



**China Council for International Cooperation on
Environment and Development (CCICED)
Special Policy Study Report**

**Goals and Pathways for Environmental
Improvement by 2035**

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China Council for International Cooperation on Environment and Development (CCICED)

Goals and Pathways for Environmental Improvement by 2035

Summary of Key Findings

In line with the objectives established by China's leaders, this report examines how to ensure that there will "be a fundamental improvement in the environment by 2035, and the goal of building a Beautiful China will be basically attained." It examines some of the main obstacles for achieving this goal and how they could be overcome, taking account of experience from developed countries and the most economically advanced regions of China. The economic and social implications of the green transformation are also analyzed as well as how environmental governance and the Chinese legal system will need to be adapted to help achieve the 2035 goal.

Some of the key recommendations emerging from the report include:

- A target and indicator system that is oriented by ecological priorities and green development shall be established, so that a high-quality development can be supported.
- China's future economic development should be guided by the need to protect and enhance the natural assets on which it depends, and well as people's well-being.
- Binding targets should be established for achieving the key ecological environmental and environmental health objectives that underlie a Beautiful China. Targets should be established for 2035 and be aligned with China's pathway to 2050.
- The targets should be established using foresight methods such as quantitative scenarios of economic, social and environmental trends, and through a wide consultative process. All sectors of the economy will need to be involved.
- The targets established for 2035 and 2050 should guide how environmental objectives are integrated into Five Year Plans, starting with the 14th Five Year Plan. The targets established in all the main policy and planning documents should be consistent and mutually reinforcing.

- The strategy for achieving a Beautiful China should take account of the different capacities and resources in China's diverse regions and use spatial and urban planning as instruments. Some regions could serve as models for others, while some poorer regions, and regions affected by structural change, will require additional support. Development of processes to align national ecological and environmental targets with regionally differentiated targets including cumulative impacts.
- Similarly, some enterprises could be encouraged to be front-runners in showing how proactive environmental management can create new markets, drive company performance and promote green development.
- Achieving a Beautiful China will require environmental governance to become more consistent, systematic and effective, particularly at the local government level. It also requires the establishment of a robust and independent monitoring system to monitor progress and to adjust the strategy and measures for achieving a Beautiful China.
- China's legal system also needs to be adapted to support the achievement of a Beautiful China, including by strengthening the capacity of the judiciary and enhancing access to justice.
- It will be essential to raise public awareness and increase public support for the measures needed to achieve a Beautiful China. Promoting greener patterns of consumption will be a central but difficult challenge.
- Strengthening global environmental governance and regional environmental cooperation can help China to achieve a Beautiful China.
- Strengthening integration of environment, economic and social policy goals including focus on adaptation to climate change
- Improving the capacity of the legal system to handle environmental issues including access by third parties
- Establishment of a Beautiful China Demonstration Zone
- To manage a green transition, sound management of chemicals and waste must be set as a long-term goal. Sustainable chemical and waste management should be

taken into account in the environmental, economic and social aspects of sustainable development.

Policy Recommendations

I. China may face four major challenges during the 14th Five-Year Plan period and needs to achieve five major changes

By 2035, China's economic and social environment will be still in the process of transformation, and ecological environmental protection is an inextricable part of this transformation. Therefore, China's pathway to ecological environmental targets for 2035 must reflect both improvement for current gaps in environmental quality and 'must have' changes enabling further achievements on the way to 2050.

During the "13th Five-Year Plan" period (2016-20), China has made remarkable achievements in the battle of ecological environmental protection and pollution control. Ecological environmental protection and management are on the right track. At the same time, however, China still faces severe challenges, and the existing problems and solutions are full of Chinese characteristics. Therefore, the policy focus towards 2035 should be twofold: (i) persistence and implementation (ii) while developing a number of important innovations. On the latter, see the text box at the end of this section.

By 2035, China's ecological environmental protection will face the following problems and challenges:

- The transformation of the industrial, energy and transportation sectors as well as land-use structure will continue. The improvement of China's ecological environment quality must be based on the greening of production and consumption patterns, including lifestyles. Equal attention shall be paid to improving the economic structure and environment.
- The ways of integrating ecological environment protection into economic, political, cultural and social fields is still agreed or being implemented, and more needs to be done to provide incentives that make integration spontaneous and self-sustaining.
- We shall pay more attention to the public's ecological environment needs and interests, in view of China's social development, including environmentally related health impacts. The scope of ecological environment governance will be gradually expanded from the battle against pollution to solving more comprehensive and difficult problems such as climate change, resource efficiency, water management, air quality, soil pollution legacy, waste and chemicals management, biodiversity,

environmental health, marine environment, environmental risks, as well as environmental justice.

- From the 14th Five-Year Plan period to beyond 2035, target setting, the implementation path, policy formulation and supporting measures for ecological environmental protection shall be consistent and forward-looking. The ecological and environmental protection strategy should not be affected by pressure from economic trends. Planning tools need to be utilized to ensure that existing and future Beautiful China targets will be achieved. Monitoring networks are necessary to assess baseline and progress.

Therefore, it is recommended to adhere to the following principles, towards 2035:

- Achieving the goals of ecological environmental quality improvement, including environmentally related health, is a long-term and continuous process (sustainability);
- The environmental quality improvement shall be steady and free from fluctuations or relapses (stability). Because of this, China's leadership would be well advised to formulate and quantify its green transformation pathway for the full period between now and 2050, and on that basis specify the targets and instruments for the 14th FYP.
- It is necessary to balance and coordinate the three key systems of sustainability, namely, economy, society and environment, so that environmental improvement keeps pace with economic and social development (coordination);
- "Beautiful" and "Green" shall be systematic and consistently implemented. Not only the environmental quality indicators must meet their targets, but also economic and social development should become green (essence);
- Policy measures shall be efficient, effective, comprehensive and innovative, and include administrative, legal, technical, economic and social means (comprehensiveness).

II. Overall considerations regarding the 2035 goals and the goals of the 14th Five-Year Plan period

- The medium- and short-term goals must be consistent in direction and well

connected. That is: consistent over time, space, and levels of government; as well as connected to the foreseen changes in economy, social environment and urbanization. Planning tools will assist in identifying priority actions to achieve the 2035 goals. The goals of the 14th Five-Year Plan shall refer to the 2050 and 2035 goals and be defined based on the goals of Beautiful China 2035 in order to link the short- and medium-term goals. Some of the target indicators of the 13th Five-Year Plan still need to be improved steadily, and it is necessary to continue to meet and simultaneously increase the requirements for rural areas, ecosystems, climate change, and environmental health (especially the health problems of vulnerable groups such as women and children), so as to make relevant work done in advance.

- The 2035 targets should align with China’s pathway to 2050. This is particularly important for slow-changing and long-lived systems, such as the energy system; urban layout and the education system. Methods of foresight such as scenario tools, quantitative models and other forward-looking analytics need to be applied in order to enable timely initiatives, for example in large old-style manufacturing areas. Foresight methods are also required to avoid, as much as possible, painful write-offs of systems that may be of some use towards 2035 but have no role thereafter. ‘Clean coal’ is a case in point. In addition, a timely understanding of the challenges and opportunities of adaptation to climate change is needed in order to minimize eventual cost, and disruption and public health risks.
- Regional differences should be taken into account when working toward the 2035 goals. Due to the wide differences among regions, it is unrealistic to expect all regions to achieve the goals of Beautiful China by 2035. For developed and underdeveloped regions, on the condition that they have met the same environmental standards and requirements, the principle of “common but differentiated responsibilities” shall also be determined; that is, we shall encourage some regions to achieve the goals of Beautiful China first while giving more support to poor and vulnerable regions so as to avoid the further deterioration of the ecological environment, for example through displacement of high polluting industry to central and west China. Environmental governance will put more emphasis on sharing positive experiences and win-win benefits. It is recommended to establish a Beautiful China demonstration zone. This could be done by establishing ecological provinces, cities, counties and districts that could play leading and demonstration roles. (2) In line with this, and as far as possible, the target indicators and policy measures for the 14th Five-Year Plan shall be differentiated by region, and the related implementation guidance and capacity building shall be strengthened. Regional differentiation should be accompanied

with a timetable showing the eventual application of ambitious protection to all regions of China and allowing investors and other actors to anticipate on this. Policies that provide perverse incentives for investments in regions with less stringent environmental requirements should be avoided.

- We shall establish a target and indicator system that is oriented by ecological priorities and green development, so that a high-quality development can be supported. This shall be the core guiding principle of the 14th FY plan. The SPS recommends targets that are ambitious, clear, measurable, outcome-based, use SMART-related criteria, focusing on absolute ambient-level targets rather than intensity targets. In terms of emission targets, it underscores the importance of setting and then sticking with long-term emission targets, to enable different actors to meet them. This approach could assist other countries in achieving environmental and development goals.
- We shall review targets and indicators regularly and independently and establish a tracking system. E.g. It is suggested to strengthen long-term tracking of the goal of achieving Beautiful China, build an evaluation system for achieving Beautiful China goals, implement assessment and early warning, establish improvement mechanism, and strengthen policy preparations.

III. Green transformation of the economy

- The key task is to realize the structural green transformation, such as the green transformation of the energy, industrial and transport sectors, as well as land-use and agricultural inputs. An effective economic policy is built upon an effective environment policy. We shall strengthen environmental impact analysis, taking advantage of China's considerable experience in strategic environment assessment. We shall also strengthen economic and technological policies, including scenario tools, enhance the ecological and environmental protection orientation, strengthen the role of environmental protection departments in promoting comprehensive policies, and achieve a high degree of integration of environmental, social and economic policies. We shall also promote innovation of technologies (in particular environmental-friendly technologies) and business models to facilitate economic transformation and high-quality economic development.
- One one hand, we shall improve the green process of China's existing industries (including but not limited to manufacturing, construction, transport and services) by introducing a green evaluation system. This will require enterprises'

environmental behavior and use of environmental credits to be evaluated, and publicly reported and an incentive scheme to be developed that includes reward and punishment measures. On the other hand, we shall also draw on international good practices in developing environmental protection industries, cultivating new economic growth points and increasing the effective supply of green products.

- With respect of the economic transformation, we shall carry out preparatory work and form a long-term strategy and cultivate economic green growth points, as was done in the industrial areas of the Ruhr Valley. This will take time and requires a strategic focus and early investment in high-quality technological research and development. When justified, financial support from the central government will support the green transformation process and help to stimulate the active participation of both small, medium and large enterprises. Of particular concern is China's legacy of soil pollution in a time of extensive economic restructuring and urbanization.
- Encouraging a group of core enterprises to be front-runners can help to drive the green transformation of regional economies, give full play to the self-discipline and self-learning capacity of the industry, and integrate the concept of environmental protection into design, layout, products, technologies and processes, rather than acting after pollution once caused. Further thought should be given to effective, realistic ways of achieving this.

