

(UNOFFICIAL TRANSLATION)

China's Mid-Century Long-Term Low Greenhouse Gas Emission Development Strategy¹

¹ This is an unofficial translation. In case of any divergence, the official text in the Chinese language shall prevail.

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Introduction

Climate change concerns human survival and development. Since the Industrial Revolution, human activities, especially the accumulated carbon dioxide emission from the intensive fossil fuels consumption of developed countries, are the main causes of global climate change and pose a huge threat to ecosystem security and economic and social development in the world, especially in developing countries. Addressing climate change is a common cause of mankind. It calls for the international community to unite, cooperate and work together to address climate change within the framework of sustainable development, sticking to the path of green and low-carbon development, promoting to build a community with a shared future for mankind, and jointly building a clean and beautiful earth home. The globally spread COVID-19 in 2020 warns us once again that mankind needs a self-revolution in the face of common challenges of non-traditional security, such as major infectious diseases and climate change, all countries in the world must maintain solidarity and cooperation.

In 2015, United Nations Framework Convention on Climate Change (UNFCCC) (hereinafter referred to as the “Convention”) 21st Conference of Parties (COP21) adopted the Paris Agreement, of its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. It defines the long-term vision and system arrangements for global climate change actions, clarifies the general direction of green and low-carbon transformation in the future, which requires all countries to work together to implement. China has made historic and fundamental contributions to the conclusion, entry into force and implementation of the Paris Agreement, and actively promoted greenhouse gas(GHG) emission reduction in international shipping and aviation, which has been widely recognized and highly appreciated by the international community.

In 2017, the 19th National Congress of the Communist Party of China

(CPC) proposed to build a great modern socialist country which is prosperous, strong, democratic, culturally advanced, harmonious, and beautiful by the middle of this century, setting the main tone for formulating China's long-term low-emission development strategy. On September 22th, 2020, addressing the general debate of the 75th session of the UN General Assembly, Chinese President Xi Jinping solemnly announced that China will scale up its Intended Nationally Determined Contributions by adopting more vigorous policies and measures, striving to peak carbon dioxide emission before 2030 and achieve carbon neutrality before 2060. On December 12, 2020, addressing the Climate Ambition Summit, President Xi Jinping announced some further commitments for 2030, China will lower its carbon dioxide emission per unit of GDP by over 65 percent from the 2005 level, increase the share of non-fossil fuels in primary energy consumption to around 25 percent, increase the forest stock volume by 6 billion cubic meters from the 2005 level, and bring its total installed capacity of wind and solar power to over 1.2 billion kilowatts. These announcements not only provide guidance and blueprint for China's green and low-carbon development, but also contribute and inject strong impetus on China's proposals for other countries to jointly meet the challenge of global climate change and protect our planet. In the process of achieving carbon neutrality, China will unswervingly implement the national strategy of actively addressing climate change and make greater contribution to maintaining global ecological security and build a community with a shared future for mankind.

Under the guidance of Xi Jinping's Thought on Socialism with Chinese Characteristics in the New Era, in accordance with the new development philosophy of innovative, coordinated, green and open for the benefit of all, and according to the relevant decisions of the Paris Climate Conference and the relevant requirements of the Paris Agreement, Chinese government has completed the *China's Mid-Century Long-Term Low Greenhouse Gas Emission Development Strategy* (hereinafter

referred to as the "Low-Emission Development Strategy") based on national conditions and future development strategy with in-depth research and demonstration and extensive solicitation of opinions from all parties. The Low-Emission Development Strategy puts forward the basic principles and strategic vision, strategic priorities and policy guidance for China's long-term low-emission development, as well as the concepts and propositions for promoting global climate governance. The Chinese government will integrate relevant requirements in the low-emission development strategy into the national economic and social development plan and continue to implement them.

Chapter 1. Addressing Climate Change and Low-emission Development

Climate change is one of the major threats and severe challenges to sustainable development of mankind. The Paris Agreement on climate change charts the course for the world to transition to green and low-carbon development and require all countries to work together to implement it. All countries must take decisive steps, and follow the path of low-emission development unswervingly, build and maintain a global ecological security barrier, and work together to build a green earth home.

1. Climate change is a severe threat to all mankind

Since 1990, the Intergovernmental Panel on Climate Change has issued six assessment reports, and increasingly sufficient scientific evidences show the authenticity, severity and urgency of global warming. According to the latest report of the World Meteorological Organization, the global average temperature in 2019 was 1.1°C higher than the pre-industrial levels, and the carbon dioxide concentrations reached a record of 410 ppm in the first half of 2020. Major risks such as frequent extreme weather events, species extinction, sea level rises, and crop yields

reduction brought by climate change seriously threaten human survival and sustainable development. China is one of the countries most adversely affected by climate change. The proportion of direct economic losses caused by climate change in GDP is much higher than the global average level in the same period. Science has confirmed that greenhouse gas emitted by human activities since the Industrial Revolution are the main cause of climate change. It is imperative to control GHG emission, and necessary to accelerate the pace of low-emission development and transformation in order to protect mankind's home planet.

2. Active response to climate change has become a global political consensus

Scientific cognition has promoted countries to reach a political consensus on addressing climate change, leading to the adoption and entry into force of the UNFCCC, the Kyoto Protocol and the Paris Agreement. In particular, the Paris Agreement proposes to keep the increase in global average temperature to well below 2 °C above pre-industrial levels and strive to control it within 1.5°C, reach the global greenhouse gas emissions peaking as soon as possible, meet the balance between anthropogenic GHGs emission and removals by sinks in the second half of this century. The adoption and entry into force of the Paris Agreement demonstrate the political choice of all country's governments to take the path of green and low-carbon transformation and protect our planet. In 2018, the International Maritime Organization adopted an initial strategy on the reduction of GHG emission from ships, set out a vision to make a 40% reduction in the carbon intensity per unit of freight of the global shipping industry by 2030 compared with 2008, a 70% reduction in carbon intensity and a 50% reduction in total carbon dioxide emission by 2050, and achieve zero emission within this century. Facing with the challenges of unilateralism, protectionism, and anti-globalization, countries around the world should not regress in their commitments and actions to climate change. And in the face of the COVID-19 pandemic and the downward

pressure on the economy, all countries should unswervingly adhere to the Paris Agreement, promote a “green recovery” after the epidemic, and make concerted efforts to promote the low-emission development globally.

3. Green and low-carbon transformation has become a general trend of global development

The requirement of actively addressing climate change has greatly promoted the global research, development and innovation of low-carbon technology, continuously improved energy efficiency, and reduced the cost of various low-carbon energy technologies, especially renewable energy technologies, low consumption and low emission industrial development modes replace the energy intensive and highly polluting industries development modes. Since the beginning of the 21st century, global scientific and technological innovation has entered an unprecedentedly intensive and active period. A new round of scientific and technological revolution and industrial transformation is reshaping the global innovation landscape and economic structure, providing strong support for countries to achieve green and low-carbon development and transformation. Dozens of countries, hundreds of cities and thousands of companies around the world have proposed the goal of achieving carbon neutrality at different stages, the global transformation of low-emission development is unprecedented.

