time, in order to increase the comparability of the ESG information, regulators should consider formulating clear and standardized performance indicators, so that listed companies do not have to worry about different interpretations and calculation methods, and investors can better distinguish the performance of companies in the same industry.

Improving the acceptance of ESG in the society

The higher the importance of the ESG in the society is, the more resources enterprises will invest in ESG reporting and using certification services. For example, the more banks value the ESG to set lending rates, the better ESG will be done by enterprises for lower borrowing costs. Financial regulators can do their part, for example, it can include the evaluation guidelines for green loan when formulating ending indicators, so as to encourage financial institutions to give loans to more enterprises that have obtained ESG certification and recognition.

In addition, if the public consumers take the company's ESG level as the patronage index, the enterprise will invest more resources to improve the company's environment, community and governance level, so as to improve the company's returns.

Enhancing the attractiveness of Hong Kong, China's financial market

Hong Kong, China, is an international financial center with a thriving stock market. The greater the number of listed companies coming to Hong Kong, China, the greater the demand for ESG report, consultancy and certification, and the more green jobs will be created.

On the contrary, the ESG has been receiving an increasing attention from international investors, and the concept of responsible investment has been valued by advanced economies, and some investment projects that do not meet ESG standards have been excluded. Hong Kong, China, is committed to improving ESG regulatory requirements and levels, which will attract more investors' attention.

Establishing a better green talent training system

The industry needs better talents to develop, but the training of ESG-related certificates in Hong Kong, China, is still quite unfocused. It is suggested that relevant departments can work with academic institutions to introduce a qualification certification framework, so that those who intend to join the industry can acquire sufficient knowledge and skills. The institutions that provide relevant training can also adapt to it and increase resources to design more appropriate courses.

In the long run, ESG consultants, auditors and certification practitioners should be professionalized, or a licensing system should be added to ensure the quality of relevant employees.

Generally speaking, the respondents in our study agreed that Hong Kong, China is still at a slightly inferior stage in ESG report and certification services compared with advanced economies. If we want to catch up, we need to increase investment in policies and resources, and these efforts will bring greater economic returns. On the one hand, as we can see from our case, it will bring an additional and a large number of green jobs. On the other hand, the better work of ESG will also enable enterprises to grow more continuously, which will also benefit the whole society.

Emphasizing the intrinsic public service motivation of participants and stakeholders

The essence of green jobs is to promote environmental protection. People engaged in these positions need not only excellent professional skills, but also a heart that truly serves the public interest. This coincides with the core essence of Public Service Motivation (PSM): emphasizing the internal driving force of individuals and pursuing the satisfaction of social and public interests. Among the green jobs in Hong Kong, China, the measurement and stimulation of PSM have thus become very important.

Specifically, PSM measurement can play a key role in the selection process, so as to select those individuals who are really driven and defend the public interest as their duty (Vandenabeele and van de Walle, 2008). Employees with a high-level PSM are more likely to perform well in green jobs, as they pursue not only salary, but also enthusiasm and responsibility for environmental protection. Therefore, the recruitment and selection process can be introduced with some specially designed evaluation tools to measure the PSM level of candidates. These tools can include interview questions, case studies and behavioral assessments for the public interest motivation.

In addition, how to stimulate the PSM of existing employees is also very important in the daily work design. In order to continuously improve the ESG implementation of enterprises, the management should pay attention to employees' sense of participation and recognition of green jobs, which can be achieved by providing more opportunities for participation, training and development programs, and incentive systems. In addition, it is important to create a culture that encourages employees to come up with green ideas and suggestions, which will help stimulate their intrinsic motivation and contribute to the success of green jobs.

In the final analysis, PSM should be regarded as one of the key factors for the successful implementation and achieving the expected results of green jobs. By strengthening the PSM consideration in selection and job design, listed companies in Hong Kong, China can better achieve their ESG goals and make positive contributions to environmental protection. This will also help ensure that green jobs are not just a window dressing, but a core force in the real struggle for environmental protection. This move will push Hong Kong, China to make greater progress in the sustainable development field, and provide more satisfying and meaningful career prospects for employees at the same time.

IX. Green economic policies and its impact on the creation of green jobs⁴²

Based on 2022 data released by Climate Watch, Indonesia is in sixth place in the world as a greenhouse gas emitting economy with total emissions of 1,475.83 MtCO₂e. Five years ago, in 2017, to be precise, Indonesia was ranked the fifth globally with total emissions of 2,275.40 MtCO₂e. Meanwhile, in 2015 and 2016, Indonesia ranked the fourth in generating the carbon emissions globally. There has been a decline, but Indonesia is still in the top 10 economies, making the largest greenhouse gas emissions in the world. Indonesia is side by side with several other largest contributors, namely China, the United States, India, Russia, etc.

This position brings Indonesia to the world's attention on the issue of climate change and economic development. Therefore, Indonesia then tried to convince itself that this economy could also contribute globally to deal with climate change through policies to reduce carbon emissions. At the commitment level, Indonesia has conveyed in various international forums that Indonesia will commit to reducing carbon emissions by 29% with its efforts and 41% with international support by 2030.

The data from the Ministry of Environment and Forestry in 2018 shows that trends in carbon emissions produced by Indonesia from 2000 to 2016 are still dominated by the energy and the forestry and other land use (FOLU) sector. Before the low carbon development policies became a part of the 2020-2024 Midterm Development Planning (RPJMN), the carbon emission reduction policies focused more on the FOLU sector through the REDD+ (Reducing Emissions from Deforestation and Forest Degradation) program (Salman et al., 2021a).

1. Low carbon development planning

One way to address fundamental problems related to food, water, and energy shortages due to environmental and economic pressures is to internalize ecosystems into decision-making tools. (H. Y. S. H. Nugroho et al., 2022).

To realize a green economy, Indonesia has developed an initiative in the form of Low Carbon Development (PRK) planning. The low carbon development is the backbone of green economic development and to achieve the vision of a developed Indonesia in 2045 and net zero emissions by 2060 (Limanseto, 2022).

This initiative emerged since it was initiated at UNFCCC COP 23 in 2017. The PRK initiative aims to include environmental considerations such as greenhouse gas reduction targets and carrying capacity into the development planning framework.

Phase 1 of Indonesia's CRP initiative has been adopted into the Medium-Term Development Plan (RPJMN) 2020-2024. Currently, the PRK initiative in Indonesia has entered phase 2, namely the implementation phase (Kementerian ESDM, 2021).

Indonesia's commitment efforts to control global climate change are reflected in its participation in the Paris Agreement, which was later ratified into Law Number 16 of 2016 concerning Ratification of the Paris Agreement against the United Nations

⁴² Henriko Tobing, Policy Analyst, Center for Manpower Policy Development; Head of Division of Policy Development of Industrial Relation, Labor Inspection & Sosec, Ministry of Manpower of Republic of Indonesia

Framework Convention on Climate Change. Parties that have ratified the Paris Agreement are required to submit Determined Contributions (NDC) containing targets for reducing greenhouse gas (GHG) emissions until 2030. Indonesia's NDC targets reducing GHG emissions by 29% with its efforts and 41% with international support. Five sectors in the NDC play a certain role in reducing GHG emissions: energy, waste, industrial processes and production use (IPPU), agriculture, and forestry. (KLHK, 2021).

In 2019, the actual emission reduction was 54.8 million tons from the target of 51 million tons. In 2020, the target was 58 million tons, and the realization was 64.4 million tons. Furthermore, in 2021, the target was 67 million tons, while the actually realized amount was 70 million tons. Finally, in 2022, the emission reduction target is 91 million tonnes, with a realization of 91.5 million tonnes. (Kementerian ESDM, 2023). In this case, Indonesia is optimistic that it will meet its emission reduction target of 29% by 2030.

One factor influencing this actual achievement includes carbon mitigation actions through the implementation of new renewable energy (EBT). EBT development strategies to support the energy transition include the construction of On Grid EBT Power Plants, implementation of Atap Solar Power Plants, conversion of Diesel Power Plants to EBT Power Plants (Gas Power Plants as a transition), mandatory B30, biomass co-firing at Steam Power Plants, providing access to modern energy with EBT (small scale such as Micro Hydro Power Plants, PLTS), geothermal exploration by the relevant departments, and implementation of off-grid EBT and direct utilization (Humas EBTKE, 2022; Putri, 2023). Another thing that also influences achievement is reducing the emissions in the transportation sector, both land and air, by optimizing biodiesel and bio aviation turbine fuel.

To realize Indonesia's low-carbon green economy, Indonesia has a target of net zero emissions or zero carbon emissions by 2060. This program costs approximately IDR 28,223 trillion. The greatest need for funds comes from the transportation and energy sectors, which reached IDR26,602 trillion.

Indonesia's green economy is supported by six renewable energy sources: ocean waves, geothermal heat, bioenergy, water, wind, and solar heat. To optimize the renewable energy, Indonesia has made various efforts. One of them is the creation of Presidential Decree Number 12 of 2022 concerning the Acceleration of Renewable Energy Development for the Supply of Electric Power. Indonesia will retire Steam Power Plants (PLTU) through this Presidential Decree. In Article 3, paragraph 1, the Minister must prepare a road map for accelerating the termination of PLTU operations. The road map in question is reducing PLTU greenhouse gas emissions, accelerating the termination of PLTU operations, and aligning other policies (Tusin, 2022).

The data below presents several scientific studies conducted by several parties. The results of this research give new hope that low-carbon development will produce more jobs, better quality jobs, and more guaranteed job sustainability compared to the business-as-usual approach. However, the existing scientific research data is entirely predictive. The challenge for all of us is how to realize this transformation towards sustainable development.

Table 23 Potential economic value of low carbon development

No.	The potential economic value of low carbon development	Potential benefits
1	Low carbon development will generate enormous economic benefits compared to business as usual.	USD26 trillion until 2030.
2	City development that is coordinated, compact, and connected can save significant waste costs.	USD17 trillion until 2050
3	Agricultural development and sustainable forest management can generate significant economic benefits.	USD2 trillion per year
4	Carbon trading represents a huge economic potential that will generate many new jobs and economic value	USD2.8 trillion per year by 2030.
5	Restoring 160 million hectares of damaged and degraded land can generate huge economic value.	USD84 billion per year.

Source: (Salman et al., 2021b)

2.Challenges of implementing the green economic policies

a. Conditions of dependence on natural resources in the development.

Based on Table 24 below, the trend in fossil energy supply (coal, crude oil, and natural gas) is increasing. The growth of fossil energy in the last two decades has been driven by an increase in coal production resulting from the acceleration of coal-fired power plant development projects.

In the domestic energy procurement program of 35 thousand megawatts (MW), the coal steam power plants contribute 25 thousand MW of the total, resulting in the potential for additional coal demand for power plants reaching 100 million tons per year. This has resulted in new renewable energy in Indonesia relatively not increasing in the last decade. (HEESI Kementerian ESDM, 2020).