IV. About some methods for eco-environmental governance

- We shall strengthen the consensus and alignment between central and local governments, and among governments and enterprises, and between the society and the public on environmental governance and the shared need to improve the ecological environment. The key is to strengthen and encourage local governments and enterprises to actively participate in environmental protection, thus changing the passive compliance of enterprises and insufficient financial support from local government. We shall support local governments to implement ecological compensation, assessment and promotion of local public officers, environmental property rights and other effective measures, using constraint and incentive policies at the same time. We will also pay more attention to the role of various economic instruments such as taxation, finance and pricing in improving environmental conditions. It is also necessary to provide more certainty on key goals and targets to increase green investment, improve the environmental management model, and give full play to the long-acting market mechanism.

- On the basis of consolidating the battle against pollution and the achievements of the blue sky, clear water and pure land defense, we will continue to expand the achievements and deepen the construction of ecological civilization. We shall strengthen the protection and restoration of ecologically fragile areas, environmentally sensitive areas, important ecological functional areas through tools such as red-lining and risk based impact assessment. We shall maintain the overall stability of ecosystems, consolidate the ecological security barrier, and enhance the overall capacity of ecosystems. We shall do so taking into account trends and uncertainties regarding, for example, climate change, urbanization and transport. We shall develop capacities for planning and oversight jointly for environment and spatial planning.
- We shall attach importance to the enhancing participation of stakeholders, strengthen the disclosure of environmental information, and pay special attention to the social impact of policies. Local governments should be assisted in putting in place environment monitoring that efficiently matches the requirements the implementation of relevant national and local eco-environmental policy plans, assessment of policy implementation, environmental public information and health impact assessments, forward-looking policy effects, and model studies.

At the same time, in view of the growing importance of China's domestic consumption as a driver of its economy, we shall strengthen public awareness of green consumption, and encourage people to appreciate the environmental and health benefits and pay for green products. Green consumption will create demand for green production and help to strengthen environmental governance.

- We shall give priority to the rule of law and focus on its implementation. We shall also further improve the legislation, law enforcement, observance of law, and judicial systems regarding the ecological environment, and focus on the formulation of good laws, strict law enforcement, conscious observance of law, and the synergy between environmental law enforcement and the judiciary. This includes that we shall strengthen the training of legal personnel

What is new in the recommendations

1. A target and indicator system that is oriented by ecological priorities and green development shall be established, so that a high-quality development can be supported
2. Developing a process to align national ecological and environmental targets with regionally differentiated targets
3. Placing the 2035 targets in a 2050 perspective, using storylines and quantitative analysis
4. Strong emphasis on integration of environment policy with economic and social change, and adaptation to climate change
5. More emphasis on health impact and environmental justice
6. Bringing together environmental management and spatial planning
7. Stepping up the active use of information tools, including scenario tools and information for the public
8. Improving the capacity of the legal system to handle environmental issues, including access by third parties to the system
9. Promoting green front runner enterprises
10. Using binding targets for key ecological environmental indicators.
11. Taking sound management of chemicals and waste which includes environmental, economic and social aspects into account as a long-term goal in a green transition.

Project Background and Implementation Plan

I. Project Background

The report delivered at the 19th CPC National Congress proposed that “there will be a fundamental improvement in the environment by 2035, and the goal of building a Beautiful China will be basically attained.” At the National Ecological Environmental Protection Conference held in May 2018, Xi Jinping emphasized that “we should step up efforts to establish an ecological civilization system to ensure that there will be a fundamental improvement in the environment by 2035, and the goal of building a Beautiful China will be basically attained.” The Opinions of the CPC Central Committee and the State Council on Comprehensively Strengthening Ecological Environment Protection and Taking Tough Steps to Prevent and Control Pollution issued on June 16 mentions that, “we should step up efforts to establish an ecological civilization system to ensure that by 2035, the spatial layouts, industrial structures, and ways of work and life that help conserve resources and protect the environment will be basically developed, there will be a fundamental improvement in the environment, and the goal of building a Beautiful China will be basically attained.” In addition, the goal of environmental quality improvement by 2020 was defined, that is, “by 2020, the overall environmental quality will be improved, the aggregate emissions of major pollutants will be greatly reduced, environmental risks will be effectively controlled, and the level of environmental protection will be compatible with the goal of building a moderately prosperous society in all respects.” On July 10, 2018, the Standing Committee of the National People’s Congress passed the Resolution on Comprehensively Strengthening Ecological Environment Protection and Taking Tough Steps to Prevent and Control Pollution according to Law, mentioning that “our overall goal is that by 2020, the overall environmental quality will be improved, and the aggregate emissions of major pollutants will be greatly reduced.” The thought of ecological civilization put forward by Xi Jinping provides a conceptual direction and a fundamental guideline for building a Beautiful China and realizing modernization featuring the harmony between human and nature. Its six principles and five systems provide us with ideological and practical guidelines for achieving the goal of environmental quality improvement by 2035.

Under the new normal economic situation, environmental goals of global sustainable development also add to China’s environmental governance pressure with increased responsibilities. The UN’s 2030 Agenda for Sustainable Development provides a new impetus to the transformation and upgrading and sustainable development of China’s

economy, and forces China to take tough measures. Therefore, it is necessary to analyze the critical impact that the environmental goals will have on China's environmental governance in the next 20 years, and to strengthen the research on global environmental governance and the application of big data.

In short, research on the mid- and long-term environmental quality improvement goals and the path in China is of great significance. It is not only conducive to clarifying basic logic, institutional constraints and systematic predicament of the current environmental governance operations in China, but also helps to predict future path for China's environmental governance.

II. Implementation Plan

The overall objectives of the project are as follows: To profoundly understand the implications of China's goal of environmental quality improvement by 2035, to assess the obstacles to achieving the goal, , and to explore the effective paths for how it could be achieved, including by 1. making clear the standards of ecological environment quality from the perspective of environmental management; 2. explaining the suggestions for institutional reform from the perspective of green transformation; and 3. analyzing the rule of law measures for environmental quality improvement from the perspective of the legal system. Based on that, we can provide blueprints for the CPC Central Committee and the State Council's implementation of China's medium- and long-term environmental governance decision and deployment.

Guided by the above overall objectives, the research team has identified the following four items to be addressed by this SPS: (1) Implications of China's goal of environmental quality improvement by 2035 and assessment of the obstacles to the achieving the goal; (2) Research on China's green transformation by 2035, its institutions, mechanisms and paths; (3) Research on the Strategic Path of a Fundamental Improvement in the Environment by 2035; (4) Rule of law measures for the realization of China's goal of environmental quality improvement by 2035.

In order to achieve the above objectives, the research team will mainly work on Item (1) and (3) in 2018, and items (2) and (4) in 2019. The specific implementation plan is as follows:

- Firstly, we will study China's green transformation system and mechanism, and propose specific rule of law measures. We will comprehensively analyze the main characteristics of China's green transformation to 2035, including its economic dimensions, and taking account of trends in demography, economic structure and energy demand structure. On this basis, we will propose systems and mechanisms

for promoting China's green transformation from the perspective of supply and demand sides and the reform of institutions side and institutional and mechanisms. Focusing on the development from now to 2030, we will propose a support plan for promoting ecological civilization and sustainable development through the rule of law. This will be aligned with the United Nations' 2030 Sustainable Development Goals and help to realize the transition to ecological civilization.

- Secondly, we will study the barriers to and key factors for improving China's ecological quality. We will describe the evolution trend and driving factors for achieving environment quality through scenario analysis. Based on that, we will analyze the implications and propose milestones and targets for improving environmental quality and building a Beautiful China.
- Thirdly, we will study the road map for a fundamental improvement in the environment in China by 2035. We will analyze the experience of developed countries, including case studies, and refer to the models used to improve the environment in China's economically developed regions. We will determine the key points for the optimization and adjustment of environmental policies at different stages based on economic and social development scenarios, and propose a roadmap for a fundamental improvement in the environment by 2035.
- Fourthly, we will study the rule of law measures needed for the realization of China's goal of environmental quality improvement by 2035. From the perspectives of legislation, law enforcement, judicial system and observance of law, we will propose supporting legal measures for the realization of China's goal of environmental quality improvement by 2035, so as to facilitate the effective connection between ecological environment protection and law.

Since the launch of the project in July 2018, the research team has held 4 Sino-foreign joint meetings and 2 Chinese expert meetings, participated in academic exchanges in Germany and the United Kingdom, and conducted domestic field research. On this basis, the research team has compiled four information bulletins and the report (in both English and Chinese). In July 2018, the research team held an SPS inception meeting and the first joint working group meeting of Chinese and foreign experts. The participants conducted detailed and comprehensive discussions on the implementation plan, the scope of research, and expected results. In the end, they developed the implementation plan and defined follow-up arrangements. They also clarified the focus and task division of tasks for the first phase of the research team in 2018. In the same month, the research team held the first Chinese expert meeting in Beijing to discuss and

exchange information on China's environmental policy and ecological environment and to summarize relevant information. In September, the research team submitted an information bulletin titled "Implications of China's Goal of Environmental Quality Improvement by 2035 and Obstacle Assessments on the Realization of the Goal.". In October, it submitted an information bulletin titled "Research on the Strategic Path of a Fundamental Improvement in the Environment by 2035". Based on the research results of the Chinese and foreign research teams, the research team held a second Sino-foreign joint video conference in October 2018. The Chinese and foreign parties had a detailed discussion of the policy recommendations and the details of the research report to ensure that foreign experience and lessons in environmental legislation and law enforcement were fully taken into account in light of learned China's actual conditions. In addition, the research team has held a number of internal meetings and teleconferences and fully taken into account the opinions and suggestions of Chinese and foreign experts of ways to improve the quality and practical significance of the report and policy recommendations. In October 2018, the research team prepared and submitted an interim report. From March 20 to 27, 2019, the SPS team, including Chinese experts, visited Germany and the United Kingdom to conduct field studies of local environmental legal systems, environmental protection policies and progress in environmental protection. This included progress in-depth exchanges and discussions with local scholars. In March 2019, the Chinese and foreign parties held the third Sino-foreign joint work conference in Dessau, Germany, and had an in-depth discussion on the progress of the project. In April 2019, the project team submitted the first draft of the complete SPS report (in both English and Chinese). On May 7, 2019, the research team held the fourth Sino-foreign joint video work conference. The participants reviewed the complete SPS report, and amended it in light of the discussion . In May 2019, the research team consolidated different parts, made further amendments, completed the preparation of the final report (in both English and Chinese), and submitted it to the CCICED.