4. China has made positive contributions to combating the global climate change

China has always attached great importance to addressing climate change. President Xi Jinping has stressed many times that addressing climate change is not something that others ask us to do, but something that we must do ourselves. In 2007, The State Council set up the National Leading Group on Climate Change, Energy Conservation and Emission Reduction, headed by the Premier of The State Council, and took the lead among developing countries in releasing the National Climate Change Program. In 2009, China announced its Nationally Appropriate Mitigation

Actions to the international community by 2020, and has included the reduction of carbon dioxide emission per unit of GDP as a binding target in the five-year plan for national economic and social development since the 12th Five-Year Plan, which has been decomposed the national carbon intensity reduction target to local governments and implemented it in the earnest. In 2015 China announced its Nationally Determined Contributions, and in both September and December 2020, President Xi Jinping announced China's new nationally determined contribution targets. In May 2021, China set up a leading group on carbon peak and carbon neutrality, headed by Vice Premier of The State Council, to further strengthen the overall planning, coordination and promotion of the work of achieving carbon peak and carbon neutrality.

China implements an active national strategy on addressing climate change, solidly promotes various policies and actions to it as well, series measures have been adopted, such as adjusting industrial structure, optimizing energy structure, conserving energy and improving energy efficiency, promoting the construction of carbon markets, and increasing forest carbon sinks, and achieved remarkable results. Preliminary estimates show that carbon dioxide emission per unit of GDP in China has been reduced by 48.1% in 2019 compared with 2005 levels, and the share of non-fossil energy in energy consumption reached 15.3%, China has fulfilled ahead of schedule the action target of controlling GHGs emission by 2020. China has taken an active part in global climate governance and international cooperation on climate change, China keeps the promise, makes important contributions to combating the global climate change, and becomes an important participant, contributor and leader in global ecological civilization construction.

The carbon neutral vision proposed by China means that it will be achieved from the peak of carbon dioxide emissions to carbon neutral in a short period of about 30 years, it is much shorter than many other major economies that have already proposed a carbon neutral vision. China is

still a developing country and faces multiple challenges, such as developing the economy, improving people's livelihood and controlling pollution. Comparing with developed countries, China will face greater difficulties and challenges in achieving a comprehensive green and low-carbon transition in a relatively short period of time.

Chapter 2. Guiding Principles and Strategic Visions

1. Guiding principles

It is a common cause of mankind to address climate change. China will adhere to the guidance of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era; fully implement the guiding principles of the 19th CPC National Congress and the second, third, fourth and fifth plenary sessions of the 19th CPC Central Committee; in accordance with the decisions and plans of the CPC Central Committee and The State Council, thoroughly implement Xi Jinping Thought on Ecological Civilization; based on the new development stage, implement the new development concept, build a new development pattern, promote high-quality development; adhere to the system concept, and handle the relationship between development and emission reduction, overall and part, short-term and medium-to-long-term, incorporate peaking carbon dioxide emission and carbon neutrality into the overall layout of economic and social development and ecological civilization construction, take the lead in green transformation in all areas of economic and social development, focus on the Green and low-carbon energy development, accelerate the formation of resource-saving and environment friendly industrial structures, modes of production, lifestyles and spatial patterns, unswervingly pursue ecological priority, green and low-carbon high-quality development roads to ensure that peaking carbon dioxide emission and carbon neutrality are achieved on schedule. At the same time, China

will work with the international community to take the road of green and low-carbon development, promote the full and effective implementation of the Paris Agreement, adhere to the principles of common but differentiated responsibilities, equity and respective capabilities, and establish a fair, reasonable, and win-win global climate governance system. Promote the construction of a community of common destiny for humanity, build a clean and beautiful world, and march towards a new era of ecological civilization together with the international community.

2. Strategic visions

China will resolutely implement the major announcement made by Chairman Xi Jinping, formulate and implement an action plan for carbon dioxide emission peaking before 2030. China will make good efforts to accelerate the construction of a green and low-carbon circular economic system and a clean, low-carbon, safe and efficient energy system, and vigorously promote low-carbon technological innovation and the development of low-carbon industries, comprehensively form green modes of production and living, significantly improve the quality and stability of the ecosystem, build a comprehensive and effective climate governance system. China will strive to reach carbon dioxide emission peak before 2030, and realize carbon neutrality before 2060, make greater efforts and contributions to achieve the long-term goals of the Paris Agreement.

China will vigorously promote the energy production and consumption revolution. By strengthening the dual control of total energy consumption and intensity, the energy utilization efficiency will be promoted substantially. China will strictly control the consumption of fossil energy, vigorously accelerate the development of non-fossil energy. By 2030, the proportion of non-fossil energy in energy consumption reaches to about 25%, and total installed wind and solar power capacity reached over 1.2 billion kilowatts. By 2060, China will fully establish a clean, low-carbon, safe and efficient energy system, reach energy

efficiency at international advanced levels, and improve the proportion of non-fossil fuels in energy consumption up to over 80%.

China will accelerate green and low-carbon transformation in the industrial sector. Efforts will be made to accelerate the industries to peak carbon dioxide emission as soon as possible, which include steel, building materials, non-ferrous, petrochemical, chemical industry, and etc..Continuously reduce carbon dioxide emission from industrial processes.Accelerate the construction of green and zero-carbon industrial parks and supply chain pilots. By 2030, energy efficiency in key industries will reach the advanced international level, "two wings" drive of low-carbon and digital economy is realized, and the manufacturing organization and production methods will be fundamentally transformed.

China will comprehensively promote the green and low-carbon development in urban and rural construction. Efforts will be made to vigorously promote the use of energy-efficient and low-carbon buildings. By 2025, 100% of new buildings in cities and towns will implement green building standards, China will accelerate the optimization of the energy use structure of buildings, the fossil fuel replacement rate by renewable energies in urban buildings will reach 8%, and the rooftop photovoltaic coverage of new public buildings and new factory buildings will strive to reach 50%.

China will accelerate the development of a low-carbon transport system, and actively expand the application of electric power, hydrogen energy, natural gas, and advanced liquid biofuels in transportation. By 2030, the proportion of new energy and clean energy-powered vehicles will reach about 40% of all the vehicles sold in that year, the carbon emission intensity of converted turnover of commercial vehicles will decrease about 9.5% from 2020 level, and the comprehensive energy consumption per unit of converted turnover of railways will drop by 10% from 2020 level, and oil consumption by land transportation strives to peak.

China will accelerate the promotion of nature-based solutions,

incorporate the sustainable use of natural resources into the policy and action framework for addressing climate change, maximize the mitigation effect of nature in forestry, agriculture, oceans, water resources, ecosystems and other fields, and comprehensively improve resilience in addressing climate change. By 2030, China's forest coverage rate will reach about 25%, and forest stock volume will increase 6 billion cubic meters over 2005 level.

Efforts will also be made to advocate a simple, moderate, green and low-carbon life philosophy, and widely form green modes for production and living. China will establish and improve the legal and institutional systems, policies and standards to address climate change, enhance the role of market mechanism, and thus form endogenous driving forces to promote the green and low-carbon transformation.

3. Technical pathways

The development of energy-saving technologies will be promoted continuously, the energy efficiencies will be improved from an overall and systematic perspective by accelerating the popularization of advanced and applicable energy-saving, low-carbon, zero-carbon technologies and manufacturing techniques, by applying advanced technologies including intelligent manufacturing, systematic integration, and circular linkage into the energy production and consumption process.

The electrification level in end-use sectors will speed up. Electricity will be the main energy source in end-us sectors by improving infrastructure and promoting electricity substitution technologies, it will vigorously improve the substitution of electricity for other forms of energy in end-use energy fields such as industrial and agricultural production, transportation, and urban and rural residents' lives.