Table 24 The primary energy supply by resource in Indonesia

Year	Coal	Crude Oil & Product	Natural Gas & Product	Hydro Power	Geothermal	Solar PP & Solar PV	Wind	Other Renewables	Solar Powered Public Street Lighting & Energy Saving Lamp	Biomass	Biofuel	Biogas	Total
2011	334,142,760	563,378,573	261,708,332	27,959,381	15,119,152	na	na	na	na	105,354,823	2,328,869	na	1,309,991,890
2012	345,000,022	589,342,626	259,456,414	29,212,853	15,129,340	na	na	na	na	99,383,737	4,339,870	na	1,341,864,862
2013	302,694,000	587,652,963	270,134,751	38,495,952	15,245,038	na	na	na	na	95,374,094	6,798,481	na	1,316,395,279
2014	319,956,003	577,688,014	271,375,371	37,955,765	16,191,566	na	na	na	na	92,873,723	11,966,513	na	1,328,006,955
2015	364,619,216	509,485,005	279,632,345	34,604,474	16,337,878	na	na	na	na	84,925,229	8,380,587	120,162	1,298,104,896
2016	380,310,000	613,521,718	288,546,633	47,450,306	17,537,710	na	na	na	na	80,062,430	20,625,241	144,549	1,448,198,587
2017	407,526,000	553,121,237	285,604,946	47,599,892	20,259,621	na	na	na	na	74,722,762	20,947,287	157,140	1,409,938,885
2018	483,335,998	567,189,661	288,310,815	40,204,916	26,040,932	355,896	466,082	30,493,437	8,795	67,522,118	28,312,237	162,745	1,532,403,632
2019	581,356,407	544,901,575	288,586,414	39,329,376	26,193,174	461,856	1,185,873	29,906,203	12,217	61,784,034	45,927,085	166,591	1,619,810,805
2020	553,923,901	470,974,377	251,143,838	45,206,315	28,909,243	704,140	1,164,203	30,386,506	13,284	65,209,276	55,515,900	176,604	1,503,327,587
2021	558,782,122	496,090,105	249,770,556	45,947,523	29,532,560	788,979	1,070,935	37,420,528	15,115	60,391,880	65,566,941	179,989	1,545,557,233

Source: Handbook of Energy & Economic Statistics of Indonesia (HEESI) 2015 –2020 (processed)

Based on the table above, non-oil and gas exports from the Indonesian mining sector show a positive performance. During January-November 2021, the export value of the mining sector reached USD34.11 billion, an increase of 94.29%. Compared to the entire year 2020, which amounted to USD19.73 billion, mining exports for the January-November 2021 period were also higher or increased by 72.9%.

Looking at the trend, the export value of the mining sector showed an increase of 33.8% in 2017 and 20.5% in 2018. However, after that, the value decreased for two consecutive years, namely 14.98% in 2019 and fell again to 20 75% in 2020, while mining sector exports for the January-November 2021 period contributed 17.23% of the total domestic non-oil and gas export value (Katadata, 2022).

Figure 2 The Indonesian Mining Sector Exports 2016 – 2021*January – November 2021.G.



Source: Katadata

The electricity supply in Indonesia is mainly supported by coal from coal-fired Steam Power Plants. Director General of Electricity at the Ministry of Energy and Mineral Resources (ESDM) Rida Mulyana explained that the peak load on the Java, Madura, and Bali (Jamali) systems reached 25 gigawatts (GW). Of the peak load on the Jamali system, coal PLTU contributes 65%, meaning that around 16 GW of peak electricity load is supported by coal-fired Steam Power Plants. (Umah, 2021).

Until now, the mining sector is still a prima donna for Indonesia's economic growth. In the second quarter of 2021, the mining and quarrying sector contributed 8.09% to the Gross Domestic Product (GDP), the 4th (fourth) largest after the processing industry sector (19.29%), agriculture (14.27%), and trade (13.08%). The coal sub-sector itself contributes 2.79% to the domestic GDP.

Figure 3 EBT in the Energy Mix 2018-2022



Source: Kementerian ESDM

b. Several problems in creating a green economy and green jobs

The problem of understanding the green economy and jobs

Based on operational understanding, green industry is an industry whose production process is carried out by utilizing environmentally friendly raw materials or methods, reusing materials or waste in other processes or in the same process (recycling), collecting waste to be used as fuel, or simply our efforts to save energy in the production process and use environmentally friendly technology or low-carbon technology. Examples of environmentally friendly technologies include biofuels, biogas, solar panels, hydroelectric power plants, wind power plants, nuclear power, carbon capture and storage, and smart grids (Viana, 2022).

According to the ILO, green jobs are decent jobs in any economic sector that contribute to preserving, restoring, and improving environmental quality. Green jobs reduce the impact of ecological damage caused by companies and economic sectors by increasing the efficient use of energy, raw materials, and water, a low-carbon economy, and greenhouse gas effects. Minimize or avoid all forms of waste and pollution, protect and restore ecosystems and biodiversity, and support adaptation to the impacts of climate change (ILO, 2023).

Understanding this operational definition is important because, based on the author's experience after attending several meetings between institutions, including ministries, NGOs, and entrepreneurs, they do not yet have a sufficient understanding of the green economy or even more in-depth regarding green jobs. For example, when discussing green jobs, the understanding of green jobs is not yet common among bureaucrats. Of course, we must also talk about the derivative aspect, namely the green skills. The green skills are simply the knowledge, abilities, values, and attitudes needed to live, develop, and support the sustainability of an energy-efficient society. (Arthur, 2022).

Green economic policy in Indonesia seems only to be understood as a function and responsibility of certain ministries, such as the Ministry of Energy and Mineral Resources and the Ministry of the Environment. From the employment aspect, for example, three things need to be anticipated in the transition process from a brown/fossil economy to a green economy (just transition), namely: 1) skills training that supports the green economy, 2) expanding employment opportunities in the

green economy, 3) and in short-term protection of workers during the transition period, especially in the energy sector.

As also stated by (Salman et al., 2021b) in their recommendations, in the creation of green jobs, economic actors are the ones whose literacy regarding low carbon development needs to be strengthened, both state/regional owned enterprises, private corporations, MSMEs, and households, as well as sectors academics are strengthened through Higher Education and Vocational Institutions. If these economic actors provide a good support in implementing low-carbon development, we can hope that efforts to create green jobs will also increase.

The progress in implementing energy transition policies.

The dependence of the state, society and entrepreneurs on the energy sector, for example coal, is still very high, and moreover, Indonesia's export production is still dominated by the mining sector. The energy transition has been carried out, but has not yet shown success. The dependence on petroleum is reduced by increasing the share of coal and natural gas, but almost no renewable energy. Renewable energy development faces challenges of central-regional coordination, geography, technology-cost, regulations, incentives and institutional capacity (H. Nugroho, 2019).

The investment costs to build Indonesia's green economy infrastructure until 2030 will reach IDR3,799 trillion. This figure is still challenging to realize, considering that new renewable energy (EBT) investment has not reached its target in recent years. In 2020, the EBT investment target was USD2.02 billion, and only USD1.36 billion, or around 70%, was realized. In 2021, Indonesia targeted an EBT investment of USD2.04 billion, but the target was again not achieved, and only USD1.51 billion, or 74%, was realized. In 2022, Indonesia increased its EBT investment target to reach USD3.93 billion, and only USD0.67 billion, or 16.9%, was realized until June 2022 (Tusin, 2022).

The green economy or economic transition from brown to green is generally still at the level of discourse. This policy is not yet popular among bureaucrats, business people, and the public. This is in line with what Achmad said in (Jay Fajar, 2017): "The absence of strong and firm state institutions in their position to coordinate and direct the issue of climate change is now feeling the impact, coordination of central and regional departments and stakeholders is a challenge in implementing the NDC, "This has not yet touched on a clearer and mutually agreed on a systematic program that is committed to each ministry,".

In line with what was stated (Fajar, 2017), to achieve sustainable development goals and to build an environmentally friendly and sustainable economy for future generations, all parties must work together (Auliya & Nurhadi, 2023).

Based on a working paper prepared by (Salman et al., 2021b), several key actors in making low-carbon development and expanding green jobs a success are as follows in the table below:

Table 25 The mapping of economic actors

No.	Economic Actors	Low carbon development transformation and
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		green jobs
1	Public-Owned Enterprises	The departments (central and regional), for the most part, and state-owned companies have not yet become a significant part of the flow of low-carbon development.
2	Private Corporations	Private corporations are the main economic actors whose paradigm needs to be changed because they generally still practice business as usual.
3	Micro, small and medium enterprises	Micro, small, and medium enterprises are economic actors that are easily invited to transform towards low-carbon development. They are the easiest to adapt if change occurs because their economies of scale tend to transform easily.
4	Households	As a consumer, there are two possibilities related to low-carbon development policies. First, households with good literacy in sustainability and environmental issues will become a pressure group for the transformation of the low-carbon development. Second, consumers with low literacy about low-carbon development will follow the current change trend. At this point, the relevant departments and all parties must make educational efforts for households. If this happens, consumer power will force corporations to transform towards low-carbon production.
5	Universities and Vocational Institutions	The concern about the low carbon development in these institutions needs to be massively introduced into learning in educational institutions such as universities and vocational institutions to provide understanding and skills so as to create a Link and Match for Green Jobs in Indonesia.

3.The impact of energy transition policies on employment

In the Forest Ecosystem Valuation Study by CIFOR (2020) in (AMF, 2023), it was revealed that implementing a green economy contributes more benefits to an economy than economic practices without environmental concern.

This research explains that forests play a vital role in economic growth and community welfare. Forests are an economic resource because they have fulfilled the needs of food, energy, and building materials for human life for thousands of years. In this research, it is stated that if Indonesia implements a green economy, employment in the forestry sector in 2030 is projected to be open to 247,945 people. Meanwhile, economic practices without paying attention to the

environment will only open up employment opportunities in the forestry sector for 193,774 people. In line with the research conducted by (Dewi & Ma'ruf, 2017), which used an investment scenario model of 2% of 2010 GDP (constant prices), the research results showed that green investment was able to result in the creation of 4,691 green jobs in the energy sector, 1,891,296 green jobs in the agricultural sector, and 2,313,479 green jobs in the forestry sector. As a result, the efforts to create green jobs in Indonesia can solve two problems at once: employment and environmental problems.

The potential for green jobs in a low-carbon development is enormous, both at the domestic and global levels. If low-carbon development goes well, as many as 65 million green jobs at the global level will be created by 2030, and 15.3 million green jobs in Indonesia will be made by 2045. Therefore, the relevant department's and all parties' seriousness is needed to strengthen low-carbon development in all aspects and arenas. (Salman et al., 2021b).

Based on calculations by the Development Planning Agency (Bappenas) using a net zero emission scenario, Indonesia has the potential of creating 1.2 million green jobs in 2020. It is estimated to continue to grow to 60 million green jobs in 2060. (Nurfaizah, 2022).

Furthermore, several things that can influence the development of green jobs in Indonesia include the spread of green jobs in many fields, the creation of new types of jobs, and the mainstreaming of the green economy. Apart from that, public awareness about climate change issues and support from all stakeholders can be factors that accelerate the implementation of green jobs in Indonesia (Nurfaizah, 2022). However, something must be watched out for if the energy transition process is not managed well. Indonesia is threatened with facing the problem of mass unemployment.

Other research results related to the scenario of decreasing coal demand on employment stated that the impact of a 30% reduction in coal demand would reduce sector employment opportunities by the coal sector by 2.3%, the mining services sector by 11.9%, the cement industry sector by 2.15% and several other sectors. Based on the position, those most affected are manual workers -5.07%, operators -3.27, and technicians -2.51% (Ismed et al., 2021). Regarding unskilled workers, they are generally low-skilled workers, and their household income is most affected. Furthermore, they generally fall into the category of informal workers and do not have social protection. The number of coal mining workers in 2018 was 137,501 people. Then, in 2020, it increased by 161,916; in the first quarter of 2021, it increased by 165,784. This figure is expected to continue growing along with increasing coal demand.

The use of renewable energy not only requires a lot of labor but also skills that are different from those developed to build and operate the fossil fuel industry (oil, gas, coal). Indonesia still tends to neglect implementing energy conservation principles, which is also indicated by the very scarcity of workers who work or have expertise in this field. Apart from that, this problem also concerns the small-scale mining sector. Indonesia is also a place where small-scale or community mining activities are developing. The number of workers involved is more significant than those working in formal, modern, or licensed mining companies. They work in small mining areas with scarce reserves. People or traditional mining workers sometimes enter areas around and even inside official

mining areas and on state land, including those with plantation status, protected forests, and production forests. Their activities are classified as "without a permit" and "illegal," giving rise to the term "Mining Without a Permit" (PETI) because they do not have a Mining Business Permit (IUP) and do not pay taxes; this also causes social unrest and environmental damage (Amrizal, 2022). As explained previously, reducing demand, for example, in the coal sector, will significantly impact workers, the majority of whom are traditional miners..

4. Carbon trading phenomenon

As a legal basis for regulating the carbon market and in order to realize Indonesia's commitment to implementing a green economy, Indonesia issued Presidential Regulation 98 of 2021 concerning the implementation of carbon economic value to achieve domestically determined contribution targets and control greenhouse gas emissions in domestic development. As stated by Febrio, Head of the Fiscal Policy Agency, Ministry of Finance:

"Indonesia really understands that to achieve the NDC target, innovations in policy instruments are needed. The enactment of this Presidential Decree is an important milestone in setting the direction of Indonesian policy toward the 2030 NDC and 2060 NZE targets" (OJK, 2022).