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Special Policy Study on the Goals and Pathways for Environmental Improvement in 2035

Summary Report

1. MAJOR CHALLENGES AND CHANGES CHINA FACES IN 2035

Xi Jinping pointed out in the report delivered at the 19th National Congress of the Communist Party of China that: "We must continue the Beautiful China initiative to create good working and living environments for our people and play our part in ensuring global ecological security." At the National Ecological Environmental Protection Conference held in 2018, Xi Jinping emphasized that "we should step up efforts to establish an ecological civilization system to ensure that there will be a fundamental improvement in the environment by 2035, and the goal of building a Beautiful China will be basically attained". General Secretary Xi Jinping attaches great importance to the establishing a Beautiful China and has delivered a series of important speeches, especially at the National Ecological Environmental Protection Conference in 2018, during which he highlighted the practical requirements for strengthening the construction of ecological civilization and building a Beautiful China (QIN Shusheng et al., 2018).

Xi Jinping pointed out that "moving towards a new era of ecological civilization and building a Beautiful China is an important part of the Chinese dream of realizing the great rejuvenation of the Chinese nation." "Strongly promote the construction of ecological civilization and implement the "blue water and clear sky" project to make the ecological environment better and better. Strive to build a beautiful China." **Beautiful China is premised on the construction of a beautiful natural environment, and is measured by the development and progress of ecological civilization. Beautiful China refers to developing China with a high degree of ecological civilization. It is the goal of China's ecological civilization construction.** Xi Jinping stated that the goal was to "realize environmental protection and build China into a country with a sound ecological environment." "The modernization of harmony between man and nature requires not only creating more material and spiritual wealth to meet people's growing demand for a better life, but also providing more high-quality ecological products to meet people's growing demand for a beautiful ecological environment."

Vigorously promoting the construction of ecological civilization and building a Beautiful China is a fundamental plan for the sustainable development of the Chinese

nation. It is a major political issue that affects the Communist Party of China's mission and a major social issue concerning the development of people's livelihood. A Beautiful China is a strategic goal of ecological civilization construction based on China's national conditions and future development.

How to define the goals of Beautiful China, how to realize the fundamental improvement of environmental quality, is the task of our SPS.

1.1 An Analysis of the Trend of China's Green Transformation in Economic and Social Development by 2035

The Chinese economy is making the transition from a high-speed growth phase to a high-quality development phase. Leading sectors are shifting from heavy and chemical industries to the high-tech industry and the modern service industry. The driving force of economic growth is shifting from material factors to technological innovation and more skilled human capital. The factors driving the economy are shifting from investment and exports to consumption. Actively cultivating new drivers of economic growth toward green transformation is the only route to high-quality economic development.

A scenario analysis of China's economic and social development in the three periods to 2020, 2035 and 2050 was made based on the existing production model and using the dynamic Computable General Equilibrium (CGE) model of State Information Center. It followed the goal of "basic implementation of socialist modernization by 2035, and buildup of a great modern socialist country by 2050", in accordance with the spirit of the 19th National Congress of the Communist Party of China. Through balancing measurement of indicators in all fields, the main results are shown as follows.

1.1.1 Population to peak and aging trend

1.1.1.1 Total population of China.

Total population of China will be about 1.41 billion by 2020, reach peak (about 1.43 billion) around 2028, and drop to about 1.35 billion by 2050.

1.1.1.2 Population age structure.

The population above 60 years old will reach 261 million, or 18.5% in proportion by 2020; the aging population of China will grow to 371 million by 2035, when the country starts to enter into the moderate aging phase; and grow to 448 million, or 33.2% in

proportion by 2050.

1.1.1.3 Urbanization level

The urbanization rate will reach around 60.6% by 2020, when China enters into the medium-level urban society; around 68.5% by 2035, when China enters into the later phase of the urbanization process; and around 72% by 2050, when the urbanization matures and stabilises.

1.1.2 Economic aggregate and structural trend

1.1.2.1 Macro economic growth rate shifts, and drive for growth gradually changes

In view of GDP growth rate, during 2021-2035, China's economy will be growing at a moderate speed ranging between 4% and 6% per annum, about 5% on average. The socialist modernization will be basically realized by 2035; during 2036-2050, China's economy will step into the phase of low-speed stable growth between 3% and 4%, averaging 3.5% per annum. A great modern socialist country will be built by 2050. In view of demand side pull, consumption will become a key driver in the future. By 2035, the consumption rate is estimated to hit 65%, and investment rate 32%; by 2050, the consumption rate 70%, and investment rate 29%. Per capita consumption is estimated to grow gradually from USD 2,700 at present to USD 16,000 in 2035, and to USD 40,000 in 2050. Especially in the areas of household facilities and articles, resident service, etc., the potential for growth is tremendous. Taken civilian car as an example, it is estimated that there will be approximately 500 million cars by 2035, equivalent to 330 vehicles per 1,000 people. Subsequently, growth will become stable, and by 2050, the total number will be about 550 million, equivalent to 370 vehicles per 1,000 people. New energy vehicles, including all-electric, hybrid and fuel-cell vehicles, will enter into a high-speed growth phase. Their number is estimated to be 140 million by 2035, about 28% of private car ownership; and 270 million by 2050, about 50% of private car ownership.

China's stock of civil buildings is expected to peak in around 2035. Accordingly, the added building area per annum from now on till 2035 will decline gradually. This means that the role of real estate investment, the key driver of China's economic growth for a long time ago, will fall progressively.

1.1.2.2 To adapt to the shift of demand structure, the future industrial structure needs to be gradually optimized

From the perspective of industrial structure development trend, during 2016 - 2020, industrialization will be upgraded toward medium-to-high end, where the weight of the service industry will be continuously increased, positive results will be achieved in agricultural modernization. The share of primary, secondary and tertiary industries will shift from 8.8 : 40.9 : 50.2 in 2015 to roughly 7.5 : 37.5 : 55.0 in 2020. During 2021 - 2035, as the tertiary industry will sector gradually accounts for the largest share of economic development, and it will exceed 60% of GDP around 2030. By 2035, the shares of the three main sectors in the economy will be roughly 5 : 28 : 67. During 2036 to 2050, when China is among the most developed countries in the service sector, it will become the center of high-end service industries across the globe, and it will lead and guide the global value chain, with much greater economic power. The tertiary industry will exceed 70% of GDP around 2050, and the shares of the three main sectors will be roughly 3 : 24 : 73 at that time.

1.1.3 Total energy demand and structure

In line with the main spirit of ecological civilization in the report of the "19th National Congress of the Communist Party of China", and based on the judgment of economic and social development trends, China's total primary energy demand will continue to increase. By in 2020, 2030, 2035 and 2050, it will reach nearly 4.8 billion tons, nearly 5.4 billion tons, 5.5 billion tons, and nearly 5.8 billion tons of coal equivalent respectively. Subsequently, it will remain at a similar level.

The demand for coal and oil will peak successively. The demand for coal will remain stable until 2020, and is then expected to continuously decline. The non-coal share energy demand is expected to climb from 35.7% in 2015 to 55% in 2030, 60% in 2035, and further to 73% in 2050. The demand for oil will remain stable until 2030, and will gradually decline as the scale of electric vehicles expands rapidly. At the same time, clean energy will gradually become a major source of energy demand. The proportion of non-fossil energy is expected to gradually rise from 11.8% in 2015 to 22.5% in 2030, 28% in 2035 and over 40% in 2050. In addition, increased greater electrification will lead to an increase in the share of energy used for electricity generation. The figure will rise from 40.9 percent in 2015 to 48.5 percent in 2030, over 50 percent in 2035 and 54.8 percent in 2050.

Based on the projection of the total energy demand and structure in primary energy, it is, tentatively estimated that China's energy-related carbon dioxide emissions will peak at about 10 billion tons around 2025. Thereafter, it is estimated that total carbon emissions will be basically stable. By 2035, the total amount of carbon emissions are

estimated to gradually drop to 9 billion tons. Thereafter, the pace of carbon emission reduction will increase. By 2050, carbon dioxide emissions are estimated to fall to around 7 billion tons.

Table 1-1 Future demand for primary energy and CO₂ emissions trend in China

		2015	2020	2030	2035	2050
Total primary energy demand (in 100 million tons of coal equivalent)	Coal	27.5	26.7	24.3	22.3	15.7
	Oil	7.7	9.0	9.4	9.1	8.4
	Natural gas	2.5	4.6	8.0	8.6	9.0
	Non-fossil	5.1	7.5	12.1	15.4	24.2
Total		42.8	47.8	53.8	55.5	57.3
CO ₂ emissions (in 100 million tons)		91	97	96	90	71
Proportion of non-coal energy (%)		35.7	44.2	54.8	59.9	72.6
Proportion of non-fossil energy (%)		11.8	15.7	22.5	27.8	42.3
Primary energy used for electricity generation	In 100 million tons of coal equivalent	17.5	21.0	26.1	28.3	31.4
	Proportion (%)	40.9	44.1	48.5	51.0	54.8

Note: According to China's existing calculation method for determining the primary energy demand, if included in the category of primary energy, non-fossil energy used for electricity generation shall be converted into coal consumed in electricity generation.

Actively encouraging and supporting high-end, green manufacturing development will become a critical direction for China's industrial transformation and upgrading. In view of China's industrial development and industrial structure at present, in 2016, industrial added value accounted for 33.3% of gross domestic product in China, and energy consumption and resource consumption per unit of output were apparently higher than those of developed countries. Currently, the energy consumed per USD 1 of added value in China is 4.3 times of that in USA, 7.7 times of that in Germany and France, and 11.5 times of that in Japan. Technology and environmental factors have become two obstacles that impede the industrial development of China and its product competitiveness. Actively promoting green technological innovation, driving green transformation of traditional industries, and realizing modernization and green development of manufacturing are inevitable directions for China's industrial development. By 2035, the green enterprise standard system and the green manufacturing system will be formed gradually. By 2050, the intelligent and green manufacturing industries such as the new generation of information technology, new energy, new material, and high-end equipment will become key drivers of China's economy. Therefore, green transition shall be promoted in three ways: supply-side policy, demand-side policy and the transformation of institutional mechanisms.

1.2 Challenges China faces by 2035

By 2035, China's economic and social environment will be still in the process of transformation, and the ecological environmental protection is an inextricable part of this. Therefore, China's pathway to ecological environmental targets for 2035 must reflect both improvement in addressing current gaps in environmental quality and 'must have' changes enabling further achievements on the way to 2050.