China will accelerate the development of a new electric power system, vigorously develop renewable energies and advanced nuclear energy technologies, accelerate the development of non-fossil energy in cost reduction and efficiency improvement and integrate with the modern

information technology revolution, actively develop "new energy + energy storage", "source-network-load-storage" and "integration of multi-energy system", support distributed new energy storage system, and promote large-scale optimization of clean power resources.

China will actively expand the application of new and clean energy in steel, cement, aviation and shipping, such as electricity, hydrogen energy, natural gas and advanced liquid biofuels. China will actively promote the development and application of high-efficiency and low-cost carbon dioxide removal technologies, and accelerate the development of large-scale and whole-process pilot and construction of carbon capture, utilization and storage (CCUS) in electric power, steel, cement and chemical industries.

China will enhance carbon sink of ecosystems. Efforts will be made to implement major projects to protect and restore important ecosystems, and carry out integrated protection and restoration of mountains, rivers, forests, farmland, lakes, grasslands, and sand. China will strengthen the land greening action, improve the protection of forest resources and the conservation and restoration of grassland ecosystems, enhance the protection and restoration of rivers, lakes and wetlands, promote the protection and restoration of marine ecosystems, promote the restoration and treatment of degraded land, and ecological restoration projects will be carried out in historical mines.

Chapter 3. Strategic Priorities and Policy Orientations

1. Foster a green, low-carbon and circular economic system

Efforts will be made to adjust the economic structure, transform the development mode, promote development of the creation of low-carbon new technologies, new products, new industries, new models, new business forms and new economies, cultivate a green, low-carbon and circular economic system, and continuously improve the quality and

efficiency of development.

Foster new drivers of green and low-carbon development.

- Accelerate the development of strategic emerging industries including a new generation of information technology, biotechnology, new energies, new materials, high-end equipments, new energy vehicles, green environmental protection, aerospace, marine equipment and others, and achieve the deep green and low-carbon transformation of traditional industries, energy, building, and transportation infrastructure.
- Accelerate the construction of a green manufacturing system, cultivate new growth poles and form new momentum in industries with cutting-edge technologies, high value and low emission including digital economy, clean energy, smart city, etc., actively promote the construction of new infrastructure and scale development of emerging low carbon industries, cultivate a number of advanced green manufacturing clusters, making the green manufacturing industry a new engine and new advantage for economic growth.

Establish a green, low-carbon, and sustainable investment and consumption system.

- Give full play to the guiding role of government investment, and establish an investment and financing system that is compatible with carbon peak and carbon neutrality, and further stimulate the endogenous power and market vitality of the whole society to promote green and low-carbon development.
- Accelerate the establishment of institutions and systems for green investment and consumption, establish and improve climate-friendly policy systems, reduce the cost of climate investment and financing, encourage more private capital to invest in low-emission industries, improve institutions and mechanisms for promoting green consumption, and meet the people's growing

needs for a beautiful ecological environment.

2. Build a clean, low-carbon, safe and efficient energy system

China will persist pushing forward the energy production and consumption revolution, vigorously improve energy utilization efficiency and accelerate the transition of the energy structure to a clean and low-carbon direction while ensuring the safe supply of energy and meeting the internal needs of the sustainable development of the national economy and the continuous improvement of people's living standards.

Significantly improve energy efficiency.

- Adhere to the energy development strategy of energy conservation as top priority, implement energy conservation throughout the whole process of economic and social development and in all sectors.
- Adhere the dual controls on energy intensity and total energy consumption. Curb irrational energy consumption, promote rational allocation of energy resources, and substantially increase utilization efficiency.

Strictly control total fossil energy consumption.

- Vigorously promote clean utilization of coal. Strictly control coal power projects. Strictly control the growth of coal consumption during the “14th Five-Year Plan” (14th FYP, 2021-2025) period, and gradually reduce it during the 15th FYP period (2026-2030).
- Oil consumption reached a peak plateau during the 15th FYP period. Accelerate the replacement of fossil fuels with non-fossil fuels.

Vigorously developed non-fossil energies.

- Accelerate the pace of renewable energies development, vigorously develop renewable energies including wind, solar, biomass, and marine energies. Develop hydropower in accordance with local conditions.
- Develop nuclear power actively and with an organized pace on

the premise of ensuring safety.

- Continuously increase the proportion of non-fossil energy in energy consumption.

3. Establish a low GHG emission industrial system

Focusing on the improvement of resource and energy utilization efficiency and improving the green level of production, efforts should be made to promote energy conservation, clean production and the green technological innovation, adjust industry energy structure and modes, deepen the implementation of green manufacturing projects, comprehensively build green manufacturing system, and promote green and low-carbon transformation in key industries.

Accelerate the green transformation of traditional industrial production methods.

- To innovate industrial modes, enterprise form, and business modes to improve the level of production management, energy resource allocation and quality management, therefore greatly improve the efficiency of industrial energy utilization, and promote the source reduction of industrial solid waste and make the comprehensive utilization of resources.
- To accelerate the construction of a green manufacturing system, with the aim of promoting the green development of the entire industrial chain and product life cycle, strengthen the system integration and resources sharing among enterprises and industries, build a green development standard system regarding green manufacture, industrial energy and water conservation, comprehensive utilization of resources and clean production. Establish a unified green products certification and identification system to increase the supply of green products.
- To carry out evaluation of clean production and certification of low-carbon products, accelerate the upgrade and re-engineering of industrial processes, promote clean and low-carbon production

focusing on green design and system optimization, and build a low carbon emission supply chain that covers procurement, production, marketing, recycling, and logistics.

Vigorously develop circular economy.

- To promote the accelerated development of green technology, environment- friendly materials, green technology and equipment, recycling of waste products and remanufacturing, develop and promote high-performance, lightweight, green and environmentally friendly new materials, and promote products intelligent sorting and high-value utilization, fine dismantling and clean regeneration of solid waste, such as scrap metal, waste plastic, waste textiles and clothing, accelerate the establishment of recycling renewable resource system.
- To increase the innovation of new materials and technologies R&D, and promote material substitution focusing on new material technologies, so as to reduce the demand for raw materials and efficient use, and improve the level of resource recycling.

Promote optimization, upgrading and low-carbon transformation of key industries.

- To formulate implementation plan for achieving carbon emission peak for sub-sectors of industries such as iron and steel, nonferrous metals, petrochemical and chemicals, and building materials, and accelerate the deployment of research and application of new production processes such as hydrogenmetallurgy.
- To improve key industries' quality and performance, to eliminate outdated production capacity in accordance with laws and regulations, and optimize the layout of production capacity.
- By optimizing the product structure, extending the industrial chain, enhancing the added value of products, to accelerate the intensive and high-end development of traditional industries.

- To accelerate the optimization and upgrading of the industrial structure, and shift the focus of development from high energy-consuming industries to high value-added, high-tech industries and strategic emerging industries.
- Vigorously promote the application of renewable energies in the industries.

4. Impel urban and rural construction in green and low-carbon manner

China will accelerate the establishment of a green and low-carbon innovation system for building sector that meets China's national conditions. While meeting the growing energy demand in the building sector brought about by new urbanization, economic and social development and the improvement of people's living standards, efforts will be made to optimize the end-use energy structure, control the total energy consumption in the building sector, and improve the building energy efficiency simultaneously.