This is also in line with what was conveyed by Pandu Sjahrir, General Chair of the Indonesian Coal Mining Association (APBI) in the Indonesia Energy Outlook discussion event organized by the Indonesian Energy and Coal Suppliers Association (Aspebindo):

"For entrepreneurs, this is an opportunity of USD300 billion per year through carbon trading, both in terms of forests/land use such as reforestation, renewable energy, household equipment, and waste disposal," (Asmarini, 2022)

Pandu further said that the value of carbon trading comes from several factors, including activities to replant deforested forests, the use of new renewable energy (EBT), household equipment, and waste disposal.

Indonesia has stipulated Financial Services Authority Regulation number 14/2023 concerning carbon trading through the carbon exchange. The availability of a legal basis regarding the requirements and procedures for licensing Carbon Trading through the Carbon Exchange is expected to become the basis for carbon trading through the Carbon Exchange for related agencies, Carbon Exchange Organizers, business actors, users of Carbon Exchange Organizer services, and other related parties (OJK, 2023).

Suppose this carbon trading transaction can run well. In that case, it is estimated that it will be able to become one way to overcome the threat of unemployment arising from the impact of this energy transition, especially for informal workers who are characterized by low levels of income and skills. On the positive side, Indonesia only needs to focus on efforts to increase green skills through upskilling or re-skilling programs because, in reality, traditional miners are generally farmers.

5. Insight

Until now, dependence on fossil energy in driving economic growth and social welfare in Indonesia is still relatively high. However, since 2017, Indonesia has slowly but surely succeeded in increasing the realization of emission reductions beyond the targets designed in the economy-wide planning document. This success was primarily driven by the success of policies in the energy sector through, among others the construction of new renewable energy power plants and energy mix conversion policies.

Based on various calculation results, Indonesia's economic value and employment opportunities based environment will be more significant than the traditional economic value and employment opportunities (not environmentally based). This indicates that environmentally-based economic development will provide more benefits for the Indonesian economy. In the short term, for example, realizing carbon trading initiatives or other environmentally based business innovations will positively impact society, workers and employment opportunities. However, another thing that deserves attention is how to anticipate the impact on employment in the short term due to the transition process from brown energy to green energy.

In essence, efforts to create a green economy also really depend on how society (relevant departments, entrepreneurs, and community) realizes and implements these green habits. In this case, relevant departments, for example, did not all of them understand and realize the urgency of this issue at both the central and regional levels. Everything is still running as usual, and only a few relevant ministries have related functions that work to implement this environmentally-based economic policy. Likewise, with entrepreneurs, the production process carried out by most entrepreneurs still uses a business-as-usual approach. Only a few companies with a better understanding and awareness do it. Likewise, with society, people do not yet have the awareness and habits of green living, including in the world of education. This issue has not yet become a major concern among academics.

Public awareness (relevant departments, entrepreneurs, education, and households) is a key factor in accelerating the successful implementation of green economics and its impact on green job opportunities.

Attachment: Indonesian Work Competency Standards (SKKNI) – New Renewable Energy

Profession	Required training	Professional certification required	Formal education
Distribution Engineer	Electricity Distribution Operational Training	Certificate for Construction and Installation of Wind Power Plants	Bachelor of Mechanical Engineering/Electrical Engineering
	Training on the use of Wind Power Plant equipment		
	Training on Wind Power Plant data processing software/applications		

Profession	Required training	Professional certification required	Formal education
	K3 and environmental protection training Wind Power Plant Risk Management Training Professional development		
Distribution System Planner	Distribution System Technical Training Training on energy regulations, systems and procedures Professional development	Distribution Systems Expert Certificate from the Association / LSP	Bachelor of Electricity/Electrical/Mechanical Engineering
Distribution System Operator	Technical Operational Training for Wind Power Plants Basic Best Practices (5R & K3 basic) Professional development	Operator Certificate from Association / LSP	High School for Sciences/Vocational School
Transmission Equipment Maintenance and Maintenance Technician	Electrical Technician Training Risk factor management training Professional development	Electrical Technician Certificate from Association/LSP	Vocational School of Electricity Engineering/Electrical Engineering
Power Plant Transmission System Operator	Basic Best Practices (5R & K3 basic) Professional development Wind Power Plant Equipment Operational Technical Training	Operator Technical Certificate from the Association / LSP	High School for Sciences/Vocational School
Power System Planner	Power Systems Technical Training Training on energy regulations, systems and procedures Professional development	Power Systems Expert Certificate from the Association/LSP	Bachelor of Electricity/Electrical/Mechanical Engineering
Protection System Operator	Wind Power Plant Technical Operational Technical Training Basic Best Practices (5R & K3 basic) Professional development	Operator Certificate from Association / LSP	High School for Sciences/Vocational School
Telecommunication Operators	Telecommunications Technical Training Basic Best Practices (5R & K3 basic) Professional development	Operator Technical Certificate from the Association/LSP	High School for Sciences/Vocational School

Profession	Required training	Professional certification required	Formal education
Power Plant Power System Operator	Wind Power Plant Equipment Operational Technical Training	Operator Technical Certificate from the Association / LPS	High School for Sciences/Vocational School
	Basic Best Practices (5R & K3 basic)		
	Professional development		
	GDP (Good Documentation Practices)		
SCADA Operators	Wind Power Plant Equipment Operational Technical Training	Operator Technical Certificate from the Association / LPS	High School for Sciences/Vocational School
	Basic Best Practices (5R & K3 basic)		
	Professional development		
Power Plant Engineer	Power Plant Operational Training	Wind Power Plant Construction and Installation Certificate	Bachelor of Mechanical Engineering/Electrical Engineering
	Training on the use of Wind PLT equipment		
	Wind Power Plant data processing software/application training		
	Training on occupational safety and health and environmental protection		
	Wind Power Plant Risk Management Training		
Power Plant Chemical Analyst	Laboratory Management Training	SIB (Surat Ijin Bekerja)	Diploma III in Chemical Analysis/Engineering
	Occupational Safety and Health and environmental protection		
	Handling Toxic and Hazardous Materials (B3)	Chemical Analyst Certificate from association/LSP	
	Professional development		
Maintenance Technician	Electrical Technician Training	Wind Power Plant Construction and Installation Certificate	Engineering/Electricity/Electrical Vocational School
	Risk factor management training		
	Professional development		
Power Plant Equipment Operator	Wind Power Plant Equipment Operational Technical Training	Operator Technical Certificate from the Association/LSP	High School for Sciences/Vocational School

Profession	Required training	Professional certification required	Formal education
	Basic Best Practices (5R & K3 basic)		
	Professional development		
Energy Planner	Energy planning assistant training	Energy conservation expert certificate	Bachelor of Engineering/Transportation
	Training on energy regulations, systems and procedures		
	Professional development		
Generating Manager Land	Land Management Techniques Training	Sertifikat Ahli Teknik Pengelolaan Lahan	Bachelor of Agricultural/Forestry Engineering
	Basic Best Practices (5R)		
	K3 and environmental protection training	Land Conservation Expert Certificate	
	Professional development		
Energy Manager	Land Management Techniques Training	Sertifikat Ahli Teknik Pengelolaan Lahan	Bachelor of Technic
	Basic Best Practices (5R)		
	OSH and environmental protection training	Land Conservation Expert Certificate	
	Professional development		
Wind Power Plant Operator	Wind Power Plant Equipment Operational Technical Training	Operator Technical Certificate from the Association/LSP	High School for Sciences/Vocational School
	Basic Best Practices (5R & K3 basic)		
	Professional development		
Energy Equipment Operator	Wind Power Plant Equipment Operational Technical Training	Operator Technical Certificate from the Association/LSP	High School for Sciences/Vocational School
	Basic Best Practices (5R & K3 basic)		
	Professional development		

X. Green Jobs in ROK: Navigating ESG, SDGs, and Green New Deal⁴³

1. Introduction

The Increase of Green Jobs

Between 2022 and 2023 alone, the presence of green talents in workplaces increased by a median of 12.3% across 48 economies. Concurrently, the demand for skills in green jobs surged at an even faster pace, growing by a median of 22.4% in job postings requiring at least one green skill (LinkedIn, 2023). Additionally, according to the LinkedIn report (2022), green jobs witnessed a remarkable 38% increase over the last five years. The proportion of green jobs in the overall job market expanded from 9.6% in 2016 to 13.5% in 2021. Notably, the most substantial growth occurred in the category of 'Sustainable Managers,' exhibiting a 30% increase over the 5-year period. Emerging sectors included Wind Turbine Technicians (24%), Solar Energy Consultants (24%), Ecologists (22%), and Environmental and Health Experts (20%).

As of 2021, the most sought-after skills and job experiences in green job postings were associated with 'Sustainable Development,' constituting 27.6%, the highest percentage. 'Environmental Improvement' and 'Environmental Policy' followed closely, accounting for 8.8% and 8.6%, respectively, as preferred competencies among companies. Among job seekers in the eco-friendly sector, the predominant competency was 'Sustainable Development' at 12.6%, with 'Ecosystem Management' and 'Renewable Energy Generation' following at 10.0% and 9.2%, respectively. Despite the overall growth in the amount of green jobs, disparities between economies persisted. From 2015 to 2021, green jobs increased by 18% in low-income economies, while high-income economies experienced a more substantial 39% increase. In upper-middle-income and lower-middle-income economies, the growth rates were 37% and 31%, respectively.

The demand for green jobs from companies is expected to continue rising, potentially leading to a shortage in the supply of such positions. Job postings requiring eco-friendly technology skills showed an annual increase of 8% from 2016 to 2021, and the percentage of individuals possessing these skills rose by 6% each year during the same period. LinkedIn highlighted that if these trends persist, the demand for green jobs could outpace the supply within five years, potentially posing challenges for companies striving to meet climate goals due to human resource constraints.

Transitioning from Traditional Industries to Green Ones in Korea

The Republic of Korea, hereafter referred to as ROK, has gained acclaim for its robust industrial base, notably in sectors such as manufacturing and heavy industries. The transition to green jobs often encounters resistance due to economic implications, job displacements, and the necessity for substantial restructuring within these traditional industries. Additionally, progressing towards a green economy requires substantial investments in renewable energy, energy efficiency, and other eco-friendly technologies. However, securing an adequate funding and attracting the investments poses challenges to the development and expansion of green industries.

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The establishment of a clear and supportive policy framework is paramount for the success of green jobs. Although ROK has actively developed policies to promote renewable energy and sustainable practices, challenges may arise in aligning these policies with economic goals and overcoming political and regulatory hurdles.

Green jobs frequently involve new technologies and practices, yet a lack of awareness and understanding among the public can impede the acceptance and adoption of green initiatives. Consequently, building public support and addressing misconceptions become essential. Additionally, the transition to a green economy may necessitate a different set of skills than those traditionally emphasized in ROK, requiring attention to ensure the workforce is adequately trained.

The climate change and environmental issues are global challenges, necessitating the alignment of policies with international standards. This can be a complex undertaking, and ROK needs to navigate these international relationships to ensure a cohesive and effective approach to green initiatives.

Advancements in technology are crucial for the success of green industries. Given ROK's technological prowess, continuous innovation and the development of new technologies are imperative to remain competitive in the green sector.

In this chapter, we delve into the landscape of green jobs in ROK. Beginning with an overview of the current state of green employment in the economy, we subsequently explore ESG and SDGs-driven green jobs, shedding light on their significance in the ROK's context. The chapter also features illustrative cases from the Korean New Deal, offering insights into its impact on the creation and promotion of green jobs. Lastly, the chapter concludes with overarching remarks summarizing the key findings and implications discussed throughout.