During the "13th Five-Year Plan" period (2016-20), China has made remarkable achievements in the battle of ecological environmental protection and pollution control. Ecological environmental protection and management have been on the right track. At the same time, however, China still faces severe challenges, and the existing problems and solutions are full of Chinese characteristics. Therefore, the focus in the future lies in persistence and implementation.

By 2035, China's ecological environmental protection will face the following problems and challenges:

- The transformation of the industrial, energy and transportation sectors as well as land-use structure will continue. The improvement of China's ecological environment quality must be based on the greening of production and consumption patterns, including lifestyles. Equal attention shall be paid to economic structural and environmental improvement.
- The ways of integrating ecological environment protection into economic, political, cultural and social fields is still not obvious, and more needs to be done to provide incentives that make integration spontaneous and self-sustaining.
- We shall pay more attention to the public's ecological environment needs and interests, in view of China's social development, including environmentally related health impacts. The scope of ecological environment governance will be gradually expanded from the battle against pollution to solving more comprehensive and difficult problems such as climate change, resource efficiency, water management, air quality, soil, waste and chemicals management, biodiversity, environmental health, marine environment, environmental risks, etc.
- From the 14th Five-Year Plan period to beyond 2035, target setting, the implementation path, policy formulation and supporting measures for ecological environmental protection shall be consistent and forward-looking. The ecological

and environmental protection strategy should not be affected by pressure from economic trends. Planning tools need to be utilized to ensure that existing and future Beautiful China targets will be achieved. Monitoring networks are necessary to assess baseline and progress.

1.3 Phased approach to ecosystems and environmental protection requiring 2020-2035

Based on the elements of the ecological environment, the proposed proposal phased approach which identifies key tasks for improving the eco-environmental quality during the period 2020-2035 can help to guide the direction of policy adjustment and optimization.

- Air quality nationwide meets national consistently agreed standards. The air quality of metropolitan areas around Beijing, Shanghai and Guangzhou will reach the current level of the air quality of London, the UK. The control of conventional pollutants such as PM2.5, PM10, SO2, NOx, etc. will be completed by 2025, and the stabilization phase will begin by 2035. Incorporating new pollutants such as O3 and volatile organic chemicals into the air quality management system requires the deployment of relevant action plans in advance.
- Focus on the treatment of seriously polluted water bodies and complete the restoration of water environment. The government should pay attention to key areas such as organic pollution control of water bodies, disposal of heavy metal pollution, underground construction such as pipe networks, sediment pollution control, marine pollution control, etc., and completely eliminate black and odorous water bodies in urban built-up areas. These measures can make the quality of centralized urban drinking water sources in line with Class III or above. In addition, the water quality of major rivers should reach the current level of the Rhine River, the water quality of offshore areas should be comprehensively improved, and the water quality of key sea areas should be as good as that of developed countries or regions. The water quality management system will still be dominated by end-of-pipe treatment and restoring the restoration functions of water environmental systems. The effectiveness of joint prevention and control of the upstream and downstream components of river basins will be further strengthened.
- Strictly protect the soil environment and extend the restoration work from pilots to the whole country. By 2025, China will establish a soil pollution control system that focuses on controlling sources and risks, and comprehensively controls the

environmental risks of contaminated land that is not being developed as well as contaminated land that is being redeveloped and utilized. By 2035, the country will fully achieve the objectives of pilot projects to remediate soil pollution. This will be promoted nationwide and used to accelerate the comprehensive treatment of soil pollution control and remediation restoration.

- Ecosystems enter a comprehensive recovery phase. The forest coverage rate and the proportion of ecological public welfare forests are continuously increasing, biodiversity reduction has been halted, and ecological service functions have been greatly improved. By 2035, there will be an improvement of various ecological restoration measures. The self-restoration and adjustment capabilities of the key ecosystems will be fully restored, and various regional ecosystems will be stable.
- Public health will become the core of the eco-environmental protection system, and the corresponding environmental health management system will be established. Air quality (outdoor and indoor), noise, chemicals, drinking water and climate change may all have an impact on public health.

2. CONNOTATION AND SETTING FOR FUNDAMENTALLY IMPROVING ENVIRONMENTAL QUALITY GOALS BY 2035

Considering the basic economic and social features of the green transition by 2035, and analyzing the main challenges and changes China may face by 2035, it is proposed the connotation of the goals of fundamental improvement of environmental quality by 2035 and the Beautiful China.

2.1 Connotation of the fundamental improvement of environmental quality by 2035

General Secretary Xi Jinping proposed two, phased goals for realizing a Beautiful China at the National Ecological Environmental Protection Conference in 2018: First goal is, by 2035, **there will be a fundamental improvement in the environment, and the goal of building a Beautiful China will be basically attained. The second goal is, by the middle of this century, there will be harmonious coexistence between man and nature, and the modernization of China's governance system and capacity is basically achieved in the field of the ecological environment, and a Beautiful China will be built.** Specifically, a fundamental improvement in the environment involves solving the outstanding ecological and environmental problems, including: (1) Air quality shall be clearly improved (binding requirement), and heavy pollution weather events is basically eliminated; (2) implement the Action Plan for Water Pollution Prevention and Control to ensure water safety and basically improve the urban black and odorous water bodies; (3) fully implement the Action Plan for Soil Pollution Prevention and Control with a focus on key areas, industries and pollutants, and strengthening soil pollution control and restoration; (4) adjust economic and energy structures to achieve green development; and (5) optimize land and space development, and adjust regional and river basin industrial layout.

2.1.1 There will be a fundamental improvement in the environment, and the goal of building a Beautiful China will be basically attained

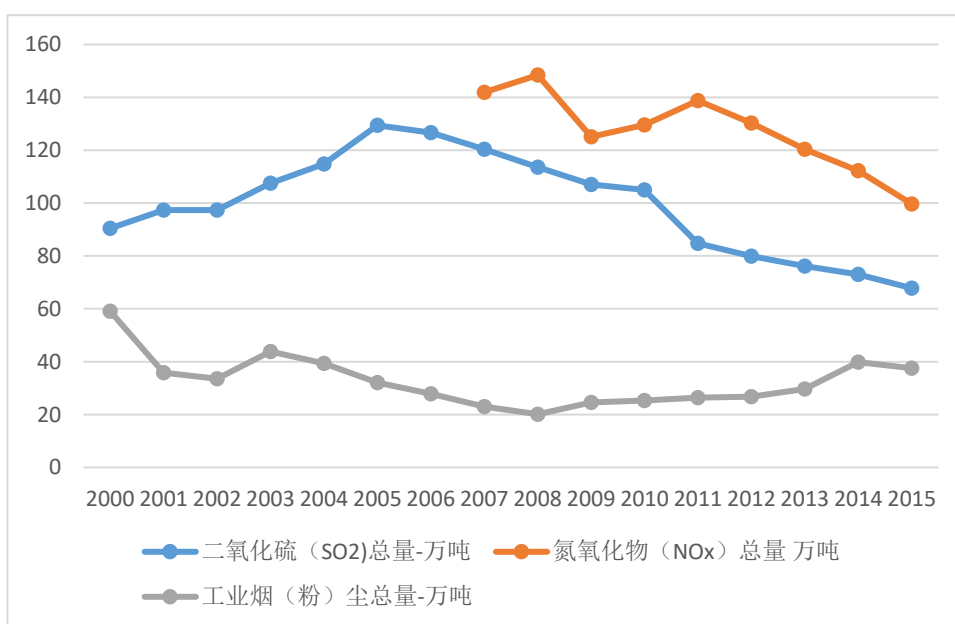
In respect of the first aspect “**there will be a fundamental improvement in the environment, and the goal of building a Beautiful China will be basically attained**”: this concerns the continuous improvement in the ecological environment, and ultimately achieving a certain standard by a specific time and for a specific space, so that the various elements of the ecosystem and the environment are in line with human survival and sustainable socio-economic development. A fundamental improvement in the environment is not a change or improvement at a certain time point, but a long-

lasting process or state. Under this situation, the natural ecosystem will basically restore its carrying capacity, and the environment will begin to realize self-regulation.

An improvement in air pollution in China's Pearl River Delta region provide a useful case study, provides tracking the historical process of environmental quality improvement, the characteristics of the staging various stages, and the driving forces of the economic and social development of the region. It also helps to distinguish identify the macroeconomic and social development strategies of the Pearl River Delta region at different stages from the "10th Five-Year Plan" period, as well as the top-level design route for the overall ecological environmental protection and the policy priorities at each stage. Based on the case study, the this following conclusions: Guangdong's macro development strategy is gradually moving from isolated environmental governance and resource conservation to integrated environmental, economic and social development. On the whole, the green development of Guangdong Province during the "10th Five-Year Plan" period was still relatively isolated. During the "11th Five-Year Plan" and "12th Five-Year Plan" periods, Guangdong Province started to transform economic and social development through resource conservation and environmentally friendly development. During the "13th Five-Year Plan" period, efforts are being made to build an ecological civilization.

Trends and Developments of Air Quality and Social-Economic Progress in Guangdong Province

Guangdong Province is of great reference for the study of the Pearl River Delta in terms of changes in air quality and economic and social development. The following is a study on Guangdong Province, which can be used as a reference for information.