Develop green buildings in an all-round way.

- Promote the use of green low-carbon building materials and green construction methods, accelerate the industrialization of new buildings, vigorously promote the use of prefabricated buildings, steel structure housing, recycling of building materials, and strengthen green design and green construction management.
- Promote the green construction of counties. Establish a green and low-carbon-oriented urban and rural planning and construction management mechanism, formulate building demolition management measures, and put an end to "large-scale demolition and construction". Build green towns and communities.

Vigorously optimize the building energy structure.

- Vigorously promote the use of renewable energies in buildings, and maximize the use of integration of photovoltaics into the building envelope. Actively promote clean heating in severe cold

and cold areas, promote central heating by using combined heat and power technology, accelerate the large-scale application of industrial waste heat heating, actively and steadily carry out demonstrations projects of nuclear heating, and deploy clean and low-carbon heating technologies such as heat pumps, biomass, geothermal, and solar energy in accordance with local conditions. Provide guidance of scientific heating in hot summer and cold winter areas, and adopt clean and efficient heating methods according to local conditions.

- Improve the electrification level of the building sector, and forster development of building with photovoltaic, energy storage, direct current, flexibility (PEDF) system.

Promote the low-carbon transformation of urban construction and management.

- To promote the cluster development for urban areas, scientifically determine the scale of urban construction, and control the excessive growth of new construction land. Advocate the concept of green and low-carbon planning and design, strengthen urban and rural climate resilience, and build sponge cities.
- To implement the evaluation mechanism on city development, promote the integration of green and low-carbon development concepts into the urban planning, design, construction, operation and management, and simultaneously optimize the urban spatial layout and governance pattern.
- To promote the construction of urban infrastructure and urban renewal process, and push forward urban ecological restoration and functional improvement projects.
- To promote the steel structure buildings actively, improve the green and low-carbon building operation and management system, and continuously optimize and improve the level of green and low-carbon building operations.

Strengthen the development of green and low-carbon counties.

- To make full use of the original topography, landforms and natural environment in building counties, and maintain the landscape and natural features.
- To properly control the construction density, intensity and residential building height. Increase the proportion of green buildings in newly built buildings.
- To vigorously develop renewable energy that meets the local resource endowments and needs of the county, and reduce the proportion of traditional fossil energies in energy consumption.
- Push forward green and energy-saving infrastructure, advocate a combination of large-scale decentralization and small-regional infrastructure layout, and apply distributed energies, sewage treatments and other facilities according to local conditions.

Speed up the modernization of rural houses and villages construction.

- To improve the design and construction level of rural houses, solve the problems including rural house sunshine duration, heat preservation and heating, ventilation and lighting according to local conditions, promote the construction of green rural houses, encourage the use of native materials and green building materials, and promote energy conservation and carbon emission reduction in rural houses.
- To actively use solar energy, biomass energy, air thermal energy, geothermal energy and other clean energies to solve the energy demands of heating, cooking, domestic hot water and etc. for farmhouse.
- To popularize the miniaturized, ecological, and decentralized rural sewage treatment methods, enhance the reduction of rural domestic waste from the source, push forward the rural energy reform, and simultaneously encourage the use of clean energy that

suits the local characteristics and needs of rural areas.

5. Form a low-carbon comprehensive transportation system

China will put same emphasis on optimizing supply and demand inducing, and give full play to the comparative advantages and combined efficiency of various transportation modes, and accelerate the establishment of a green, low-carbon and integrated transportation system.

Create a low-carbon and efficient transportation system.

- Build a comprehensive three-dimensional transportation network and integrate the concept of green development throughout the entire process of transportation infrastructure planning, design, construction, operation, and maintenance, and actively promote the construction of green railways, green highways, green waterways, green ports, green airports, and green hubs.
- Accelerate the optimization and adjustment of the transportation structure, continue to deepen the construction of special railways and special railway lines, actively develop direct river-sea and river-sea combined transportation, strive to increase the proportion of combined iron and water transportation, accelerate the promotion of the "revolution to rail" and "revolution to water" of bulk cargo in coastal ports, and vigorously develop multi-modal high-efficiency transportation organization modes such as combined transportation, drop-and-pull transportation and joint distribution, improve the efficiency of transportation operations, promote the standardization of freight vehicles, and accelerate the application of recyclable standardized logistics turnover boxes.
- Promote the development of smart transportation, and actively develop new technologies, new business formats, and new models such as autonomous driving and shared cars.
- Accelerate the development, promotion and application of key energy-saving and low-carbon technologies and products in the transportation sector.

Accelerate the transformation of energy structure in the transportation sector.

- Continue to increase the retention rate of new energy vehicles.
- Promote the realization of electrification, new energy and cleanness of urban public transportation and urban logistics and distribution vehicles and promote the use of new energy for private cars and trucks.
- Promote the application of low-carbon energy ships and explore the application of biomass fuels and other synthetic fuels in civil aviation.
- Increase the application of renewable energy such as solar energy, wind energy and geothermal energy in transportation infrastructure, accelerate the improvement of the LNG and hydrogen energy supply (filling) system, and focus on solving the problems of difficult approval, construction, and operation of marine LNG refueling stations. Build (near) zero-carbon hubs, stations and ports (port areas).

Speed up the construction of a green travel system.

- Strengthen the comprehensive management of urban traffic congestion, give priority to the development of urban public transportation, encourage the public to preferentially choose urban public transportation to travel, improve the urban slow traffic system, and increase the proportion of green travel.
- Actively develop large-capacity and high-efficiency inter-regional rapid passenger transport services with high-speed rail and aviation as the mainstay, improve the level of rail transit commuting in urban agglomerations, and encourage the mass transit form operation of intercity road transportation in areas with high passenger demand.

6. Achieve a substantial reduction in non-carbon dioxide GHG emission

Coordinate the management and control of non-carbon dioxide GHGs emission for energy, industrial production processes, agriculture, waste treatment and other fields. Carry out actions to strengthen the coordinated control of GHG emission and air pollutant emission, to include different types of non-carbon dioxide GHGs emission into the scope of quantitative management and control in a focused, step-by-step, and phased manner, and to establish and improve non-carbon dioxide emission statistical accounting system, policy system and management system. Actively implement the Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, and strictly require all difluoro-chloromethane production enterprises to harmlessly dispose of their by-product trifluoro methane. Increase the research and development of low-carbon and environmentally friendly alternative technologies. Actively adopt low global warming potential alternative technologies in the process of replacing HCFCs to reduce emission; promote the recovery, reuse and harmless treatment of controlled substances, and support relevant production companies to create green factories and strictly control leakage and discharge of controlled substances during production. Priority should be given to the implementation of alternative and emission reduction HFC actions in industries where alternative technologies are relatively mature.

7. Implement the Nature-Based Solutions

China will uphold the harmonious coexistence of human and nature, efforts will be made to exploit the potential of "Nature-Based Solutions" in GHGs emission reduction and increase the carbon sink, improve the climate resilience of terrestrial and marine ecosystems, and enable green mountains and clear water to continue to exert benefits in ecological conservation and economic and social development.

Form a territorial spatial layout and ecosystem that can reduce emission and increase sinks.

- Give full play to the strategic lead and strengthened control of

territorial space planning on the territorial space development and protection, improve and implement the strategy of major functional zones based on the evaluation of the carrying capacity of resources and the environment and the suitability evaluation of territorial space development, making overall plans for the development and protection of territorial space in the new era.