2. Current Status of Green Jobs in ROK

An Overview of the Job Market

ROK has a highly industrialized and developed economy, with key sectors including technology, manufacturing, and services. Traditionally, the job market in ROK has been strong in these sectors (Lee et al., 2021; Cardinale, 2019; Rhyu & Lee, 2006). The economy has been making efforts to transition towards a more sustainable and green economy, which can have implications for the job market. Also, ROK has been increasingly focusing on environmental sustainability and renewable energy (Youm, 2022; Chae & Youm, 2021). The ROK has set ambitious targets for reducing greenhouse gas emissions and increasing the share of renewable energy in the total energy mix.

First, the ROK has been investing in renewable energy sources such as solar and wind power. This has the potential to create jobs in the renewable energy sector, including roles in manufacturing, installation, maintenance, and research. Second, the green jobs are not limited to the energy generation. There is a growing demand for expertise in environmental technologies, waste management, and sustainable practices in various industries. Third, as the economy implements policies to meet its sustainability goals, there is a need for professionals in policy development, urban planning, and environmental management (Korea Government Report, 2021).

Sustainability Initiatives

The ROK has launched various initiatives to promote green jobs and sustainability: 1) ROK has announced a Green New Deal, which aims to invest in environmentally friendly infrastructure, promote green industries, and create green jobs. 2) The ROK has set ambitious targets for expanding the share of renewable energy in the total energy mix. This includes increasing the capacity of solar and wind power facilities. 3) ROK has set a goal to achieve carbon neutrality by 2050. This involves comprehensive efforts across industries and sectors to reduce carbon emissions (Korea Government Report, 2021).

Despite the positive initiatives, challenges exist. ROK's economy has traditionally been dependent on industries that may not align with green principles. Transitioning to a green economy requires careful planning and management to address potential job displacement and skills gaps.

3. ESG and SDGs-Driven Green Jobs in ROK

Environmental, Social, and Governance Principles

There is a growing debate about the need for ESG management in the public sector. ESG stands for Environment, Social, and Governance, and is defined as "the environmental, social, and governance factors that can affect an institution's ability to execute its strategy and increase its value. In other words, it refers to management activities to increase corporate value through the fulfillment of corporate social responsibility (CSR). When a company or economy selects an investment target, it looks not only at financial statements and cash flows, but also the impact on sustainability such as corporate morality, trustworthiness, and transparency.

Table 26 ESG and CSR

Contents	ESG	CSR
Goals	Introducing environmental, and social responsibility, and improved governance, and promoting the sustainable development	An institution and company's additional activities for the purpose of contributing to society
Methods	Integrating ESG Factors into Corporate Management and Financial Activities	Volunteer, donate, and give back programs, and more
Short-term effects	Impact the shareholders, potential investors, investment media, etc. In addition, publish ESG status as an index	Positive image for consumers, NGOs, employees, and more

Long-term effects	Leads to financial stability for companies and public institutions and corporations	Helps improve the organization's reputation and contributes to increased sales for firms
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Corporate ESG investing has been on the rise in 2020, even as the global economy has been challenged by COVID-19. As investor standards change, ESG is no longer an option for companies, but a necessity. In today's increasingly sophisticated business environment, organizations need to innovate their environmental, social, and governance structures to create future value. ESG has been evaluated as having positive effects on companies. First, ESG management has been shown to increase top-line growth (Brogi & Lagasio, 2019: 576-587; Sa, 2021 reinsert). Second, ESG management cost reductions through ESG management. According to McKinsey, up to 60% of operating profits of operating profits are reported to be influenced by the efficient management of resources, including energy, water, and waste. Third, ESG management can reduce the cost of regulatory and legal interventions. A company's strong ESG implementation can protect it from various regulatory and legal interventions. Fourth, it can improve employee morale and contribute to productivity uplift. Fifth, you can expect investment & asset optimization effects.

Aligning with Sustainable Development Goals

The concept of sustainable development was developed in 1987 by the United Nations Environment Programme (UNEP) and the World Commission on Environment and Development (WCED) in their report "Our Common Future." As used in this report, sustainable development is defined as "meeting the needs of the current generation without sacrificing or compromising the ability of the future generations to meet their own needs (Bartelmus, 1994: 6; Sa, 2021 recite)." This concept of sustainable development emphasizes the equity between classes and between economies. The reason why the concept of sustainable development emphasizes equity between classes and economies is that, although equity itself is an important value, in reality, the gap between the rich and poor and the rich and poor between economies is an important factor that accelerates resource depletion and environmental pollution (Lee, 1994: 14, Sa, 2021 reinsert).

In 2015, the United Nations General Assembly adopted the Sustainable Development Goals (SDGs) to be implemented from 2016 to 2030, with the slogan "Leave no one behind." With the slogan, "Leave no one behind," it set out the direction of humanity in the "five P's" of *People, Planet, Prosperity, Peace, and Partnership*, with 17 goals and 169 targets. The SDGs pursue universal and comprehensive goals that address social inequality, equitable education, economic growth, sustainable cities and communities, climate change, and ecosystem integrity. The SDGs encompass issues for both developing and developed economies while emphasizing global engagement through strengthened partnerships. Economies with low levels of SDGs may face the following five challenges to sustainable development and prosperity.

- 1) The negative impact on the economy's economic stability and sustainable growth
- 2) Social inequality is deepening, which is likely to increase social instability

- 3) Environmental destruction is likely to occur more frequently and our ability to respond to natural disasters is likely to be weakened
- 4) More health problems may occur and have a negative influence on the health of low-income and vulnerable groups
- 5) Difficulties in the cooperation with the international community may increase and international support for the development and transfer of new technologies may be difficult

Figure 4 17 Sustainable Development Goals



Source: Sachs, J.D., Lafortune, G., Fuller, G., Drumm, E. (2023). Implementing the SDG Stimulus. Sustainable Development Report 2023. Paris: SDSN, Dublin: Dublin University Press, 2023. 10.25546/102924

ESG and SDGs

In terms of the relationship between ESG and sustainable development as represented by the SDGs, if sustainable development is the goal, then ESG is the means and activities that firms and institutions implement to achieve that goal. ESG can be said to be the 'means' and 'activities' that companies implement to achieve the goal. In other words, sustainable development (SDGs) is the goal, and ESG management is the means. For example, if a public organization conducts ESG activities through carbon neutralization, it will contribute to the achievement of the 13th goal of the SDGs, tackling climate change.

If we look at the 17 SDGs and relate them to ESG, we see that on the environmental side, zero hunger, health and well-being, clean water and sanitation, sufficient energy, jobs and economic growth, industry and infrastructure, sustainable cities and communities, responsible consumption and production, climate change, conservation of aquatic life, conservation of terrestrial ecosystems, and partnerships towards the goals; and on the social side, poverty eradication, zero hunger, and health and well-being, quality education, gender equality, jobs and economic growth, reducing inequality, responsible consumption and production, peaceful and just societies, building strong and just institutions, and partnerships towards the goals. On the governance side, it includes gender equality, responsible consumption and production, and partnerships toward goals that are interrelated (Khaled and Mohamed, 2021: 7;

Sa, 2021 reinsert).

Aligning with Sustainable Development Goals: Korean Case

In 2022, ROK ranks 31st out of 166 economies assessed for the SDGs, down from 28th in the previous year. <Figure 5> and <Figure 6> show the overall SDG status of ROK. In 2022, ROK’s SDGs show weaknesses in 5, 12, 14, 15, and 17. ROK scored very low on gender equality, responsible consumption, marine ecosystem protection, terrestrial ecosystem protection, and SDG partnerships, highlighting the need to upgrade public and corporate policies in these areas.

In the 2022 SDG achievements, ROK secures the 31st position, with Finland, Sweden, and Denmark from the Nordic economies leading the rankings, followed by Japan at 21st, China at 63rd, and Singapore also at 63rd. In the context of Korea, a strategic emphasis on aligning individual policies with the SDGs is imperative. Analyzing the distinctive elements of SDGs in advance is essential for identifying crucial components within individual policies and programs. As an illustrative example, the Japan Business Federation, known as Japan Keidanren, has pioneered the concept of Society 5.0 for the SDGs. This innovative approach not only presents a new growth model but also envisions “solving social issues” and “creating a better future,” thereby contributing significantly to the attainment of SDGs.


Figure 5 Korea’s SDGs Scores 2022



Source: Sachs, J.D., Lafortune, G., Fuller, G., Drumm, E. (2023). Implementing the SDG Stimulus. Sustainable Development Report 2023. Paris: SDSN, Dublin: Dublin University Press, 2023. 10.25546/102924

Figure 6 The 2023 SDG Index: 2022 Scores and Rank

The 2023 SDG Index: score and rank

	Rank	Economy	Score	Rank	Economy	Score
	1	Finland	86.8	45	Kyrgyz Republic	74.4
	2	Sweden	86.0	46	Cuba	74.1
	3	Denmark	85.7	47	Bosnia and Herzegovina	74.0
	4	Germany	83.4	48	Israel	74.0
	5	Austria	82.3	49	Russian Federation	73.8
	6	France	82.0	50	Brazil	73.7
	7	Norway	82.0	51	Argentina	73.7
	8	Czechia	81.9	52	Costa Rica	73.6
	9	Poland	81.8	53	Azerbaijan	73.5
	10	Estonia	81.7	54	Albania	73.5
	11	United Kingdom	81.7	55	Vietnam	73.3
	12	Croatia	81.5	56	Armenia	73.3
	13	Slovenia	81.0	57	Fiji	72.9
	14	Latvia	80.7	58	Tunisia	72.5
	15	Switzerland	80.5	59	Cyprus	72.5
	16	Spain	80.4	60	North Macedonia	72.5
	17	Ireland	80.1	61	Bhutan	72.3
	18	Portugal	80.0	62	Dominican Republic	72.1
	19	Belgium	79.5	63	China	72.0
	20	Netherlands	79.4	64	Singapore	71.8
	21	Japan	79.4	65	Peru	71.7
	22	Hungary	79.4	66	Kazakhstan	71.6
	23	Slovak Republic	79.1	67	Montenegro	71.4
	24	Italy	78.8	68	Maldives	71.3
	25	Moldova	78.6	69	Uzbekistan	71.1
	26	Canada	78.5	70	Morocco	70.9
	27	New Zealand	78.4	71	Algeria	70.8
	28	Greece	78.4	72	Türkiye	70.8
	29	Iceland	78.3	73	El Salvador	70.7
	30	Chile	78.2	74	Ecuador	70.4
	31	Korea, Rep.	78.1	75	Indonesia	70.2
	32	Uruguay	77.7	76	Colombia	70.1
	33	Luxembourg	77.6	77	Jordan	69.9
	34	Belarus	77.5	78	Malaysia	69.8
	35	Romania	77.5	79	United Arab Emirates	69.7
	36	Serbia	77.3	80	Mexico	69.7
	37	Lithuania	76.8	81	Egypt, Arab Rep.	69.6
	38	Ukraine*	76.5	82	Jamaica	69.6
	39	United States	75.9	83	Sri Lanka	69.4
	40	Australia	75.9	84	Barbados	69.4
	41	Malta	75.5	85	Tajikistan	69.2
	42	Georgia	75.0	86	Iran, Islamic Rep.	69.1
	43	Thailand	74.7	87	Bolivia	68.9

Source: Sachs, J.D., Lafortune, G., Fuller, G., Drumm, E. (2023). Implementing the SDG Stimulus. Sustainable Development Report 2023. Paris: SDSN, Dublin: Dublin University Press, 2023. 10.25546/102924

In the context of Korea, fostering the “green jobs” and embedding their integration within both companies and the public institutions is of paramount importance. These roles serve as a crucial bridge between ESG (Environmental, Social, and Governance) principles and SDGs (Sustainable Development Goals), constituting a potent policy instrument alongside ESG in the pursuit of the SDG objectives.

The primary objective of green jobs lies in mitigating carbon emissions and environmental pollutants by championing environmental protection, restoration initiatives, and the adoption of eco-friendly industrial practices. Additionally, the secondary aim of the green jobs extends to advancing universal values for humanity,

including equality, safeguarding rights and interests, and fostering the provision of responsible public services. A comprehensive evaluation of ROK's 2022 progress towards SDGs, as outlined by Cho (2023), underscores the imperative for additional policy measures to address identified weaknesses in achieving the four designated goals.