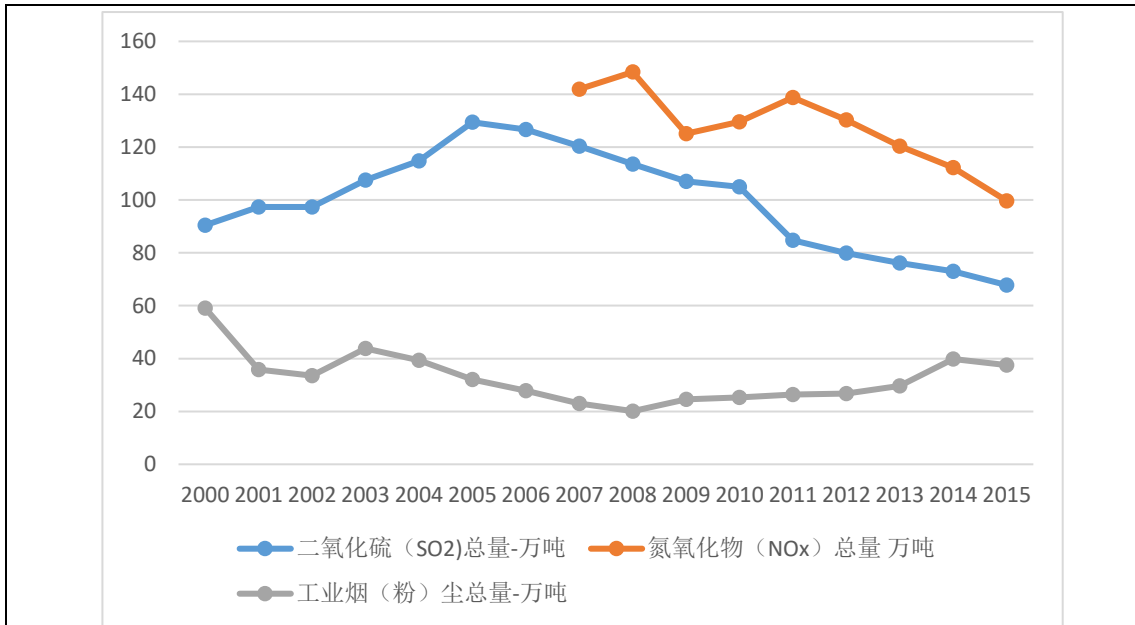


Figure 2-1 Total emissions of major pollutants from 2000 to 2015 in Guangdong Province

(Source: Statistical Yearbook of Guangdong Province, the same below)

SO2-10,000 tons

NOx-10,000 tons

Industrial smoke (powder) dust-10,000 tons

Data for Guangdong Province show that sulfur dioxide emissions continued to decline after reaching a peak in 2005, with an especially significant decline in 2011; industrial smoke (particles) dust emissions began to decline in 2003, but there was a small increase after 2008; nitrogen oxides emissions fell sharply in 2009, then increased, and again started to decrease after 2011.

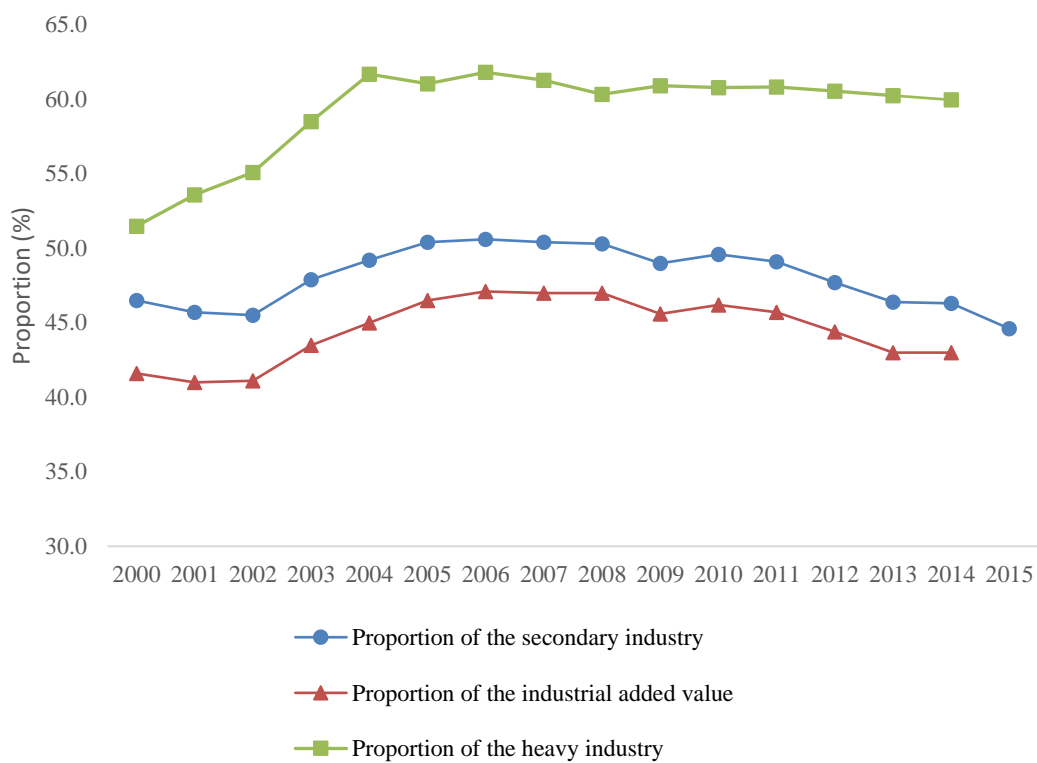
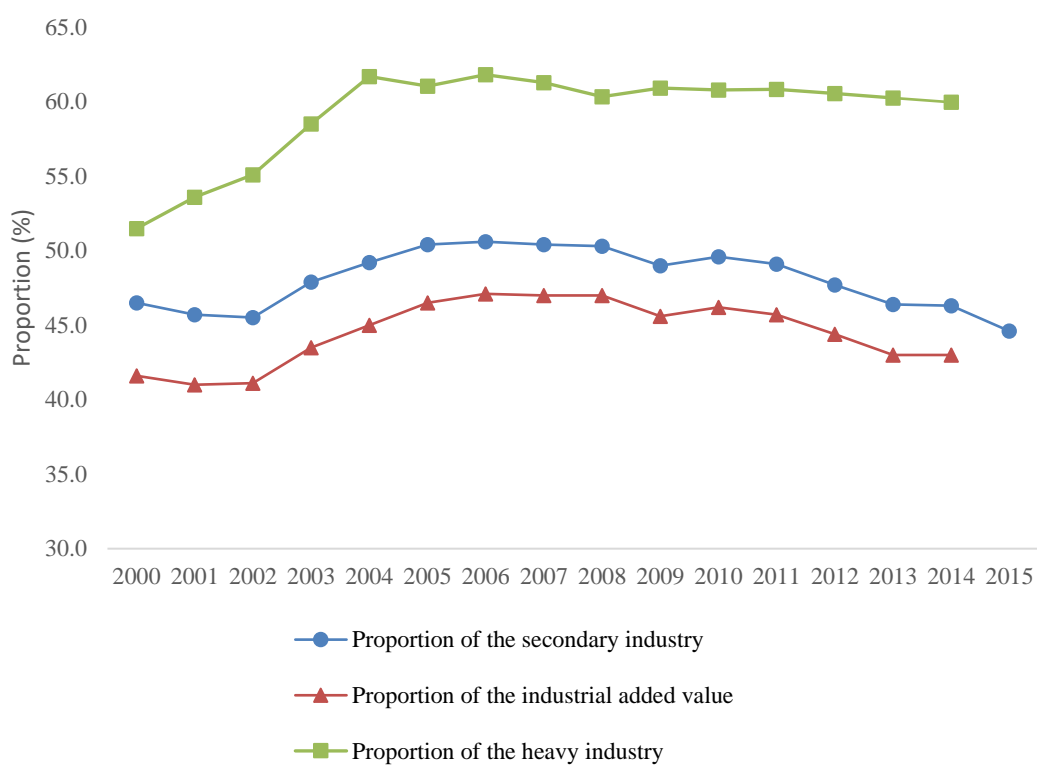


Figure 2-2 Trends in the industrial structure development in Guangdong Province

The proportion of the added value of the secondary sector, the proportion of industrial added value, and the proportion of heavy industry in industrial added value in Guangdong Province continue to decline after peaking in 2006. Specifically, the proportion of value added of the secondary sector dropped from 50.6% in 2006 to 44.6% in 2015. The proportion of industrial added value dropped from 47.1% in 2006 to 43% in 2014. The proportion of heavy industry in industrial added value fell from 61.8% in 2006 to 60% in 2014.

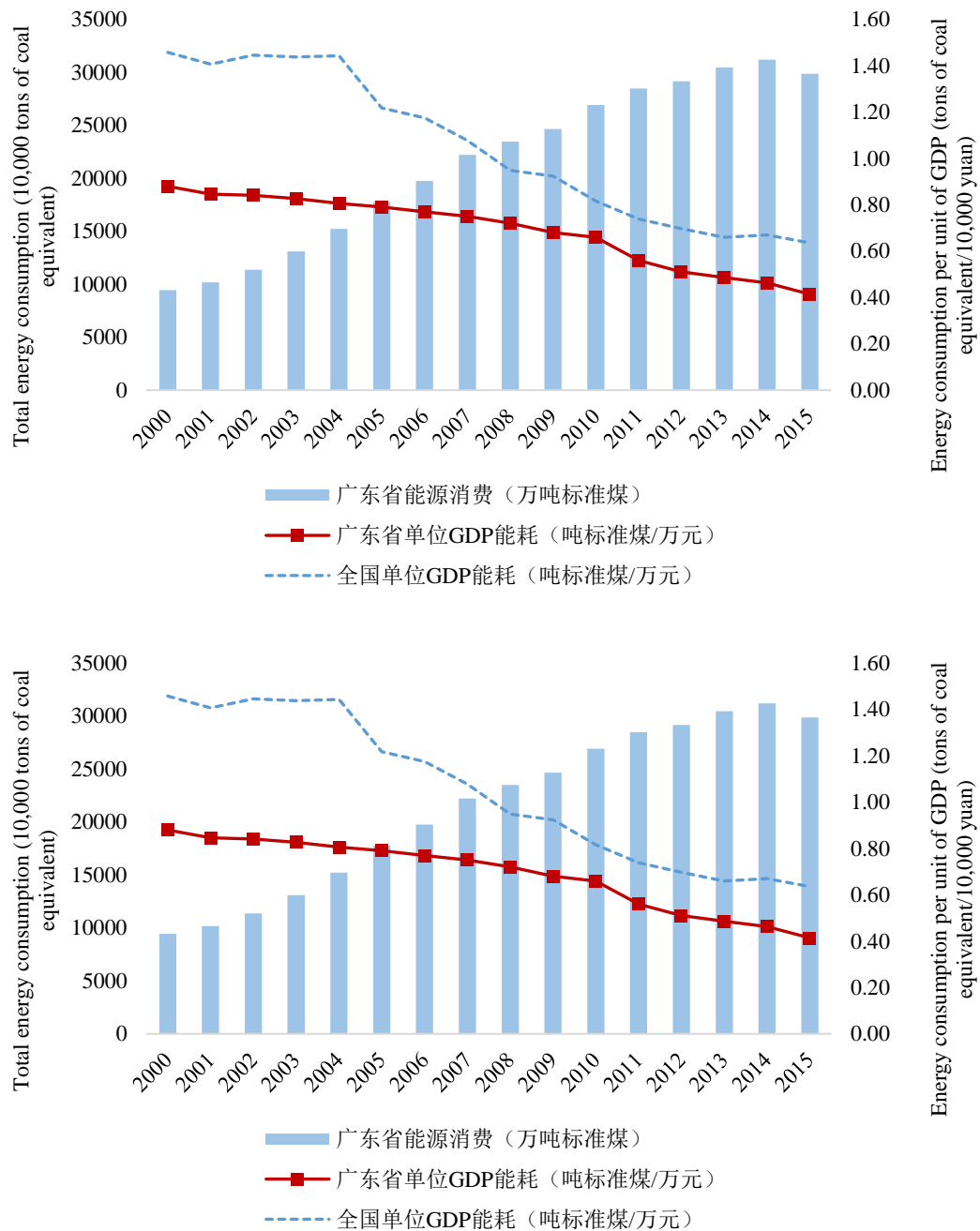


Figure 2-3 Trends in energy consumption in Guangdong Province

Energy consumption in Guangdong Province (10,000 tons of coal equivalent)

Energy consumption per unit GDP in Guangdong Province (tons of coal equivalent/10,000 yuan)

National energy consumption per unit GDP (tons of coal equivalent/10,000 yuan)

The total energy consumption of Guangdong Province continues to rise. In 2014, it reached 311.48 million tons of coal equivalent, 3.3 times that of 2000. The total energy consumption in 2015 decreased for the first time, down 4.2% from 2014. At the same time, the energy consumption per unit of GDP has been declining, from 0.88 tons of coal equivalent per 10,000 yuan in 2000 to 0.41 tons of coal equivalent in 2015.