- Persist in the living community concept of mountains, rivers, forests, fields, lakes, grasslands and deserts and implement measures and policies according to local conditions. Coordinate efforts to promote afforestation, ecological restoration and systemic governance, and promote and improve the service functions of ecosystem. Reduce the social costs of climate change mitigation and improve the resilience of territorial space by protecting, restoring and improving natural resource management.

Promote agriculture's green and low-carbon development.

- Make the development orientation of agriculture from increasing production to improving quality and efficiency, and develop green, low-carbon circular agriculture with the basic characteristics of "ecological green, high-quality, and environmentally friendly",
- Promote the resource-saving and recycling-oriented development of agriculture, focusing on saving land, water, fertilizer, medicine, energy, and labor, and effectively reduce material consumption and resource input in agricultural production including facility planting and large-scale breeding, and improve agricultural production efficiency and comprehensive benefits.
- Innovate the comprehensive utilization mechanism of agricultural waste, formulate and implement policies for comprehensive utilization of agricultural waste, optimize the industrial structure of comprehensive utilization of agricultural waste and improve the quality and efficiency.
- Vigorously push forward the research and development,

promotion and application of ecological technologies, green technologies and carbon sink technologies, promote the recycling of straws, livestock and poultry breeding wastes, protect and improve cultivated land quality, and achieve a healthy and sustainable development of the industry.

Strengthen ecosystem protection, restoration and carbon storage.

- Propel major ecological protection and restoration projects, strengthen the ecological protection and restoration of forests, grasslands, oceans, wetlands, and deserts, designate and strictly adhere to ecological protection red lines, improve the comprehensive disaster prevention and control capabilities of forests and grasslands, and reduce GHG emission.
- Innovatively develop forest and grass low-carbon industries, and vigorously develop emerging industries including eco-tourism, forest and grassland health care, new materials, bio-pharmaceuticals, and biomass energies exploitation.
- Comprehensively build a natural protected area system with national parks as the main body. Protect biodiversity, and give full play to the function and role of ecosystems in responding to climate change.
- Actively protect and restore blue carbon ecosystems including mangroves, seagrass beds, and salt marshes, and explore the research and practice of sink-increasing technologies including aquaculture carbon sinks, shell-algae fishery carbon sinks, and micro-biological carbon sinks.
- Strengthen scientific and technological innovation, and carry out carbon source and sink monitoring and assessment including forests, grasslands, oceans, wetlands and other ecosystems and the inversion of human carbon dioxide emission changes based on satellite remote sensing and multi-source data assimilation methods.

8. Inspire low-emission technology innovation

China will strengthen R&D and international cooperation and accelerate the deployment and application of cutting-edge, critical and disruptive technologies, leading by the planning and guidance of technological innovation. The development and promotion of various sustainable energy consumption technologies including energy-saving and energy-efficiency improvement can work as the emission reduction measures with the lowest cost and the most synergistic benefits in the medium and long-term.

Strengthen the development and application of energy-saving technology

- Continue to carry out energy conservation technology transformation, energy system optimization, and cascaded utilization of energy resources.
- Accelerate the popularization of advanced and applicable energy-saving, low-carbon, and zero-carbon technologies and processes.
- Accelerate the application of energy efficiency improvement technologies such as demand reduction, intelligent manufacturing, and system integration, and improve energy efficiency from the overall and system, taking advantage of the development of artificial intelligence, the Internet, information and communication technology and blockchain technology innovation and development.

Vigorously develop non-fossil energy development and utilization technologies.

- Vigorously support and develop a batch of low-cost, high-efficiency renewable energy utilization technologies.
- Promote the in-depth integration of technologies such as the Internet and big data with the renewable energy industry, and accelerate the independent innovation and industrial upgrading of new energy equipment.

- Proactively develop nuclear power in a safe manner, and increase the research and development of advanced nuclear energy such as small modular reactors, so that nuclear power will continue to play an important role in ensuring the safe supply of electricity and the deep GHG emission reduction.

Actively promote the innovative development of revolutionary emission reduction technologies.

- Strive to make technological breakthroughs in large-capacity wind power, high-efficiency photovoltaics, high-power LNG engines, large-capacity energy storage, low-cost renewable energy hydrogen production, low-cost CCUS technology, and accelerate the R&D of basic materials including carbon fiber, aerogel, and special steel, in order to tackling areas of weaknesses in fabrication of key components and parts, software, etc.
- Promote advanced and mature green, low-carbon technologies and carry out demonstration projects. Build full-process, integrated, and large-scale CCUS projects. Promote application and demonstration of molten salt energy storage for heating and power generation. Accelerate the development and application of hydrogen technologies, and explore large-scale applications in the sectors including industry, transportation, and construction.

9. Create a new pattern of nationwide participation

China will take the cultivation of the green and low-carbon lifestyle as an important indicator for improving the living environment and raising the level of social civilization. Efforts will be made to extensively advocate and publicize the ways of simple and moderate, green, low-carbon, civilized and healthy life, and also to establish and further improve the policies and management systems that promote green life and green consumption.

- Comprehensively enhance the public's awareness of green and low-carbon consumption. Popularize the concept of the green and

low-carbon development through publicity activities on World Earth Day, World Environment Day, Energy Saving Publicity Week and National Low-Carbon Day, and carry out legislative education with the theme of promoting green production and green living. Advocate green and healthy nutritional diet to fight against food waste.

- Make public institutions play the demonstration and guidance role in practicing green and low-carbon concepts in the whole society. Promote green and low-carbon housing and travel.

10. Promote the modernization of climate governance system and governance capacity

China will push forward institutional transformations and make faster move to build a modern climate governance system. Efforts will be made to establish sound legal, institutional, policy, market and support systems for climate governance, and basically establish a governance system that led by government, mainly composed by enterprise, actively engaged by social organizations and the public. At the same time, China will promote the establishment of science-based mechanisms for reducing GHGs emission from international shipping and aviation.

Continuously improve the legal system.

- Comprehensively screen and modify the current laws and regulations that are not compatible with carbon peaking and carbon neutrality, and strengthen the coordination between laws and regulations.
- Enhance research and formulate special laws for promoting carbon neutrality, accelerate the revise of the existing laws and regulations including *The Energy Conservation Law*, *The Electricity Law*, *The Coal Law*, *The Renewable Energy Law*, *The Circular Economy Promotion Law*, etc., to enhance their pertinence and effectiveness.

Establish a sound policy system.

- Issue and implement *the Opinions on Fully, Accurately and Comprehensively Implementing the New Development Concept and Doing A Good Job in Carbon Peak and Carbon Neutrality* and the *Action Plan for Carbon Dioxide Peaking before 2030*
- Formulate and issue implementation plans for achieving carbon peaking in sub-sectors such as energy, industry, urban and rural construction, transportation, agriculture and rural affairs. Formulate policy systems from technological support, green finance, fiscal and taxation, and price perspectives.
- Accelerate the formation of a "1+N" policy system to achieve carbon peaking and carbon neutrality vision with clear objectives, reasonable division of labor, effective measures, and orderly linkage.

Promote the market-based mechanisms.

- Give full play to the role of market mechanisms in controlling GHG emission, accelerate the establishment and stable operation of a national carbon emission trading market with complete legal systems, fair and scientific quotas, active and credible emission control manners, active and orderly transactions, reliable facilities.
- Steadily expand the coverage of industries and types of GHGs, and simultaneously promote the construction of a GHG certification and emission reduction trading market.
- Actively participate in international carbon market-related cooperation.