To enhance the global standard of gender equality, concerted efforts are required to ensure that initiatives aimed at preventing any form of abuse against women and girls align with environmentally sustainable practices. This includes the creation of women's safety and health-related jobs designed to function within a green framework.

The nexus between the responsible consumption and production and sustainable lifestyles is evident. There is a pressing need to transition roles related to food consulting towards reduction and to "green" jobs within office environments. These measures are essential for promoting responsible consumption and sustainable living practices in alignment with SDG targets.

Enhancing the value of the sea and land we inhabit necessitates the availability of a diverse array of skilled professionals. This includes specialists in marine waste decomposition and inflow prevention, experts in terrestrial waste management and landfill decomposition, and individuals possessing scientific management capabilities for effective fisheries resource restoration. Additionally, professionals specializing in land and marine environmental restoration and protection play a crucial role in these endeavors.

Global cooperation and partnerships are paramount. Building scientific and technological innovation capabilities requires individuals with the ability to foster long-term economic recovery visions, facilitate cooperation, and negotiate agreements across various fields. The development of such jobs is imperative for the successful implementation of additional policy efforts. Ensuring the education of future generations and identifying professions that empower women's participation in society, particularly in "green jobs," are key components of this strategy.

Education for future generations is foundational. Initiatives like the Korea Youth Work Agency (KYWA), established in July 2022, support self-directed activities such as carbon neutrality and ecological transition, aiming to create a world where current and future generations coexist harmoniously. Additionally, societal shifts in Korea, such as the rising age of marriage, increasing divorce rates, and rapid office automation, have expanded women's economic activities, underlining the need for professions that accommodate these changes.

Recognizing the vital role of women in achieving a sustainable society, various green jobs tailored for women are being developed. These encompass roles like the Living Environment Curator (Carbon Dioxide Reduction Project), Environmental Basic Facilities Guide, training for urban hazardous environmental substance monitoring personnel through the introduction of the associate engineer system, monitoring of rural biomass, and the School Environment Curator (KWENF, 2009).

4. Korean Green New Deal: A Catalyst for Green Jobs

The Korean New Deal, unveiled on 14 July 2020, outlines an ambitious plan to invest a total of KRW160 trillion, with KRW114.1 trillion allocated for fiscal investment, aiming

to generate 1,901,000 jobs by 2025. This transformation initiative seeks to make the economy more environmentally sustainable, digitally advanced, and fortified with robust safety nets. Implementation involves fiscal support for economic stimulus and enhanced regulations to stimulate private sector participation (Korea Government Report, 2020).

Figure 7 Main Policies of the Korean New Deal



Specifically addressing energy concerns, the Green New Deal (GND) allocates KRW73.4 trillion, with KRW42.7 trillion sourced from the Treasury. This substantial investment is directed towards bolstering climate action and fostering a green economy, focusing on green infrastructure, renewable energy, and the cultivation of green industries (Korea Government Report, 2020).

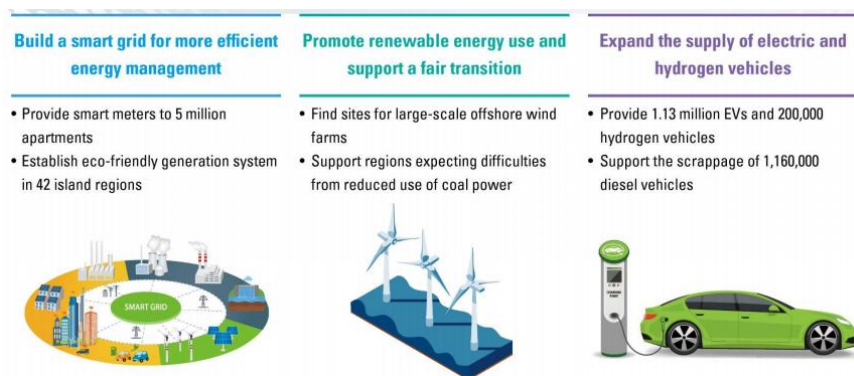
Further details of the plan, a green transition of infrastructures, include a KRW30.1 trillion investment by 2025 to create 387,000 jobs. Key initiatives encompass the pursuit of eco-friendly infrastructure and renewable energy production, working towards achieving the 2030 greenhouse gas emission reduction target and RE3020 goals. This involves the green transition of infrastructure through the remodeling of public buildings and schools (Korea Government Report, 2020b).

Figure 8 The Green Transition of Infrastructures



The plan also emphasizes the promotion of low-carbon and decentralized energy solutions, entailing the construction of smart grids and the expansion of electric and hydrogen vehicle supplies. By investing KRW35.8 trillion, 209,000 jobs' creation could be expected to be completed by 2025. Additionally, measures include the encouragement of innovation in green industries by providing technology development support for environment and energy SMEs, establishing green industrial clusters to facilitate technology development, testing, production, and marketing, and creating approximately 215 billion won worth of public-private joint funds to support the growth of green businesses. Further support involves making 1.9 trillion won worth of loans available for businesses investing in environmental protection tools and facilities (Korea Government Report, 2020b).

Figure 9 The Low-carbon and Decentralized Energy Supply



The GND involves significant investments in renewable energy infrastructure, with a specific focus on expanding solar and wind power capacities. This expansion spurs demand for skilled workers, encompassing roles in solar panel manufacturing, wind turbine installation, and the maintenance of renewable energy systems.

Moreover, the GND places a strong emphasis on enhancing energy efficiency across sectors like buildings and transportation. This initiative creates opportunities for professionals in energy auditing, green building design, and the development of energy-efficient technologies. The plan also champions the widespread adoption of electric vehicles (EVs) and the development of associated charging infrastructure.

This shift towards green transportation generates jobs in the manufacturing of electric vehicles, battery production, and the installation and maintenance of EV charging stations.

Furthermore, the GND fosters innovation in environmental technologies, encouraging research and development in areas such as waste management, water conservation, and sustainable agriculture. The demand for the professionals with expertise in these domains contributes significantly to the growth of green jobs. The ROK's commitment to the GND establishes a foundation for the development and enforcement of policies supporting sustainability. This, in turn, creates a demand for professionals specializing in policy development, regulatory compliance, and environmental law.

As a result, the GND involves substantial investments in green infrastructure projects, ranging from the construction of eco-friendly buildings to the development of smart grids and improvements in public transportation. These projects generate employment opportunities in construction, engineering, and project management. To facilitate the transition to a green economy, there is a strong emphasis on education and training programs, equipping the workforce with essential skills for green jobs. This includes a training in renewable energy technologies, sustainable practices, and environmental management.

In sum, the Korean Green New Deal acts as a catalyst for green jobs by driving investments in renewable energy, energy efficiency, green transportation, environmental technologies, and sustainable infrastructure. This policy not only addresses environmental challenges but also contributes to economic growth and the development of a skilled workforce in emerging green sectors. For the latest and most accurate information, it is recommended to consult official sources and policy updates.

5. The Conclusion and Key Takeaways

In conclusion, fostering green jobs in ROK is pivotal for achieving a sustainable and resilient economy. Through a comprehensive approach that encompasses skills development, financial incentives, and environmental integration in business practices, the economy can position itself as a leader in the global green economy. The key takeaways from this initiative include:

Investment in the Green Skills Training: Firstly, relevant departments should establish comprehensive training programs to equip the workforce with the skills necessary for green jobs. This investment in green skills training ensures that the labor force is adequately prepared to meet the demands of environmentally-friendly industries, facilitating a smooth transition to a green economy.

Incentives for Green Industries: Financial incentives, such as tax breaks and subsidies, should be introduced to encourage businesses to adopt environmentally sustainable practices. This incentivizes the growth of green industries, resulting in increased job opportunities and contributing to overall economic development.

The Integration of ESG Principles in Business Practices: Furthermore, policies should encourage companies to integrate Environmental, Social, and Governance (ESG) principles into their operations. This integration not only promotes environmentally responsible practices but also creates and sustains green jobs, aligning with broader sustainability goals.

Research and Development (R&D) Funding: Allocating funds for research and development in green technologies is crucial. This investment fosters innovation, creating new green job opportunities and positioning ROK as a leader in sustainable technologies on the global stage.

Public-Private Partnership (PPP): Public-private partnerships should be fostered to promote collaboration between relevant departments, private sector, and non-profit organizations in advancing green initiatives. This coordinated effort addresses environmental challenges and creates a supportive ecosystem for the growth of green jobs.

Green Procurement Policies: Implementing policies that prioritize environmentally friendly products and services in government procurement can have a significant impact. This green procurement approach boosts demand for eco-friendly products, stimulating growth in green industries and creating a ripple effect on green job opportunities.

Education and Awareness-Raising Campaigns: Educational programs are essential to raise awareness about green jobs and their significance. By cultivating a workforce that understands the importance of sustainability, these programs make individuals more likely to seek and contribute to green job opportunities.

Monitoring and Evaluation: Establishing a monitoring and evaluation system is crucial for tracking the effectiveness of green job initiatives. This feedback loop ensures continuous improvement, allowing policymakers to make necessary adjustments and optimize the impact of these policies in achieving sustainable economic and environmental outcomes.

XI. Green Jobs: Opportunities and Challenges in Developing Vocational Workforce in Thailand⁴⁴

1. Introduction

The climate change has a significant impact to the planet. For instance, rising of sea level, more severe weather conditions, and ecosystems destruction. To mitigate these effects, we need to drive the world towards low-carbon economy.

Green jobs are environmentally friendly occupation, which contribute to the conservation and restoration of environment. These jobs have been served long time ago. It is obvious in the regime of manufacturing and construction, as well as emerging green sectors such as renewable energy. These jobs aimed to improve clean energy production with high efficiency, reduce greenhouse gas emissions, minimize waste and pollution, also protect and restore ecosystems. They support climate change adaptation by fostering sustainability.

The global trend on Green Jobs in this decade is continuously rising. It has primary focus on driving the green economy and achieving net-zero society in the future. Therefore, workers associated in this field have a significant role in the sustainable business development.

According to the World Economic Forum, the proportion of environmentally friendly jobs called Green Jobs increased to 38% in 2015, where the United States was the leader of environmentally friendly workers across all professions. Employment in the renewable energy and environmental sector in the United States increased by 237% over last five years, while workers in the oil and gas sector only grew slightly by 19%.

2. Green job in Thailand

In Thailand, the situation is obvious that environmentally friendly jobs are rising. Four key industries, including energy and chemicals, food and agriculture, healthcare, tourism and hospitality, are promoting green jobs. These industries have historically relied on natural resources. If these jobs do not focused on this change, it might lead to loss in profits and significant halt the growth opportunities in the future.

Thailand is actively supporting the creation of environmentally friendly jobs through various policies that encourage businesses across industries to invest in environmental sustainability sector. These policies included tax exemptions for machinery imports, forcing banks to offer low-interest loans, promoting solar cell installations, and increasing taxes on companies which emitted high pollution.

The ordinary steps for businesses to gain competitive edge, and establish green businesses that meet future market demands is to invest in upskilling their employees regarding environmental concerns. Human resources or the workforce, are the most

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crucial resource in the world of Green Job. These Green Jobs have high demand in Thailand, leading to higher wages, especially in fields of eco-tourism and clean energy sector.

Expecting future situation has a hypothesis, there will be many Green Job positions emerging across all industries, requiring skilled workers with related environmental awareness. Educational institutions, including universities, must prepare new generation who aware on environmental issues and understand sustainable development goals. In part of industrial sector, workforce training is preferable. Collaboration among all stakeholders, including the governmental sector, universities, and businesses, can lead Thailand towards a sustainable world.

3. The BCG Model

Thailand has been promoting the Bio-Circular-Green Economy Model (BCG Model) since 2021 as one of its main policies is specified for inclusive and sustainable growth. The BCG Model aims to lead the economy out of middle-income status and generate sufficient income for people, particularly in the agricultural sector. Thailand has been promoted the innovation, utilizing the economy's strengths in biodiversity and cultural richness.

The BCG Model is a comprehensive framework designed to support balanced and sustainable economic growth, shifting the focus from general economic considerations to social and environmental aspects. It consists of three main models: the Bio-Economy Model, the Circular Economy Model, and the Green Economy Model. These models collectively pursued the goal of achieving sustainable economic growth while considering diverse perspectives within the economic, social, and environmental systems.