While the overall changes in the Pearl River Delta are consistent with that of Guangdong Province, there are still some differences, and further detailed analysis is needed.

The following five features shall be realized in order to achieve a fundamental improvement in the environment by 2035:

Firstly, compliance. The quality of the ecological environment shall first of all reach the national standards of the time. This is the most basic feature and the bottom line requirement for the fundamental improvement in the environment. To evaluate whether the quality of the ecological environment is up to standard, efforts shall be made to quantify the applicable targets. By determining the standard and quantitative indicators, it is possible to formulate operational and detailed tasks for evaluation and assessment. “Laggard” shall catch up and achieve compliance with the quality standards; “front-runners” shall maintain the lead and move toward higher standards.

Secondly, stability. On the basis of compliance, the quality of the ecological environment must be maintained in a state of continuous compliance or above the standard with a small fluctuation range (which shall be an agreed range subject to minimizing any exceedances). This is the most essential feature that distinguishes it from the overall improvement goal of the ecological environment in 2020, and is the fundamental requirement of improvement in the environment and pollution control consolidation. Take air quality as an example: the goal is to achieve at least three consecutive years of compliance, 90% of days per year with quality air, basically no “off-the-charts” pollutant (such as PM2.5) level, and no return of heavy pollution. It would be normal to have blue sky and white clouds. It is not easy to protect the ecological environment. To achieve continuous improvement of the environment poses a bigger challenge. To achieve this goal, it is necessary to both mitigate the risk and actively respond to environmental risks, enhance early warning capability and prepare for prompt reaction in order to reduce major ecological and environmental incidents.

Thirdly, balance. The quality of the ecological environment should be comprehensively improved. This is the main feature, and a difficult task in achieving, the fundamental improvement in environment. To achieve balanced development, it is necessary to improve the quality of the ecological environment on three levels. Firstly, comprehensively improve all elements in the environment, including air, water, soil, forest, wetland and biodiversity to meet the standards without any outstanding points of weakness. Secondly, efforts to improve the environment shall fully cover China’s extensive areas. The natural resource endowment and level of social-economic

development varies greatly among different regions, as does the degree of eco-environment damage, resulting in very different governance tasks. As far as the current environmental governance is concerned, emissions of conventional pollutants in the eastern region have reached their peak, showing slow yet steady improvement. The central region is experiencing its worst conditions and may require a longer treatment time. Emissions in the western region continues to increase, posing the biggest challenge. Based on the status quo, a fundamental improvement in the environment by 2035 requires narrowing the gap in environmental quality between regions and achieving balanced development, so as to realize comprehensive and thorough improvement to the ecological environment. A whole of China approach is required to minimize the risk of high polluting industries being displaced to central and western China and a worsening of their ecological environment. Finally, we shall decoupling environmental pollution from economic growth. Efforts shall be made to coordinate the development, and truly follow the principle that “green mountains and clear water are as good as mountains of gold and silver”, which is the inherent requirement for achieving fundamental improvement in environment.

Fourthly, comparability. We should regard the improvement of China’s eco-environment from an international perspective. Its governance outcome and quality standards shall be comparable with those of developed countries such as the United States and Europe, and can provide reference for late-developing countries. With growing globalization, China needs to gradually integrate itself into the global environmental governance process. As a responsible country, China shall ensure comparable quality of the eco-environment in the global context. The meaning is threefold. The first is that China shall have comparable environmental elements and concerns. In addition to the local outstanding eco-environmental issues, it is necessary to gradually incorporate key environmental issues of concern in international environmental governance into our national governance system, or further enhance our efforts in this regard. This includes issues such as climate change issues, marine micro-plastics, migration and diffusion of atmospheric pollutants, and biodiversity conservation issues. Secondly, it is necessary to gradually improve the quality standards and bring them in line with those of the developed countries, enhance international recognition of our environmental governance performance, and strengthen our bargaining power. Finally, it is essential to apply data monitoring technologies that are comparable to the developed countries and gradually narrow the gap in between.

Fifthly, consistency. According to the main contradictions in China's current society and the fundamental purpose of the Communist Party of China, the ultimate goal of people-oriented development, and to achieving a fundamental improvement in the environment, is to meet the people's desire for a better life. Therefore, it is not only an improvement in the statistics, but also an overall improvement of the feelings of the people about the environment. A sound eco-environment can thus truly become the growth point for a better life for the people. For example, we shall pay special attention to the current issues, e.g. decreasing concentrations of major pollutants in the atmosphere yet no significant improvements in visibility; environmental monitoring

data showing compliance with environmental requirements yet persistent odors; water complying with environmental requirements but with low clarity; clear water but posing a risk to human health, etc. Greater use of health related data may be a useful means of demonstrating China's progress in addressing the less visible pollutants and minimizing public concerns. An important feature of achieving a fundamental improvement in the environment by 2035 is to ensure that the general public feels that its environmental quality of life has improved.

2.1.2 There will be harmonious coexistence between man and nature, and the modernization of China's governance system and capacity is basically achieved in the field of the ecological environment, and a Beautiful China will be built

To modernize the national governance system in the field of ecological environment, the policy framework shall include the following:

- **Developing an ecological and cultural system based on ecological values.** The main objectives include: Popularization of ecological civilization education; construction of national forest parks; construction of natural and wetland protected areas to strengthen research of ecological cultural systems; development of ecotourism and cultural tourism.
- **Establishing an ecological and economic system with eco-development of industries and industrialization of eco-development.** It is required to closely integrate, coordinate and optimize the industrial, ecological and social systems within a specific regional space and to do so within the carrying capacity of natural systems, making full use of resources, ending environmental damage, and coordinating the sustainable development of nature, society and economy.
- **Establishing an ecological civilization system that guarantees the modernization of the governance system and capacity.** The ecological civilization system mainly includes systems for natural resource property rights, the development and protection of land, spatial planning, total resource management and comprehensive conservation, payments for use of resources and ecological compensation, environmental governance, ecological civilization performance evaluation and responsibility, investigation and accountability, etc.
- **Establishing an ecological protection system focusing on the virtuous cycle of ecosystems and the effective prevention and control of environmental risks.** The requirements for the construction of an ecological protection system include restoring ecological space, improving the quality and area of ecosystems, improving and maintaining air quality, water environment, water resources, soil resources, slowing down biodiversity degradation, and maintaining biodiversity

2.2 Eco-environmental quality and Beautiful China's milestone targets (for the next 5 years and by 2035)

2.2.1 Target for the next 5 years

In 2016, the State Council promulgated the “13th Five-Year Plan for Ecological Environmental Protection”, which proposed protection measures and development goals for air, water and soil pollution prevention and control. Table 1 shows the development goals of ecological environment quality to 2020, covering three aspects: environmental quality, total pollutant emissions, and ecological protection and restoration.

Table 1-1 Ecological environmental quality development goals

Indicator		2015	2020	(Cumulative) 1	Attributes
Eco-environmental quality					
1. Air quality	Prefecture and above cities ² : ratio of days with good and moderate air quality (%)	76.7	>80	-	Binding
	Pollutant concentration decrease of prefecture and above cities with non-complying level of fine particulate matters (%)	-	-	(18)	Binding
	Decreased proportion of days with heavy pollution and above in prefecture-level and above cities (%)	-	-	(25)	Expected

2. Water environmental quality	The ratio of water body with surface water quality ³ that is or better than Class III water (%)	66	>70	-	Binding
	Proportion of water body with Class V surface water quality (%)	9.7	<5	-	Binding
	Water quality compliance rate of important rivers and lakes in the functional area (%) How many does this capture?	70.8	>80		Expected
	Proportion of very poor groundwater quality (%)	15.7 ⁴	~15	-	Expected
	Proportion of water quality (Class I and II) in coastal regions (%)	70.5	~70	-	Expected
3. Soil quality	Contaminated farmland safe use rate (%)	70.6	~90	-	Binding
	Contaminated land safe use rate (%)	-	>90	-	Binding
4. Ecological status	Forest coverage rate (%)	21.66	23.04	{1.38}	Binding
	Forest stock (100 million cubic meters)	151	165	{14}	Binding
	Ratio of red line area (%)			{25}	Binding

	Wetland coverage (100 million <i>mu</i> , \approx 6,666,666.7 ha)	-	≥ 8	-	Expected
	Vegetation coverage rate of grassland (%)	54	56		Expected
	Ecological environmental status index of counties with key ecological functional areas Confirm index please. Does this reflect broader biodiversity measures? RK	60.4	>60.4	-	Expected
	Forest pests occurrence rate		<4‰		Expected
Total pollutant discharge					
5. Reduction of total discharge of major pollutants (%)	Chemical oxygen demand	-	-	(10)	Binding
	Ammonia nitrogen	-	-	(10)	
	SO ₂	-	-	(15)	
	NO _x	-	-	(15)	
6. Reduction of total regional pollutant emissions (%)	Volatile organic compounds in key industries in key regions ⁵	-	-	(10)	Expected
	Key area total nitrogen ⁶	-	-	(10)	Expected
	Key area total phosphorus ⁷	-	-	(10)	

Ecological restoration				
7. National key wildlife protection rate (%)	-	>95	-	Expected
8. National natural shoreline retention rate (%)	-	≥35	-	Expected
9. Newly restored desertified land (10,000 square kilometers)	-	-	{10}	Expected
10. Newly treated area of soil erosion (10,000 square kilometers)	-	-	{27}	Expected
<p>Note: 1. { } is a five-year cumulative number.</p> <p>2. The air quality assessment covers 338 cities across the country (including prefectures and some provincial-level cities, excluding Sansha and Danzhou).</p> <p>3. The assessment of water environmental quality covered the national surface water control section, and the number of sections increased from 972 to 1,940 during the “Twelfth Five-Year Plan” period.</p> <p>4. Statistics in 2013.</p> <p>5. Promote total volatile organic compounds cap control in key regions and industries in order to drop the total national emissions by more than 10%.</p> <p>6. Implement total nitrogen control in 56 cities along the coast and 29 eutrophicated lakes and reservoirs.</p> <p>7. Implement total phosphorus emissions cap on non-complying entities and relevant upstream areas.</p>				

Source: 13th Five-Year Plan for Ecological Environmental Protection

In terms of climate change, according to the goal of building a moderately prosperous society in all respects, the National Development and Reform Commission and relevant departments have prepared the *National Planning on Response to Climate Change (2014-2020)* with 2020 climate change goals as shown in Table 2.