Chapter 4. China's Approaches and Advocates for Promoting Global Climate Governance

1. Adhere to fairness and equity

To achieve global low-emission development, it is necessary for

parties to comply with the objectives and principles laid out in the UNFCCC and the Paris Agreement. UNFCCC set down the principles of common but differentiated responsibilities, fairness and respective capabilities as the cornerstone of global climate governance system. This lays the legal basis for global climate governance, thus providing legal guarantee for pursuing global low-emission development. Parties should follow the principles and provisions of the UNFCCC and the Paris Agreement, formulate low-emission development strategies in respect of their national conditions, responsibilities and development paths, and undertake international obligations in line with their national conditions, and development stages.

2. Adhere to win-win cooperation

Mankind is a community with a shared future, and to work together with solidarity and cooperation is the most effective way to achieve global low-emission development pathway and address climate change. The achievement of Paris Agreement is a milestone in global climate governance and represents the direction of the global green and low-carbon transition. It requires all countries to work together to implement it. To cope with global issues such as climate change, we should abandon the narrow mindset of zero-sum game, unilateralism and protectionism, resolutely oppose the unilateral climate trade barriers, commit to multilateralism, while at the same time we should work together in the spirit of partnership with mutual benefits and win-win results and implement low-emission development strategies. At the same time, we should actively carry out South-South cooperation in tackling climate change, and vigorously support the development of green and low-carbon energies in developing countries.

3. Adhere to the respect for science

To achieve low-emission development, all parties must respect the scientific understanding of global climate change, raise awareness of the urgency and severity of climate change, and scientifically and rationally

formulate low-emission development paths that are in line with their respective national conditions and development stages. International cooperation in scientific research and technological innovation to address climate change is a necessary precondition to achieve carbon neutrality as early as possible in the second half of this century. All parties should work together to share scientific and technological achievements and practical experience in addressing climate change, and jointly promote the development path transformation, the upgrade of industry, energy revolution and technological innovation.

4. Adhere to the commitments

The full implementation of the provisions of the Convention and the Paris Agreement is the political basis for the implementation of low-emission development. The Paris Agreement is in line with the general direction of global development and it has not come easily. Each one should hold to the agreement, keep its commitments, and take positive actions. Adequate, stable and strong financial support provided by developed countries is an indispensable prerequisite for developing countries to achieve low-emission development. While taking the lead in reducing emission significantly, the developed countries should continue to increase their support to developing countries, and help developing countries achieve their low-emission development strategies.

Concluding Remarks

As pointed by China's chairman Xi Jinping, addressing climate change is an important area of global governance, and the global efforts to address climate change serve as a mirror and bring us valuable enlightenments for exploring future global governance modes and promoting the building of a community with a shared future for mankind. He also emphasized that the Paris Agreement represents the general

direction of the global green and low-carbon transition, which requires all countries to work together to implement it and take decisive steps.

It's a common cause of mankind responding to climate change. China has always been a supporter of multilateralism and is willing to continue to strengthen communication and coordination with all parties on major issues such as climate change, so as to promote the establishment of a fair, reasonable, cooperative and win-win global climate governance system and make contributions in achieving a higher level of global sustainable development.

As the fundamental theory is a simple theory, it is the most important to practice and work hard. It requires timely and strong practical actions by all countries to implement long-term low-carbon emission development strategies for the mid-century of this century, accelerate the green and low-carbon transition of economic and social development, and promote the building of a community with a shared future for mankind. As a developing country, China is willing to work hand in hand with the international community to promote the global low-emission development transition, achieve lower levels of GHG emission, and jointly move towards a new era of global ecological civilization.

Annex I: Long-term Low Greenhouse Gas Emission Development Strategy of Hong Kong Special Administrative Region

I. Background of Strategy Formulation

The Government of the Hong Kong Special Administrative Region (HKSAR) attaches great importance to combating climate change. In 2017, the HKSAR Government announced Hong Kong's Climate Action Plan 2030+ which set out in detail the key mitigation, adaptation and resilience measures to combat climate change, as well as the target to reduce Hong Kong's carbon intensity by 65% to 70% between 2005 and 2030, which is equivalent to a reduction of Hong Kong's total carbon emission by 26% to 36%.

To align with China's commitment to achieve carbon neutrality before 2060, the Chief Executive announced in the Policy Address published on 25 November 2020 that HKSAR would strive to achieve carbon neutrality before 2050. To this end, the Chief Executive announced in the 2021 Policy Address that the HKSAR Government would publish the Hong Kong's Climate Action Plan 2050 in 2021 to set out more proactive strategies and measures to reduce carbon emission, and pursue more vigorous strategies and measure, and enhanced interim decarbonisation targets to reduce Hong Kong's carbon emission by 50% before 2035 as compared to the 2005 level. The HKSAR Government announced the latest Hong Kong's Climate Action Plan 2050 on 8 October 2021. With the vision of "Zero-carbon Emission·Liveable City·Sustainable Development", it outlined HKSAR's strategies and targets for combating climate change and achieving carbon neutrality.

II. Present Situation and Trend

The climate change mitigation measures proposed in Hong Kong's Climate Action Plan 2030+ have been progressively implemented with fruitful results. In 2019, electricity generation was Hong Kong's largest

source of carbon emission (accounting for about 66% of the total), followed by transport (accounting for about 18% of the total) and waste (accounting for about 7% of the total). Therefore, our decarbonisation work focuses on these three key areas.

In respect of energy, the HKSAR Government has reached agreements with the two power companies to gradually replace coal with cleaner natural gas for electricity generation. From 2015 to 2020, the share of coal in the fuel mix has been reduced from around half to less than a quarter, while the share of natural gas has significantly increased from around a quarter to almost half. Meanwhile, the Government has earmarked a total of \$3 billion to install small-scale renewable energy systems at existing government premises. Installation of larger-scale solar energy generation systems at suitable locations at reservoirs and landfills are also being pursued. In addition, the HKSAR Government has introduced the “Feed-in Tariff” to encourage different sectors to install renewable energy systems, and has installed solar photovoltaic panels for eligible schools and non-governmental welfare organisations free of charge. The public response has been enthusiastic.

Buildings account for about 90% of Hong Kong’s total electricity consumption, and over 60% of our carbon emission is attributable to generating electricity for our buildings. The Energy Saving Plan for Hong Kong’s Built Environment 2015~2025+ promulgated by the Government in 2015 has set a target of reducing energy intensity by 40% by 2025. So far, the energy intensity in Hong Kong has decreased by over 30%. The HKSAR Government has also taken the lead in energy saving. The Government achieved the five-year target of reducing electricity consumption in government buildings by 5% in 2018-2019, one year ahead of schedule, and achieved a final electricity saving of about 7.8%. We have also set a new Green Energy Target to further improve the energy performance of the whole Government by 6% by 2024-2025.

Regarding green transport, the HKSAR Government announced in

March 2021 Hong Kong Roadmap on Popularisation of Electric Vehicles, setting out the long-term policy objectives and plans to promote the adoption of electric vehicles and their associated supporting facilities in Hong Kong, guiding Hong Kong towards zero vehicular emission before 2050. This acts in concert with our other target to strive for carbon neutrality in the same time frame, with a view to meeting our aspirations for “Zero Carbon Emission·Clean Air·Smart City”. In addition, the HKSAR Government announced in June 2021 the Clean Air Plan for Hong Kong 2035. With the vision of "Healthy Living·Low-carbon Transformation·World Class", it sets out the actions to promote the use of new energy transportation, and continue planning for railway networks and adopt environmentally friendly transport modes in new development areas.