Bio-Economy Model: The Bio-Economy Model is related to the production of bio-circular resources and raw materials that can be transformed into value-added products by using technology and innovation. The key aspect is the application of bio-circular resources and raw materials in economic system.

Circular Economy Model: The Circular Economy Model drives a production and consumption system. It focuses on designing products, services, and systems to eliminate the waste and pollutants, emphasizing the reuse and recycling of resources. The goal is to return the value to wastes in other forms.

Green Economy Model: The Green Economy Model controlled the principles of environmental science into advantages for humanity in a way that is continually inclusive and comprehensive. It emphasizes on how the environment benefits on both society and economy.

The strength of the BCG economic framework lies in the synthesis of all three models. It covered policy responses that intertwine complex relationships among the economy, society, and the environment. Policymakers can design integrated actions for sustainable economic development by considering these various approaches. The core objectives of the BCG economy included balanced and sustainable economic growth, optimizing the use of resources, restoring natural systems, and promoting well-being in a mutually supportive manner. This framework recognizes the interconnections between various sustainable development pathways, enhancing policymakers' ability to manage the complexities of sustainable economic

development.

4. The growth of green skills and the green job market in Thailand

The International Labour Organization (ILO) expressed concerns about the decrease in youth employment by 7% in the first quarter of 2021, primarily due to the significant impact of the COVID-19 pandemic. It resulted in the portion of the youth unemployment rate of 3% on both males and females. Furthermore, climate-related policies may further destabilize the job recruitment, particularly for young generation. Those lacking the environmental issue concerns skills may have reduced wages and limited opportunities compared to their skilled counterparts.

In-depth studies on changes in employment from 2015 to 2020 revealed variations across different sectors. While some sectors, such as water and electricity, gas, and steam, have been increased. Hiring in the field of agriculture, forestry, fishing, manufacturing, and mining, experienced declining employment rates. Overall, job postings have been decreased due to the widespread impact of the COVID-19 pandemic. However, green job opportunities have shown a noticeable increase compared to the total job market, reaching its peak in the third quarter of 2020. The service sector and the organizations have led in the highest proportion of green job postings, followed by industrial and energy sectors, respectively. While transportation and logistics sector have the lowest representation.

The increase in green jobs can be attributed to several factors, driven by the growth of the job market, increased interests from organizations which are focusing on sustainability and green economy, coupled with various incentives supporting sustainability. The Stock Exchange of Thailand (SET) plays a significant role in driving this trend by introducing the Thailand Sustainability Investment Index (SETTHSI). This index promotes businesses to adapt sustainable practices, leading to an increase in green job postings. Furthermore, global commitments to combat climate change and achieve environmental conservation goals are essential in stimulating green job opportunities. Agreements such as the Paris Agreement set ambitious targets for greenhouse gas reduction and the transition to a low-carbon economy. Consequently, economies and industries worldwide are heavily investing in renewable energy, sustainable infrastructure, and clean technologies. This has created a growing demand for expert skill in various related fields. The convergence of business interests, public initiatives, and the international agreements has contributed to the development of a robust environmental system, promoting the expansion of green jobs as a significant driving force in the job market of the future.

5. New Job Opportunities Await for Those Who Rapidly Adapted

Even in Thailand, the economy with its own environmentally-friendly job market, it is obvious that the field is continuously growing. Industries that are ahead of the curve in our economy consist of four key sectors: energy and chemicals, food and agriculture, health care, and tourism and hospitality. These sectors have traditionally relied more on natural resources for their operations. If they do not adapt now, they may face substantial financial losses and miss out on future growth opportunities.

Thailand is actively promoting environmentally-friendly job positions through various policies aimed at encouraging businesses from all industries to invest more in sustainability and environmental initiatives. For instance, tax exemptions on imported machinery, low-interest loans from banks, support for the installation of solar panels,

and increased taxes on high-pollution companies.

The first step for business owners to adapt, gain a competitive edge, and create a green business that caters to future market demands are to invest in their organization's future. This can be achieved by providing training that instills a sustainable mindset and attitude among employees. Companies such as CPN, a major Thai corporation, are already doing this. Their CFOs take on responsibilities for sustainability, oversee corporate governance, and ensure environmental care through investment. This creates a sustainable business that can continuously grow in the future, and all stakeholders can grow together in a sustainable manner.

According to a 2020 report by the International Labor Organization (ILO), Thailand's green economy accounted for approximately 7% of all jobs in the economy, which is higher than the global average of 6%. The report also stated that Thailand's green economy has the potential to create an additional 1.2 million jobs by 2030.

Currently, environmentally-friendly workers in Thailand are still in high demand, resulting in significantly higher salaries, up to three times the average in some cases, especially in the environmental tourism and clean energy sectors. Examples of such professions include forest regeneration tourism managers, wind turbine technicians, solar panel installers, and clean energy consultants. These occupations represent new opportunities for everyone.

6. Staying Ahead of the World with Up-skilling and Re-skilling

Environmentally-friendly jobs are trending towards providing competitive wages and benefits, along with opportunities for skill development and career advancement. This helps reduce carbon emissions, improve air and water quality, and create more flexible and resilient communities. This helps individuals adapt better to the impacts of changing climate conditions.

One of the greatest challenges in the growth of environmentally-friendly jobs is ensuring that everyone has equal access to these emerging opportunities, particularly marginalized groups, vulnerable individuals, and those from undeserved communities. This includes up-skilling and re-skilling workers who previously worked in high-carbon industries.

Thailand's commitment to sustainable development and the increasing demand for environmentally-friendly products and services indicate that the environmental job market in the economy will continue to improve steadily in the coming years, despite challenges such as limited capital, lacking of awareness and understanding of green technologies.

Looking towards the future, it can be observed numerous career opportunities in environmentally-friendly job sectors across various industries. In addition, job roles mentioned earlier, there are opportunities for career growth from traditional occupations. For example, farmers can utilize big data and technology in agricultural sector to optimize crop production, reduce water consumption, minimize food loss, or architects can design energy saving homes by using natural light and ventilation instead of relying on artificial lighting and air conditioning.

On a larger scale, Thailand is investing in human resources through educational policies, universities are producing a new generation of environmentally-conscious

professionals, and companies are investing in workforce training. With these combined efforts, Thailand is well-positioned to confidently step into a sustainable world.

7. The Office of the Vocational Education Commission (OVEC) of Thailand for the Green Job Ecosystem

The green skills training programs

Green skills training programs are recognized as essential ways to develop a workforce capable of addressing sustainability challenges and being part of a greener and more sustainable future. Green skills encompass a diverse range of capacities that enable individuals to work and live in an environmentally friendly and sustainable manner. The importance of green skills training programs lies in bridging the gap between environmental awareness and practical knowledge.

These courses prepare individuals, including young people, to acquire the expertise needed to understand, conserve, and restore environmental systems while promoting sustainability across various industries. They cultivate environmentally competent professionals who can manage skills gaps in forestry, environmental conservation, and contribute to environmental goals through energy conservation, waste reduction, and pollution control. These programs also play a vital role in the public efforts and international commitments to environmental conservation and sustainability, as they encourage the adoption of sustainable practices across all sectors.

The main benefits of the green skills training programs include:

- a. **Raising Environmental Awareness and Understanding:** These programs help young people develop the awareness and understanding of environmental challenges and the significance of sustainable actions. They will be instilled a sense of responsibility for the environment from young age, encouraging them to explore and pursue possible career paths in the growing green economy.
- b. **Empowering the Youth to Make a Positive Impact:** The young people will be empowered at green jobs to take an action. Also, creating a positive impact on the environment and their communities. They can become social change agents, actively participating in environmental conservation projects and inspiring others to do so.
- c. **Hands-On Learning and Practical Skill Development:** These programs provide hands-on learning experiences and develop practical skills that can be applied in various environmental fields, such as the renewable energy technologies, waste management, green building, and sustainable agriculture, through interactive workshops and internships.

By offering green skills training opportunities, economies can generate more skilled and environmentally conscious workforce, better equipped to address environmental challenges and contribute to a sustainable future.

The green skills training program opens up opportunities for new careers in the thriving green economy, along with various industries that aim to reduce carbon footprint and adopt sustainable practices. The demand for professionals with green

skills is on the rise. However, without the appropriate training and necessary skills, transitioning into environmentally-focused operations may lead to unemployment due to the changing economic landscape. Green skills training courses contribute to building a more prosperous society by fostering the environmental stewardship and promoting sustainable practices and conservation efforts.

The Development of Vocational Education Excellence Centers

The Office of the Vocational Education Commission (OVEC), as the main organization responsible for the important task of producing and developing a high-quality and industry-relevant workforce, has planned and executed strategies to ensure that the workforce possesses quality, standards, and sustainable professional competencies. This includes reinforcing the competitiveness to support Thailand's accession to the ASEAN community.

The Development of Excellent and Specialized Teachers for Preparedness

Preparing human resources to be efficient and competitive on the global stage is essential in this era of rapid technological change and free trade. It is necessary to plan and develop human resources in line with the needs of the business sector and enhance their ability to respond to rapidly changing technology. In the 13th Economic and Social Development Plan, Target 12 aims for Thailand to have a highly competent workforce that is committed to continuous learning to meet future development challenges. The strategy includes: developing a highly competent workforce that aligns with the needs of the production sector and can create jobs and a future. Increasing the number of high-quality human resources to develop the targeted production sector. Creating smart entrepreneurs who have the ability to create and use technology and innovation throughout the production and service processes, management, and marketing.

The Office of the Vocational Education Commission (OVEC) is the agency that produces a workforce that meets labor market demands. Therefore, developing the vocational teachers to keep pace with technological changes in the business sector is of great importance.

Development of Professional Skills and Competencies (Re-skill, Up-skill)

One of the key objectives of Thailand's domestic strategy, in the years 2018-2037, is the development and enhancement of human potential. The strategy aims to prepare Thai people to be virtuous, skilled, and high-quality individuals, ready for work in the 21st century. This is achieved through the master plan under the domestic strategy's framework, focusing on the development of lifelong human potential.

The plan highlights the importance of upgrading the skills and competencies of the workforce to meet market demands, considering both fundamental skills and specialized skills which are crucial for specific professions. It also emphasizes the need to motivate and encourage those in the workforce to participate in training and developing programs to increase their opportunities for employment.

Additionally, the plan recognizes the significance of leveraging online platforms for skills and knowledge development, making it more convenient for individuals to enhance their capabilities in areas of their interest. Furthermore, it suggests that the relevant departments may provide support through cost-sharing or vouchers for

training in vocational skills to better prepare the Thai population for the changing job landscape and economic opportunities.

In conclusion, the project of the vocational education, the development of professional skills and competencies in Thailand are part of the economy's broader efforts to prepare its workforce for the challenges and opportunities of the 21st century, ensuring that individuals have the skills and knowledge needed to thrive in the changing job market and contribute to the economic growth.

Promoting Collaboration between Public and Private Sectors in Both Domestic and International Vocational Education

Quantitative Outcome: Thirty-five occupational groups have been established under the mechanism of cooperation between the Public and Private Sectors Committee for the Production and Development of Vocational Personnel (PPV) in various vocational fields. This collaboration involves 282 agencies from both the public and private sectors. It has been a significant collaboration in upgrading the quality of vocational education, in both production and development of vocational human resources together with seven economies. Furthermore, agreements have been signed with the Ministry of Labor to promote education and employment opportunities for students and expand benefits to the general public. These efforts aim to develop the potential of students, vocational students, and workers at all levels by providing them with knowledge, skills, and craftsmanship in line with domestic labor standards.

The focus is on the quality of skilled labor in Thailand and supporting industry sectors, including five economic councils: the Farmers' Council, the Thai Tourism Industry Council, the Thai Chamber of Commerce, the Digital Economy and Society Council, and the Fisheries Association. In terms of quality, the cooperation is driven by the Public and Private Sectors Committee for PPV, which defines directions and project plans urgently needed by business sectors in various occupations. It also outlines the methods for developing the vocational management towards students.