Table 1-2 China's 2020 climate change target requirements

Indicator	2020 goal

Greenhouse gas emission control action	
CO ₂ emissions per unit GDP	40%-45% lower than in 2005
Non-fossil energy and primary energy ratio	15%
Adaptation to climate change	
Effective utilization coefficient of farmland irrigation water	>0.55
Ratio of restored desertified land	>50%
Forest pests occurrence rate	<4‰
Optimize energy mix	
Natural gas consumption in primary energy consumption	>10%, utilization amounted to 360 billion m ³
Conventional hydropower installed capacity	350 million kilowatts
Installed capacity of nuclear power	58 million kilowatts
Grid-connected wind power installed capacity	200 million kilowatts
Solar power installed capacity	100 million kilowatts
Biomass installed capacity	30 million kilowatts
Energy conservation	
Total energy consumption	About 4.8 billion tons of standard coal

CO ₂ emissions per unit industrial added value	about 50% lower than in 2005
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Source: National Planning on Response to Climate Change (2014-2020)

2.2.2 2035 target

According to China's social and economic development, the goal building a Beautiful China by 2035 is as follows:

Indicator		2035	(Cumulative) compared to 2015	Attributes
1. Air quality	Prefecture and above cities ² : ratio of days with good and moderate air quality (%)	90	-	Binding
2. Water environmental quality	The ratio of water body with surface water quality ³ that is or better than Class III water (%)	80	-	Binding
	Water quality compliance rate of important rivers and lakes in the functional area (%)	90		Expected
	Proportion of water quality (Class I and II) in coastal regions (%)	85	-	Expected
3. Soil quality	Cultivated land safe use rate (%)	100	-	Binding
4. Ecological status	Forest coverage rate (%)	27	(1.38)	Binding
5. Reduction of total discharge of major pollutants (%)	Chemical oxygen demand	-	(25)	Binding
	Ammonia nitrogen	-	(25)	
	SO ₂	-	(20)	
	NO _x	-	(25)	
6. Reduction of total regional pollutant emissions (%)	Volatile organic compounds in key industries in key regions ⁵	-	(20)	Expected
	Key area total nitrogen ⁶	-	(20)	Expected
	Key area total	-	(20)	

	phosphorus ⁷			
7. National key wildlife protection rate (%)	-	-		Expected
8. National natural shoreline retention rate (%)	-	-		Expected
9. Newly restored desertified land (10,000 square kilometers)	-	{ 30 }		Expected

2.3 Overall considerations regarding the 2035 goals

2.3.1 The medium- and short-term goals must be consistent in direction and well connected.

The medium- and short-term goals should be consistent over time, space, and levels of government; as well as connected to the foreseen changes in the economy, social context and urbanization. We shall carry out relevant work done in advance based on the goals by 2035. The goals of the 14th Five-Year Plan shall refer to the 2030 and 2035 goals and be defined based on the goals of Beautiful China 2035. Some of the target indicators of the 13th Five-Year Plan need to be improved steadily, and it is necessary to continue to meet and simultaneously strengthen the requirements for rural areas, ecosystems, climate change, and environmental health (especially the health problems of vulnerable groups such as women and children), so as to carry out relevant work in advance. A three-year moving average could be considered for setting some targets.

2.3.2 The 2035 targets should align with China’s pathway to 2050.

This is particularly important for slow-changing and long-lived systems, such as the energy system; urban layout and others. Methods of foresight need to be applied in order to enable timely initiatives, for example in large old-style manufacturing areas. Foresight methods are also required to avoid, as much as possible, painful write-offs of systems that may be of some use towards 2035 but have no role thereafter (‘stranded assets’). ‘Clean coal’ is a case in point. In addition, a timely understanding of the challenges and opportunities of adaptation to climate change is needed in order to minimize eventual cost and disruption and potential public health risks.

2.3.3 Regional differences should be taken into account when working toward the 2035 goals.

Due to the wide differences among regions with different economic development level and natural resources /biodiversity values it is unrealistic to expect all regions to

achieve the goals of Beautiful China by 2035. For example, the Pearl River Delta region may complete the goal by 2030, while it may take longer in central and western regions. For developed and underdeveloped regions, on the condition that they have met the same environmental standards and requirements, the principle of “common but differentiated responsibilities” shall also be determined; that is, we shall encourage some regions to achieve the goals of Beautiful China first while giving more support to poor and vulnerable regions so as to avoid the deterioration of the ecological environment. Environmental governance will put more emphasis on sharing positive experiences and win-win benefits. It is recommended to establish a Beautiful China demonstration zone. This could be done by establishing ecological provinces, cities, counties and districts that could play leading and demonstration roles. (2) In line with this, and as far as possible, the target indicators and policy measures for the 14th Five-Year Plan shall be differentiated by region, and the related implementation guidance and capacity building shall be strengthened. Regional differentiation should be accompanied with a timetable showing the eventual application of ambitious protection to all regions of China and allowing investors and other actors to anticipate on this. Policies that provide perverse incentives for investments in regions with less stringent environmental requirements should be avoided.

2.3.4 We shall establish a target and indicator system that is oriented to ecological priorities and green development, so that a high-quality development can be supported.

This shall be the core guiding idea of the 14th FY plan. The SPS recommends targets that are ambitious, clear, measurable, outcome-based, use SMART-related criteria, focusing on absolute ambient-level targets rather than intensity targets. In terms of emission targets, it underscores the importance of setting and then sticking with long-term emission targets, to enable different actors to meet them. This approach could assist other countries in achieving environmental and development goals.

2.3.5 Regular and independent review of targets and indicators and establishment of the tracking system

As the general conditions for achieving sustainable development may change, new problems and possibilities may arise or new and better data may become available, a regular independent revision of indicators, targets and measures required is necessary. In terms of the Beautiful China demonstration zone, it is suggested to strengthen long-term tracking of the goal of achieving Beautiful China, build an evaluation system for achieving Beautiful China goals, implement assessment and early warning, establish

improvement mechanism, and strengthen policy preparations.

Box 1 German Sustainable Development Strategy: Targets and indicators

Targets and indicators reflect the status of sustainable development and form the basis for assessing the success of the measures taken.

The German Sustainable Development Strategy is not based on a single index per SDG but on several key indicators. The number of these key indicators is kept relatively small (in comparison to the UN SDGs, with a total of 232 indicators) in order to provide a quick overview of the current state of sustainable development in Germany. After the current revision of the strategy in 2018, 67 indicators have been established to track progress in 36 areas among the 17 SDGs. These key indicators also serve as points of entry for other national indicator systems, for example the indicators of the National Biodiversity Strategy.

Most indicators are linked to quantitative targets (e.g. “indicator x shall reach value y in year z”). Other indicators are linked to qualitative targets (e.g. “indicator x shall increase in the future”). Progress towards the target is evaluated in an independent report by the Federal Statistical Office of Germany. For a quick overview and better comparison, the result of the evaluation for each indicator is illustrated by weather symbols in four categories (e.g. sun for very good performance, thunderstorm for very poor performance).

1.Principles of Target and Indicator Development

Specifying adequate long-term goals and indicators is a requirement for the successful implementation of any sustainability strategy. They reflect the status of sustainable development and form the basis for monitoring the success of measures taken. With regard to the German Sustainability Strategy process, the following success factors have proven to be important:

2.Embedding national targets into the international framework (of SDGs)

The 2030 Agenda’s SDGs provide an exceptional framework for the development of national targets and indicators. Linking national indicators and targets to a well-established international process leads to a broader relevance and acceptance of the strategy and facilitates the international exchange of experiences.

3.Highlighting the relevance of the targets

In order to promote acceptance and support for newly developed targets, it is important to link them to internationally agreed goals such as climate protection and to underpin them with recognized scientific findings.

4.Reflecting national priorities

Political priorities must include ambitious targets and indicators. This is the only way to link ambitious policy measures to targets and ensure successful monitoring. The number of indicators and targets should be limited.

5.Illustrating interdependencies, synergies and conflicts of social, environmental and economic targets

While targets are often assigned to one specific dimension of sustainability, they have interdependencies with the other two dimensions. These interdependencies and possible synergies and conflicts must be taken into account when developing indicators for the targets. An ecological economic system not only has a positive impact on the ecologic dimension of sustainability, e.g. reduced CO₂ emissions or reduced resource consumption. It may also contribute to achieving economic targets, e.g. by improving competitiveness through more efficient use of energy and decreasing dependence on potentially depleting resources.

6. Scaling down goals and indicators in order to be relevant for action and linking measures to them

Since overarching goals are generally broad in scope, the design of more specific sub-goals and related indicators is important in order to enable detailed monitoring. Targets and indicators should then be chosen in such a way that they can be linked to and affected by policy measures.

The goal of reducing CO₂ emissions for example can be divided into reductions in the sectors of industry, private households and transportation. A further subdivision would be possible for the different pathways for achieving this goal: Increasing energy efficiency and increasing use of renewable energy sources. As a result very specific targets and indicators (linked to specific measures) can be developed.

It has to be noted though that indicator-based monitoring is not the only instrument for the evaluation of the strategy and its implementation. Not all domains and measures that are relevant to sustainable development can be reflected in an indicator-based monitoring system.

Further feedback regarding the success of the strategy and its measures is given by all the relevant stakeholders (e.g. the Council for Sustainable Development, the Parliamentary Advisory Council for Sustainable Development, other social actors and international experts within the framework of the Peer Review).