As for waste reduction, the HKSAR Government announced in February 2021 the Waste Blueprint for Hong Kong 2035 which advocates the vision of "Waste Reduction·Resources Circulation·Zero Landfill". It sets out targets for per capita municipal solid waste disposal and recovery rate, and the goal of developing adequate waste-to-energy facilities with the aim to move away from reliance on landfills for municipal waste disposal by 2035.

In addition, the HKSAR Government has been promoting a green and low-carbon community; raising public understanding and concern about the importance of climate change; as well as introducing and subsidising a variety of publicity and education activities, including “Low Carbon Living Calculator”, to facilitate behavioural change and encourage the public to practise low-carbon living.

The HKSAR is moving steadily towards the 2030 carbon reduction target. Hong Kong’s carbon emission reached its peak in 2014. In 2019, Hong Kong’s total greenhouse gas emission amounted to 40.1 million

tonnes of carbon dioxide equivalent (CO₂e), while the carbon intensity was reduced by about 35% when compared with the 2005 level. The per capita emission had dropped to about 5.3 tonnes of CO₂e. Preliminary estimation shows that the per capita carbon emission in 2020 would be reduced from the peak level of 6.2 tonnes in 2014 to about 4.5 tonnes.

III. Overall Target and Strategy

The HKSAR Government is committed to deep decarbonisation, and strives to achieve carbon neutrality in Hong Kong before 2050 in support of the global efforts to combat climate change. The HKSAR Government will take climate actions to align with the target of the Paris Agreement, i.e. holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

On specific strategies, the HKSAR Government will endeavour to implement the various measures set out in Hong Kong's Climate Action Plan 2050, and pursue the interim decarbonisation targets set out therein to reduce Hong Kong's carbon emission by 50% before 2035 as compared to the 2005 level.

IV. Four Major Decarbonisation Strategies

The four major decarbonisation strategies in Hong Kong's Climate Action Plan 2050 cover the following targets and measures:

(1) Net-zero electricity generation

Cease using coal for daily electricity generation by 2035; increase the share of renewable energy in the fuel mix for electricity generation to 7.5%-10% by 2035, and to 15% subsequently; and try out the use of new energies and strengthen co-operation with neighbouring regions to achieve the long-term target of net-zero electricity generation before 2050.

(2) Energy saving and green buildings

Reduce the overall electricity consumption of buildings through promoting green buildings, improving energy efficiency of buildings and

stepping up efforts to lead a low-carbon lifestyle. The goal is to reduce the electricity consumption of commercial buildings by 30% to 40% and that of residential buildings by 20% to 30% from the 2015 level by 2050, and to achieve half of the above targets by 2035.

(3) Green transport

Achieve the long-term target of attaining zero vehicular emission and zero carbon emission in the transport sector before 2050, through the electrification of vehicles and ferries, development of new-energy transport and measures to improve traffic management. The HKSAR Government will cease the new registration of fuel-propelled and hybrid private cars in 2035 or earlier. Apart from promoting electric buses and commercial vehicles, the HKSAR Government also plans to collaborate with the franchised bus companies and other stakeholders in the next three years to test out hydrogen fuel cell electric buses and heavy vehicles.

(4) Waste reduction

To achieve the long-term target of carbon neutrality in waste management before 2050, the HKSAR Government will strive to develop adequate waste-to-energy facilities by 2035, so as to move away from reliance on landfills for municipal waste disposal. The HKSAR Government will also further promote waste reduction and recycling, and expects to implement waste charging in 2023 and regulate disposable plastic tableware in phases from 2025 onwards.

5.Next Steps

In the next 15 to 20 years, the HKSAR Government will devote about \$240 billion to take forward various measures on climate change mitigation and adaptation. The Steering Committee on Climate Change and Carbon Neutrality under the chairmanship of the Chief Executive was set up in mid-2021 to formulate the overall strategy at the highest level and oversee implementation and coordination. The HKSAR Government will

also set up a new Office of Climate Change and Carbon Neutrality to strengthen co-ordination and promote deep decarbonisation. Also, a dedicated advisory committee on combating climate change will be formed to encourage different sectors in the community, including young people, to participate actively in climate actions. The HKSAR Government will, in line with the spirit of the Paris Agreement, review Hong Kong's Climate Action Plan about every five years to update the strategies and targets for decarbonisation and other actions to combat climate change.

Climate change is an imminent global challenge. As a Special Administrative Region of China, the HKSAR will continue to actively participate in global climate actions, and further promote international and regional cooperation on various platforms, such as the C40 Cities Climate Leadership Group, Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area and Hong Kong-Guangdong Joint Working Group on Environmental Protection and Combating Climate Change, for the purpose of combating climate change.

Annex II: Long-term Low Greenhouse Gas Emission Development Strategy of Macao Special Administrative Region

I. Current situation and trend

The Macao Special Administrative Region (MSAR) attaches great importance to combating climate change. In order to align with the national climate change action target, the Government of MSAR has set a greenhouse gas (GHG) emission reduction target of reducing carbon intensity by 40%-45% by 2020 compared with 2005. The carbon intensity in 2019 was 6.21 tons of carbon dioxide equivalent (CO₂e) per million patacas, decreasing 67.1 percent from 18.9 tons of CO₂e per million patacas in 2005. MSAR has already achieved its 2020 emission reduction target in advance.

Macao, as a special administrative region of China and the pearl of the South China Sea, is a micro open economic system. In recent years, with the accelerated development of the construction and application of major regional infrastructure such as the Pearl River Delta intercity Rail, the Hengqin Island development and the Hong Kong-Zhuhai-Macao Bridge, the economy and society of Macao have ushered in a new round of accelerated development. Based on the model scenario analysis, the growth of energy consumption and carbon emission in the MSAR is expected to slow down in the future, and the energy consumption elasticity is expected to be lower than 0.7 currently. Carbon emission in the MSAR are expected to drop significantly by 2050 compared to 2018, with per capita carbon emission below 4 tons of CO₂e (including outsourced electricity). If a wide range of low-carbon and energy-saving policies are implemented in the transport and tertiary industries, with the gradual intensification of these policies, energy consumption and carbon emission in the MSAR will be significantly reduced, and the total emission may reach peak before 2030.

II. Overall strategy and objectives

Implementing Xi Jinping Thought on ecological Progress, solving prominent ecological and environmental problems as soon as possible, and modernizing ecological and environmental governance system and capacity have become the most pressing issues at present. As a micro open economic system, Macao profoundly grasps the interconnections among the construction of special zone, economic and social development, the utilization of energies and resources and environmental quality improvement. The MSAR actively develops the GHG emission reduction potential, takes the initiative to adapt to climate change, strengthens low-carbon development and energy conservation and environmental protection technology exchanges and cooperation, speeds up the introduction and implementation of low carbon technology; actively participates in and integrates into the development of the Guangdong-Hong Kong-Macao Greater Bay Area, promotes the evaluation of green and low-carbon development in the Greater Bay Area; strives to reach the peak of carbon emission in the SAR as soon as possible, and builds the SAR into a model city of green development; establishes a dual control and reduction mechanism for both energy consumption and the intensity and total amount of carbon dioxide emission.