8. Green Internships

Once we experienced the challenges of climate change and sudden environmental degradation, the need for sustainable solutions becomes urgent. Green internships which provide hands-on experience and knowledge related to environmental conservation, renewable energy, and sustainable practices, serve as powerful tools for shaping the current job market landscape.

While the world is recovering from the COVID-19 pandemic, many people are seeking new career paths. Working in a simulated roles like these not only offers young individuals some learning experience and earning income but also directly involves them in various environmental issues, fostering a deep understanding of the challenges we are currently facing and encouraging innovative thinking to address these challenges. Young generation can gain practical skills, a strong sense of sustainability, and the ability to make a positive impact on communities and the world through such programs.

Key Benefits of Green Internships:

- a. Unique opportunities for youth to gain hands-on experience in environmental work, allowing them to apply theoretical knowledge to real-world situations and develop practical skills and innovative ideas.
- b. Preparing the youth to be competitive in the job market while employers increasingly value the experience gained from real work. These programs offer participants the career paths, networking opportunities, and skill development in environmentally focused businesses.
- c. Enhancing young peoples' awareness of environmental issues, allowing them to understand better the ongoing impact of human activities on the environment. Through active involvement in conservation, waste reduction, and renewable energy projects, young people can personally experience the consequences of human actions on the environment.
- d. Fostering a lifelong commitment to environmental stewardship through participation in sustainability programs, where youth actively engage in conservation, waste reduction, and renewable energy efforts.
- e. Providing a platform for the youth to develop personally and discover themselves, while also cultivating the essential life skills such as leadership, communication, and adaptability.

Opportunities to apply skills in the real-world environments help young people explore and discover their interests, abilities, and unique strengths. This step aids in charting a career path in line with their aspirations for the future. While young people may not be directly involved in green roles, there are still many valuable roles behind the scenes, such as management, budgeting, communication, and responsibilities unrelated to research in various aspects of the green sector.

The Project to Enhance Vocational Education through Community-Based Approaches

Thailand has a policy to increase the number of students in vocational education to better align with the economy's economic workforce needs and to prepare them for integration into the ASEAN community. A key mission of the Office of the Vocational Education Commission (OVEC) is to produce high-quality individuals with skills and competence for the workforce, thus enhancing the economic strength. This is achieved through the strategic development of individuals via a community-based vocational education system. The goal is to expand and cover the target groups of learners and businesses continuously, in line with the quality and standards specified by the Vocational Education Commission for community-based vocational education.

This project is continuous and is being developed from the previous initiatives launched in the 2022 fiscal year, with a focus on local stakeholders such as administrators, teachers, vocational education learners, businesses, and relevant parties. The emphasis is on developing prototype community-based schools through innovation, instructional management, and the use of information networks. The project aims to promote and support the improvement of the quality of community-based vocational education by utilizing local resources.

Driving the Reform of Agricultural and Fisheries Colleges

Quantitative Outcome: There has been an 18.85% increase in the number of students in agricultural and fisheries vocational education programs since 2023. This has led to the increased knowledge and understanding of land use by educational institutions to motivate the agricultural work among teachers, staff, and students. The participants included 47 agricultural and fisheries educational institutions, four agricultural vocational institutes, as well as collaboration with the Department of Treasury, the Department of Land, the Department of Agricultural Education, Mahidol University's Faculty of Agriculture, and related agencies. Quality improvement has been carried out through the reform of learning sources and smart farms, the improvement of the quality of agricultural and fisheries vocational students, the enhancement of vocational teacher quality, and the reform of management systems and regulations that hinder the development of agricultural and fisheries vocational education. Quality strategies have been defined by creating announcements from the Committee for Vocational Education.

9. Green volunteer work

Being a green volunteer is a driving force for various environmental initiatives and it promotes the sustainable development. The opportunities for being a green volunteer provide a profound experience that fosters the personal growth, cultural perspectives, and opportunities to positively impact the lives of others. The youth engagement in green volunteering is of a paramount importance as the young people have the potential to shape the future by dedicating their time and energy to the environmental conservation and sustainability efforts, such as planting and waste separating. They have unique experiences in contributing significantly to building a greener and more sustainable community, improving the balanced and enhanced environmental systems. They can also inspire others to join the conservation efforts and be the catalysts for change. Youth involvement in these initiatives is a way to protect natural resources, preserve biodiversity, and combat the impacts of the climate change.

Main benefits of being a green volunteer

Involvement in green volunteering relies on collaboration from various individuals, including fellow volunteers, community members, and other stakeholders. Youth can develop essential skills through this experience, such as leadership, communication, problem-solving, and teamwork, which are integral to their personal development as responsible and engaged citizens.

Being a green volunteer offers young people a rare opportunity to deepen their understanding of environmental systems, environmental issues, and sustainable practices. Hands-on experiences, practical seminars, and working with experts provide valuable knowledge that can influence their future choices and careers.

Green volunteering brings together individuals who share similar values and passions for the environment. Young people foster a sense of a community and collaborate towards the common environmental goals. They promote a sense of community involvement and work together to achieve the shared objectives through connections with fellow volunteers. Such a network supports further environmental initiatives in the future.

It instills a sense of civic responsibility. Volunteering for environmental causes

nurtures a sense of civic responsibility in young people. It cultivates a sense of the community involvement and motivates them to elevate the environmental well-being. In turn, their efforts drive the positive, community-wide impacts that contribute to a domino effect of the positive change for the better.

The Project to Integrate the Development of Vocational Skills and the Cultivation of Desirable Characteristics of Vocational Education Students (FIX IT - Volunteer Spirit)

Based on the policy of the Ministry of Education to promote vocational education values, reshape the perception, and set standards to motivate students, parents, and guardians to encourage more students to pursue vocational careers, especially in professions that are in demand in the job market.

In addition, the domestic education strategy aims to develop students at all levels to have academic knowledge, emotional intelligence, ethics, morals, good citizenship, awareness of rights and responsibilities, equality, and a sense of social benefit. It also seeks to instill volunteering and a good conscience.

The Office of the Vocational Education Commission is responsible for managing vocational education in various fields such as industrial, commercial, artistic, agricultural, etc., with educational institutions distributed across all provinces. These institutions are equipped with tools, devices, and educational personnel with knowledge, skills, and experience in their respective professions to assist the society and communities. The importance of developing the vocational education students is recognized, aiming to enhance their thinking, analysis, and activity planning skills as well as to develop knowledge, abilities, skills, and experiences. Furthermore, it instills core values, ethics, discipline, social responsibility, and encourages students to work as a team and engage in volunteer activities that are beneficial and character-building. This creates unity and cohesion among vocational education students.

The Office of the Vocational Education Commission has organized activities to expand the role of the community development centers, volunteer activities, community assistance, and vocational development. This project serves as a real-world experience for students and instills confidence, pride, and volunteer spirit in vocational education students. It offers practical training opportunities and reinforces vocational skills that are in demand in the job market. Additionally, it aims to develop the entrepreneurship skills in students, allowing them to apply theoretical, technical, and innovative knowledge in business contexts and commercial ventures.

This provides an important career choice and equips them to deal with various economic, labor market, and pandemic-related risks. It contributes to the creation of new entrepreneurs in the future in line with the economy's development strategy for enhancing competitiveness and promoting human resource potential, as outlined in the domestic strategy under the 8th Economic and Social Development Plan, focusing on small and medium-sized enterprises and the new era of entrepreneurship.

In terms of quantity, the implementation of repair centers for community assistance has resulted in the establishment of 500 new centers, providing services to 48,414 individuals for repairs, developing professional skills in 8,138 students, creating and developing careers for 11,444 community members, developing 380 community craftsmen, and serving 4,937 communities. There are 433 educational institutions involved in the activities, producing 376 community products, and establishing 156

community assistance centers. Additionally, 4,431 students have participated in activities, including training at the community vocational centers, benefiting 280,062 individuals. In terms of quality, vocational education students have experienced the development of their thinking processes, analysis, knowledge, skills, and experiences, instilling core values, ethics, discipline, social responsibility, and an image-building mindset. These efforts aim to promote confidence, pride, and volunteering to help people and communities.

10. Green Scholarships

Green scholarships have emerged as tools for driving change, empowering youth to achieve environmental sustainability. These scholarships offer more than just financial assistance but they served as platforms for empowering environmentally conscious leaders who can create significant impacts. Beyond financial support, they provide opportunities that are invaluable, often impossible to quantify, through training, specialized mentoring, and access to networks.

The main benefits of green scholarships include:

- a. Alleviating the financial burdens of the higher education: By ensuring access to quality education and training programs on equal terms, these scholarships enable youth to focus their time and effort on driving the positive change, free from financial constraints.
- b. Developing environmental skills in the young people: These scholarships provide hands-on experiences that enhance knowledge, expertise, and leadership abilities. From research projects to internships and practical seminars, they prepare young scholarship recipients for careers in the area of environmental sustainability.
- c. Empowering the young people to promote and support environmental causes: Scholarship recipients gain a deep understanding of environmental issues and develop the necessary skills to actively contribute to promoting and supporting effective environmental practices. They become champions for the responsible environmental behavior and stimulate change not only through educational investments but also through their actions and influence.
- d. Creating a new generation of environmental leaders: The success stories of scholarship recipients inspire others, particularly young people, to pursue careers and activities that prioritize environmental sustainability. This ripple effect expands the scope of environmental awareness and fosters a community of like-minded individuals who work together to achieve shared goals.
- e. Fostering civic responsibility: By receiving green scholarships for environmental purposes, young individuals cultivate a sense of civic responsibility, becoming actively involved in improving their communities' environmental well-being. They become catalysts for a positive change, motivating others to join in, ultimately leading to the widespread environmental improvements.

Green scholarships are instrumental in nurturing a new generation of leaders who are environmentally conscious and dedicated to making a lasting impact on the environment.

Elevating Vocational Education on a Regular Basis – Free Education with a Profession

In the fiscal year 2023, 87 educational institutions participated in the project, consisting of two technical colleges, 38 vocational colleges, and 47 agricultural and technological colleges. Currently, there are 2,737 students enrolled at the level of Vocational Certificate (Vocational Certificate Level 2). The emphasis is on increasing opportunities and access to quality education for disadvantaged individuals and students with special needs, allowing them to lead sustainable lives in society by ensuring equal educational opportunities, equity, and equality in state education. Furthermore, it supports students who have dropped out of the education system to reintegrate into high-quality vocational education and standards.

11. Conclusion

Green jobs not only provide meaningful impacts on our planet but also establish sustainable careers. These jobs covered various sectors, including the traditional industries such as manufacturing, technology, renewable energy, construction, transportation, waste management, etc. With growing global interest in sustainability and environmentally friendly practices, the importance of green jobs is at the forefront of transitioning to a low-carbon global economy.

Green jobs play a significant role in addressing environmental issues while driving economic growth, creating more job opportunities, offering higher revenue, reducing the impact of automation, promoting learning and up-skilling, and contributing to cost savings, efficient operations, and healthier workplaces (Manpower, 2022). The number of green jobs is continuously rising up, even though it faced numerous challenges due to the COVID-19 pandemic.

Green jobs represent a tangible path to a better and more sustainable future, driven by practical and efficient utilization of resources.

Annex I Project Report

1. About the Project

The APEC's Putrajaya Vision 2040 states that a strong, balanced, secure, sustainable and inclusive growth is an important driving force. Facing the impact of the Covid-19, a green and sustainable development has become an important centerpiece of the economic recovery of the Asia-Pacific Region. In September 2020, China announced its goal of achieving a “carbon peaking” by 2030 and a “carbon neutrality” by 2060. Other APEC economies have also set their own strategic objectives and action plans for sustainable development.

Human resource development is an important element of the APEC cooperation and is one of the areas with the broadest consensus as well as the best basis for cooperation among member economies. The implementation of green sustainable development and of the resilient economic recovery in the post Covid-19 era cannot be achieved without the support of green human resources. It is important for economies to formulate and implement strategies and policies related to green jobs as well as to accelerate green human resource development. In this context, it is necessary to study and learn from the experiences of the economies in the field of green jobs within the framework of the forum of the APEC Human Resources Development Working Group, so as to promote jointly a resilient economic recovery in the post Covid-19 era.