(1) Actively integrate itself into the newest situation and trends of international and domestic efforts to address climate change, and take climate change and low-carbon development as an important development strategy in light of its own strategic positioning, development goals and plans. Per capita carbon emission of Macao in 2017 were about 5.7 tonnes, slightly lower than the per capita carbon emission of EU and about 30% higher than the global per capita carbon emission level. To this end, the MSAR should take the positive response to climate change and low-carbon development as the strategic choice for the future development, and actively build a "green and low-carbon" business card and shape a good international image.

(2) Determine the carbon dioxide emission reduction target of Macao

and the emission peak target as soon as possible, carry out research and take active roles in the "Leading The Summit City Alliance"; strive for lower carbon dioxide emission in 2030 than those in 2018, with per capita carbon emission less than 5 tonnes; achieve significant reductions in carbon emission by 2050 compared to 2018, with per capita emission below 4 tons.

(3) Promote the procurement ratio of green electricity including wind , photovoltaic and nuclear power, within the framework of the Guangdong-Hong Kong-Macao Greater Bay Area cooperation, and reduce the carbon emission intensity of electricity in Macao.

(4) Actively promote the use of clean energies and reduce carbon emission in transportation sector.

(5) Better manage the use of air conditioning in MSAR; buy products with higher energy efficiencies.

III. Building sector

MSAR will control excessive growth rate of carbon emission from public, commercial and hotel buildings, and strive to realize decrease in carbon emission of building sector by 2030.

(1) Promote green buildings with high standards in new buildings

Coordinate the implementation of building energy efficiency standards and the research and development of green building standards. In the design and supervision of public housing projects, low carbon and energy saving building standards will be included, and relevant adjustments and improvements will be made in the revision of related laws and regulations regarding urban buildings. At the same time, efforts will be made to improve the design standards of public housing buildings and also to implement green building standards in new buildings.

Build a number of near-zero emission building demonstration projects. Efforts will be made for new buildings and government-funded public buildings to meet star-rated green building standards. And more work will be done to promote the integrative development of solar energy

integrated buildings and housing industrialization, making the wider use of renewable energies in new public building projects such as office buildings of public institutions and public housing buildings.

(2) Promote energy-saving renovation of existing buildings

Support the construction of distributed photovoltaic power generation systems on the roofs of commercial complexes and large public buildings, and release policies and measures to promote energy-saving renovation of commercial buildings.

(3) Mandatory energy consumption supervision and management of buildings

Classify and clarify the main responsibilities regarding energy-saving, and comprehensively strengthen the management of building energy use for different types of commercial buildings and public buildings, by taking overall consideration of rights and responsibilities of the property owners, property management and users.

Make full use of technical means such as the internet and cloud computing to accelerate the promotion of building visualization and intelligent building energy consumption monitoring and management systems, and implement sub-item and zone measurement control for different building energy consumption systems and places such as air conditioning, heating, elevators, and lighting.

Strengthen the energy-saving management of the air-conditioning system, and reasonably increase the summer air-conditioning temperature setting in the office area. Optimize the design of the air-conditioning system and carry out energy efficiency evaluation after the air-conditioning system is completed for newly-built public buildings that use central air-conditioning systems.

IV. Transportation sector

MSAR will Strive to reduce carbon emission from the transportation sector by more than 10% in 2030 compared with 2020, and achieve more than 30% reduction compared with 2020 by 2050.

(1) Road transportation: Strengthen the regulation of vehicle growth. Guide the purchase of new energy vehicles and increase the proportion of green transportation. Vigorously develop public transportation, accelerate track construction, and optimize the ground public transportation network. Increase the electrification ratio of official vehicles and taxis, and build supporting infrastructure for new energies and clean energy vehicles such as charging stations and charging piles. Strengthen energy conservation and emission reduction in the field of logistics, build green logistics system, accelerate the development of intensive, pollution-free, and low-energy logistics by looking into the entire process of transportation, warehousing, loading and unloading, circulation processing, packaging, and distribution. Encourage logistics enterprises to adopt modern logistics technologies and energy-saving equipments, and share third-party logistics services.

(2) Water transportation: implement stricter clean shipping policies.

(3) Aviation: Accelerate the application of fuel-saving technologies and measures, actively promote the use of aviation biofuels, and strengthen low-carbon renovation and operation management of airports.

V. Energy sector

Efforts will be made to make the power sector peak before 2025, and drop by more than 15% from the peaking level in 2030, and further decrease significantly in 2050.

(1) Expand the use of high-quality clean energy

Accelerate the building of clean, low-carbon, safe and efficient modern energy system with natural gas and electricity as the mainstay, and establish intelligent low-carbon energy supply system. Under the cooperation framework of the Guangdong-Hong Kong-Macao Greater Bay Area, promote the proportion of green power procurement, such as wind power, photovoltaic power generation, and nuclear power, and reduce the carbon emission intensity of electricity in the MSAR.

(2) Vigorously develop new energy and renewable energy

Accelerate the development and utilization of renewable energies

such as recycled water and waste heat in accordance with local conditions, rationally use solar energy, promote the use of distributed photovoltaic power generation systems in schools, hotels, and large public buildings, and promote the integrated application of solar and thermal buildings. Promote the construction of comprehensive zero-carbon demonstration projects, with the design of zero-carbon projects incorporating the renewable energies including triple-generation systems and solar panels.

(3) Actively explore the application of clean energies in the transportation sector

In view of the important roles of clean energies in achieving global carbon neutrality in the future, the MSAR may consider introducing clean energy for transportation to reduce carbon emission in the transportation sector appropriately.

VI. Other sectors

As a coastal city vulnerable to climate change, Macau also needs to continuously strengthen and improve its ability to adapt to climate change, especially its ability to withstand extreme weather, and reduce the loss to economic development and urban operation caused by flooding, storm surges and astronomical tides.

VII. Supporting measures

Constantly raise awareness and establish the position of addressing climate change in the future development of Macau. Climate change legislation could be in the following aspects.

(1) In accordance with *the Basic Law of the Macao Special Administrative Region of the People's Republic of China*, the MSAR government has strengthened its legislative research work in addressing climate change and low-carbon development.

(2) Carry out research on carbon pricing mechanism.

(3) Broaden the coverage of the environmental protection and energy conservation fund, making it cover environmental protection, low-carbon development and energy conservation. Make use of quota auction revenue

or carbon tax revenue as the continuous funding source of the fund.

(4) Actively communicate with mainland in the formulation of energy-saving and low-carbon standards, integrate the MSAR into the construction of the Greater Bay Area, introduce advanced energy-saving and emission-reduction technologies from the Mainland, practice the ecological concept in the construction plan of the Greater Bay Area, and continuously improve and optimize the MSAR's the ecological and environmental system.

(5) Make full use of government procurement to continuously promote the low-carbon products consumption. Establish low-carbon product catalog, promote the government to purchase low-carbon products, establish a subsidy system for energy-saving products, and encourage the public to purchase energy-saving products.

(6) Actively promote the participation of the Macao's aviation sector in the linkage issues of China's Certified Emission Meductions (CCER) and the ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), and use China's CCER in achieving carbon neutralization of Macau's aviation emission.

(7) Establish Pu Hui Certified Emission Reductions, promote the whole society to take low-carbon actions, and better quantify the effects of individuals' low-carbon behaviors through carbon credits.