In 2023, under the guidance of the International Cooperation Department of the Ministry of Human Resources and Social Security, China (MOHRSS), the Chinese Academy of Personnel Sciences (CAPS) applied for and implemented the APEC project *Promoting Green Jobs for a Resilient Economic Recovery from COVID-19*, which is co-sponsored by 9 economies including Hong Kong, China; Indonesia; Korea; Malaysia; Papua New Guinea; Peru; the Philippines; Thailand; and the United States.

Through a collaborative research and the international forum, the project aims to examine the priority areas, challenges and good practices of green jobs development in APEC economies in the post Covid-19 era, and to make policy recommendations for economies to promote and support green jobs development and achieve sustainable and resilient economic recovery, so as to better support the goal of strong, balanced, secure, sustainable and inclusive growth as set out in the Putrajaya Vision 2024. The project outputs include (1) Research Work and A Research Report (2) Case Reports (3) 1-day International Hybrid Forum and (4) A Project Report.

The major contractor of the project for research is Prof. Ren Yong's team from East China University of Political Science and Law. By applying research methods of desk research, field study, survey, on-line and off-line interviews and the case study, the research team completed a final research report of about 180 pages. The team, with the assistance of the PO's team, distributed survey questions among all 21 APEC economies and conduct on-line and off-line interviews with more than 20 interviewees from APEC economies. The PO's team and the major contractor also engaged researchers from five economies to complete five case reports with three case studies in each report. The leading researchers from each economy were:

Zhao Ning, Associate Researcher, Chinese Academy of Personnel Science, China

Linda Chelan Li, Professor and Associate Head of Department of Public and

International Affairs, Director of Research Centre for Sustainable Hong Kong (CSHK), City University of Hong Kong, Hong Kong, China

Henriko Tobing, Policy Analyst, Center for Manpower Policy Development; Head of Division of Policy Development of Industrial Relation, Labor Inspection & Sosec, Ministry of Manpower of Republic of Indonesia

Byoung Joon Kim, Professor of Public Administration; Director of Global Development Cooperation Institute, Kookmin University, Republic of Korea

Thanakarn Khumphai, Lecturer, Chachoengsao Technical College, Institute of Vocational Education: Central Region 3, Thailand

With the support of the event logistics provider Mr. Sun Hao and the assistant Ms. Ouyang Wanyue, the International Forum on Promoting Green Jobs for a Resilient Economic Recovery from COVID-19 is successfully held in Kunming, China, on October 27. The Forum engaged more than 80 participants from APEC economies and international organization, consisting of an opening ceremony, project briefing, keynote speeches, dialog and two parallel sessions on sub-themes. One field study to Yunnan Baiyao Group (a famous medical company in China) was arranged in the afternoon of October 27.

2. About the International Forum on Promoting Green Jobs for a Resilient Economic Recovery from COVID-19

Time and Venue

Time: 26-28 October 2023

Venue: Kunming Kai Wah Plaza Hotel, Kunming, China

Organizers

Chinese Academy of Personnel Science

Department of Human Resources and Social Security of Yunnan Province

Theme and Sub-themes

Theme: ***Promoting Green Jobs for a Resilient Economic Recovery from COVID-19.***

Two sub-themes: ***Green Jobs and Resilient Recovery and Inclusive Green Jobs.***

Detailed Agenda

Time	Activity
October 26, Thursday	
09:00-18:00	Registration
18:00	Dinner

Time	Activity
October 27, Friday	
ID:983 3857 7713 PW:866156	Opening Ceremony
	Moderator: HOU Nan, Director of Division of International Cooperation, Department of Human Resources and Social Security of Yunnan Province, China
09:00-09:05	Mr. OUYANG Ning, Deputy Director General, International Cooperation Department, Ministry of Human Resources and Social Security, China Opening remarks
09:05-09:10	Mr. LIU Xuezhi, Vice President of Chinese Academy of Personnel Science, China Opening remarks
09:10-09:15	Mr. HU Xiaobing, Deputy Director General, Department of Human Resources and Social Security of Yunnan Province, China Opening remarks
09:15-09:20	Zhao LI, Lead Shepherd of Human Resources Development Working Group (HRDWG) of APEC Opening remarks (Recorded Video)
ID:983 3857 7713 PW:866156	Project Briefing and Research Output Sharing
09:20-09:30	WANG Yi, Deputy Director, Research Division of International Human Resources and International Cooperation, Chinese Academy of Personnel Science

09:30-09:40	REN Yong, Professor and Dean, School of Government, East China University of Political Science and Law
ID:983 3857 7713 PW:866156	Keynote Speeches (20 minutes each) Moderator: REN Yong, Professor and Dean, School of Government, East China University of Political Science and Law
09:40-10:00	Hon. Bienvenido E. LAGUESMA, Secretary of the Department of Labor and Employment (DOLE), the Philippines (Recorded Video) Title: Strategic Implementation of Philippine Green Jobs for a Just Transition to Sustainable Development
10:00-10:20	CHEN Jia, Researcher, the Center for Modernization Studies, Peking University Title: Promoting Green Jobs for a Resilient Recovery from COVID-19
10:20-10:40	Eric ROEDER, Technical Specialist on Green Jobs, Climate Action and Resilience through Just Transition, Asia Pacific Region, ILO Title: Promoting Green Jobs for a Climate Resilient Economy
10:40-10:50	Break
ID:983 3857 7713 PW:866156	Dialog on Story Sharing of Green Jobs Development Moderator: ZHAO Ning, Associate Researcher, Research Division of Enterprise Personnel Management, Chinese Academy of Personnel Science
10:50-10:58	Linda Chelan LI, Professor and Associate Head, Department of Public and International Affairs; Director, Research Centre for Sustainable Hong Kong, City University of Hong Kong Title: Green Jobs in Hong Kong, China: Some Observations from ESG Reporting and Green Certification Services
10:58-11:06	Henriko TOBING, Policy Analyst, Center for Manpower Policy Development; Head of Division of Policy Development of Industrial Relation, Labor Inspection & Sosec, Ministry of Manpower of Republic of Indonesia Title: Green Economic Policies and Situation, and Its Impact on the Creation of Green Jobs

11:06-11:14	Edward DELA ROSA, Chief TESD Specialist, NITESD-TRDD Technical Education and Skills Development Authority (TESDA), the Philippines Title: Greening the TVET System
11:14-11:22	YANG Yifan, Professor, Southwest Jiaotong University, China; Executive Director, New Liberal Arts Laboratory; Director, Center for Ecology of Innovation and Entrepreneurship Title: Cultivation and Development of Green Talents
11:22-11:30	LU Lijing, Deputy Director of the Administration Committee, Taicang High-tech Industrial Development Zone, Jiangsu Province, China Title: Experiences of Green Development and Green Jobs in Taicang High-Tech Development Zone
11:30-12:00	Discussion
12:00-13:30	Lunch Break
ID:983 3857 7713 PW:866156	Parallel Session One on Green Jobs and Resilient Recovery Moderator: WEN Bo, Associate Professor, Department of Government and Public Administration, University of Macau
13:30-13:45	Thanakarn KHUMPHAI, Lecturer, Chachoengsao Technical College, Institute of Vocational Education: Central Region 3, Thailand Title: Green Jobs: Opportunities and Challenges in Developing Vocational Workforce in Thailand
13:45-14:00	DONG Liang, Assistant Professor, Department of Public and International Affairs, City University of Hong Kong Title: Green Jobs Potential in Hong Kong, China's Green Building Sector: A Life Cycle Perspectives and Policy Recommendations
14:00-14:15	Byoung Joon KIM, Professor of Public Administration; Director of Global Development Cooperation Institute, Kookmin University, the Republic of Korea Title: Fostering Green Jobs for a Low-Carbon Future in Republic of Korea
14:15-14:30	Kanokkarn SUKSUNTICHAJ, Director of ASEAN Unit, International Cooperation Bureau, Office of the Permanent Secretary, Ministry of Labour, Thailand Title: Green Jobs and Resilient Recovery: The Case of Thailand

14:30-14:45	Joyce TEO Siew Yean, Assistant Vice Chancellor and Vice President (Global Affairs), Universiti Brunei Darussalam (Online) Title: Greening the Economy through Promoting Sustainable Job Growth
14:45-15:00	Randy TUANO, Dean of the Ateneo School of Government, Ateneo de Manila University, the the Philippines Title: Projections and Challenges in the Growth of Green Jobs in the Philippines
ID:977 2254 7973 PW:2023	Parallel Session Two on <i>Inclusive Green Jobs Promotion</i> Moderator: FENG Ling, Associate Researcher, Research Division of Talent Theory and Technique, Chinese Academy of Personnel Science
13:30-13:45	Kyung Ho CHO, Professor, Department of Public Administration, Kookmin University, the Republic of Korea Title: ESG, SDGs and Green Jobs in Korea
13:45-14:00	XU Yong, Deputy Head of Talent Work Division, Human Resources Department, China Petroleum Corporation (CNPC) Title: Energy Company Transformation Promoted by Green Skills Enhancement
14:00-14:15	Reginald G. UGADDAN, Professor, College of Public Administration and Governance, University of the Philippines Title: Green Jobs in the Philippines: Trends, Emerging Issues, and Scenarios for Sustainable Economic Recovery
14:15-14:30	NGUYEN Xuan Hai, Department of Employment, Ministry of Labour Invalids and Social Affairs, Viet Nam Title: Green Jobs in Viet Nam: Particulars, Progress and Prospects
14:30-14:45	WANG Shuangshuang, Associate Professor, Southwest Jiaotong University, China; Associate Director, Center for Ecology of Innovation and Entrepreneurship Title: Green Jobs for Disadvantaged Groups from an Inclusive Development Perspective
14:45-15:00	WANG Qiulei, Assistant Researcher, Research Division of International Human Resources and International Cooperation, Chinese Academy of Personnel Science Title: Skills and Competencies Needed for Green Jobs: A Case Study of

	"Dual-carbon" Talents
15:00-15:10	Break
ID:983 3857 7713 PW:866156	Closing Ceremony Moderator: WANG Yi, Deputy Director, Research Division of International Human Resources and International Cooperation, Chinese Academy of Personnel Science
15:10-15:30	Mr. OUYANG Ning, Deputy Director General, International Cooperation Department, Ministry of Human Resources and Social Security, China Summary
15:45-18:00	Field Study (Yunnan Baiyao Group Co., Ltd)
18:30	Dinner

Time	Activity
October 28, Saturday	
09:00-18:00	Departure

Annex II Survey questions

Survey questions for APEC project Promoting Green Jobs for A Resilient Economic Recovery from Covid-19

Dear Colleagues from APEC economies,

The Chinese Academy of Personnel Science is a research institution affiliated to the Ministry of Human Resources and Social Security, China. This year, the Academy is undertaking the 2023 APEC project Promoting Green Jobs for a Resilient Economic Recovery from COVID-19 as Project Overseer. To conduct better the project research and make it a fruitful and insightful one, the Academy would appreciate input from APEC economies on green jobs related questions by distributing survey questions among economies. The survey consists of six questions. The data and information collected will be used only for this research and a survey report will be drafted.

The survey will be closed on 1 August 2023. If you have more in-depth suggestions, feel free to contact us by email with any information you'd like to share. Thank you very much in advance for your support and your time.

1. Please briefly introduce the status quo of green jobs in your economy
 - 1.1 Classification, measurement, and labeling methods for green jobs
 - 1.2 The proportion of green jobs and development trends
 - 1.3 Distribution of green jobs among industries
2. Please briefly introduce status quo of green employment in your economy
 - 2.1 The proportion of green employment and its development trend
 - 2.2 Distribution of green employment among industries
 - 2.3 The proportion of women in green employment
 - 2.4 The demand for green employment in the post-Covid era
 - 2.5 Are there any gaps in green skills in your economy? If so, what are they?
3. What green job related policies have been implemented in your economy? (For example, green human resource development strategies, green career development policies for various industries, and policies for improving workers' green skills)
4. Are there any green jobs-related elements in economic recovery policies and measures in your economy?
5. Please briefly introduce the contribution of green employment to the economic

recovery.

6. What are the difficulties and challenges in developing green jobs and green skills in your economy?

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