7. Defining clear responsibilities and establishing transparent and credible monitoring

It is indispensable to monitor the progress towards achieving the targets and to take subsequent action. In Germany, the Federal Statistical Office is responsible for monitoring. It enjoys a high degree of recognition in the sense of high data quality assurance. The quality and acceptance of monitoring is also a decisive success factor.

8. Regular and independent review of targets and indicators

As the general conditions for the sustainable development process may change, new problems and possibilities may arise or new and better data may become available, a regular independent revision of indicators and targets is necessary. In Germany, this revision process is carried out by international experts as part of the peer-review process of the sustainability strategy. In the current revision of the 2018 strategy, 3 new indicators were introduced and 2 targets revised to better reflect the current state of science and policy.

3. A COMPREHENSIVE LIST OF RELEVANT INITIATIVES TO GREEN TRANSFORMATION BY 2035

In accordance with the strategic plan of the 19th National Congress to build a “Beautiful China”, all sectors of society are gradually building consensus and actively promoting green transformation. However, it is actually a complex systematic project to achieve and realize green transformation, which not only requires a supervision and implementation of the already established air pollution control actions as well as a construction of a clean, low-carbon safe and efficient modern energy system for minimizing the pollutant output; but also requires a long-term green development plan for promoting green production and green consumption which contribute to the reduction of the generation of pollutants from the source. At the same time China’s population ages, its economic engine will gradually but significantly shift from export to domestic consumption. In addition to sorting out the existing economic and social green transformation policies, this report focuses on the policy measures to promote the transformation of green consumption. In contrast to the traditional policy system in the field of production, these policy measures attach more emphasis to influencing consumer preferences, the guidance of consumer behavior, and the increase in the supply of green consumer goods. At the same time, more emphasis is placed on relying on market instruments rather than administrative orders for green transformation. There will be a lot of challenges arising from the green transformation to 2035. In some areas such as products, technologies, and systems, the challenges have always existed and the difficulties identified, but the direction is clear. However, in terms of how to promote green consumption, the challenges we have encountered and will encounter are new. At present, there is no consensus established; built in particular, it is still not known what kind of policy measures need to be adopted and how government departments in various fields can cooperate with each other. These will be important challenges to be addressed for China to achieve green transformation in the future.

3.1 Realizing the economic and social green transformation

3.1.1 To realize the structural green transformation of energy

3.1.1.1 Continuing to deepen the reform of the power system

Efforts in this regard include accelerating the establishment of transparent and efficient national and provincial power trading platforms, improving the medium- and long-term power trading mechanism, and further promoting the construction of auxiliary power service markets and pilots of the spot market. The work also includes speeding up the deregulation of power generation and electricity use plans, increasing the proportion of market-oriented power transactions, further reducing the energy costs of enterprises, accelerating the reform of power distribution/marketing and improving the fairness and

openness of incremental distribution networks to the public. We shall also put in place a price and distribution mechanism that is conducive with the on-grid consumption of power generated from renewable energy, and gradually implement the power allowance assessment of renewable energy and green certificate trading mechanism, etc.

3.1.1.2 Continuing to deepen oil and gas reform

The reform of the oil and gas exploration and exploitation management systems shall be deepened, and detailed rules shall be issued as soon as possible; the exit mechanism of oil and gas exploration areas shall be strictly implemented, the competitive transfer of blocks shall be comprehensively put into practice, transfer of mineral rights in a market-oriented manner shall be encouraged, and the rules of transfer of mineral rights, reserves, and value assessment, among others, shall be improved. A mechanism for the disclosure and sharing of oil and gas geological materials shall be established and improved; the reform of the pipeline operation mechanism shall be promoted, the independence of the pipeline shall be realized, and the natural gas pipeline network and other infrastructure shall be available to third-party market entities in a fair manner. The price scheme of residential natural gas gate station and the sales price of residential natural gas shall be rationally implemented; differentiated price policies such as seasonal price difference and interruptible gas price shall be implemented to promote load shifting; price regulation of natural gas transmission and distribution links shall be enhanced, excessively high transmission and distribution price in provincial regions shall be reduced, etc.

3.1.2 Financial support from the central government

Central government funding has an important role to play in supporting the green transformation and upgrading of the industry. The government can provide support for the green upgrade of both the software and hardware dimensions of the traditional manufacturing industry through market-based means such as industrial innovation funds, targeted tax reductions and exemptions, targeted financial subsidies, for instance, by supporting circular economy and green factory demonstration, encouraging software integration development that supports green development with IT technology, actively promoting the development of a productive service industry and key technological innovations in advanced manufacturing and emerging industries to tackle a number of key technology obstacles. In the strategy for regional coordinated development and the process of building city clusters and industrial clusters, indispensable enterprises or parts of the industry chain with high pollutant emissions intensity are to be retained by green transformation and technological innovation supporting government funding to

avoid a “one-size-fits-all” shutdown action.

3.1.3 Focusing early on high-quality technological research and development and strengthening support for green technology

3.1.3.1 Building a public service platform for green technology.

We shall strengthen the development of public service platforms and intermediary service institutions that promote the green upgrading of traditional industries, accelerate the establishment and improvement of innovative platforms such as green technology centers, etc., promote the dissemination and application of key and common industrial technologies, and enhance the green technology capacity of traditional industries as a whole; we shall develop technology service institution of various kinds, enhance the supportive role of platforms for science and technology, for instance, by building green technology literature service platforms, policy information service platforms, technology data and green technology information platforms, as well as sharing of large scientific research equipment; we shall develop some data bases on green science and technology commercialization achievements, focus on promoting the development of green innovation and entrepreneurship service centers to accelerate the commercialized application of scientific and technology achievements.

3.1.3.2 Improving an Industry-University-Research collaboration mechanism

Innovations in Industry-University-Research integration shall be made focusing on pillar industries such as green high-end equipment manufacturing and new energy, etc. This could include encouraging enterprises to establish academician workstations, post-doctoral workstations and engineering technology research centers with universities and research institutes at home and abroad; and to form a scientific research & development & production collaboration mechanism with complementary advantages and benefit and risk sharing by making full use of technology achievements from universities and research institutes and production capabilities from enterprises.

3.1.3.3 Focusing on building a talent guarantee system.

Optimizing the range of disciplines at higher education institutions to foster various talents needed for the green transformation and upgrading of manufacturing, and to develop a group of professionals and engineers in science and engineering. The curriculum design shall be aligned with fundamental, cutting-edge, and key generic technologies and applications, and combined with production

practice; practical teaching of basic theory courses shall be strengthened, by incorporating the assessment in the practice session into the assessment for the entire course. **Shifting the talent selection from a “degree over skill” mindset.** The green upgrading of traditional industries cannot happen without frontline skilled workers. We shall improve the vocational training system, popularize the vocational training for mid- and low-end labor force; improve support of resources for higher vocational and technical colleges, and enhance the status of higher vocational and technical colleges in the current collegiate system; accelerate the development of equivalent job title evaluation for skilled workers to enable skilled workers to enjoy the same benefits as senior engineers (researchers, professors); form an interactive dynamics with a view to cultivating skilled workers comprising government incentives, increased enterprise investment, and active participation by training institutions and workers.

3.1.3.4 To strengthen intellectual property rights protection.

Putting in place an intellectual property rights protection system suitable for China’s national conditions and based on the key principle of equity. We must make bold explorations and implementations of the commercialization mechanism of scientific and technological achievements to protect and stimulate the enthusiasm of the market for scientific and technological innovation; strengthen the crackdown on intellectual property infringement, increase the penalties for infringers, by strictly cracking down on any infringement activities, exposing typical cases and incorporating infringement information into social credit records; we shall reform the patent examination and approval system and shorten the patent review cycle; a serious problem involved in the patent examination and approval system is the patent royalties charging system. It is recommended that fees shall be charged reasonably according to the size of the economic benefits of the patent. Unreasonable fees shall be eliminated to avoid reducing incentives for invention. **Speeding up the establishment of intellectual property rights protection assistance system for green innovation.** Priority shall be given to the development of an intellectual property rights protection system and dispute settlement mechanism for green technologies by drawing experience from intellectual property rights protection issues faced by China’s manufacturing enterprises in international trade and investment. It is recommended that a deep cooperation mechanism among administrative departments, judicial departments, and large internet platforms be built to realize effective protection of intellectual property rights from the industry’s green innovation by the administrative and judicial authorities in the context of spatial network.

3.1.4 To stimulate the active participation of enterprises.

Encouraging a group of core enterprises to be front-runners can help to drive the green transformation of regional economies, give full play to the self-discipline and self-learning capacity of the industry, and integrate the concept of environmental protection into design, layout, products, technologies and processes, rather than acting after pollution once caused. In particular, it is proposed to foster green and innovative enterprises. The status of enterprises as the actors of innovation shall be further defined. With a view of making breakthroughs in key and common technologies, resources shall be consolidated to strengthen support for the development of R&D centers of green technology businesses, provide guidance to enterprises to improve apparatus and equipment for scientific researches, upgrade their equipment capabilities, continuously enhance the level of technology in their products, to accelerate the cultivation of innovative enterprises; relevant tax policies, such as tax-deductible R&D costs, accelerated depreciation of fixed assets, custom duty exemption for introduced technical equipment, customer and import VAT exemption for key raw materials and components of major technical equipment, VAT deduction for enterprises purchasing machines and equipment, etc., shall be implemented. The development of the National Emissions Trading System shall be completed as soon as possible including the development and improvement of implementing rules and regulations, to encourage enterprises to increase investment in green technology innovations and enable to enjoy returns as soon as possible.

Box 2 Environmental technology as win-win for ecology and economy

As experience of environmental policy in the last century shows, relatively low hanging fruits for environmental policies are measures leading to a win-win-situation for ecology and economy.

1. Win-win measures in Germany

For example, Germany's long-standing pioneering role in the field of environmental technologies has both opened up export opportunities and brought longer-term dynamics to environmental policy. The substitution of fossil energies and other critical resources with renewable energies/material is a key area for harmonizing ecological and economic interests. The German Renewable Energy Act (EEG) from 2000 originally provided a feed-in tariff scheme to encourage market entry for electricity from renewable sources with a guaranteed tariff for 20 years. Since 2014, this scheme is being transferred to an auction system. The EEG led to a boom in

renewable energy production (currently 36% of German electricity supply originates from renewables), numerous technological developments and generated more than 300.000 jobs. Another important field are all kinds of efficiency improvements optimizing the input-output-relation of resources on the one side and goods/services on the other side. Around one fourth of Germany's total final energy consumption is consumed by private households, most of it for space heating. Measures improving thermal insulation are accordingly effective. Since 1976, several energy conservation acts, regulations and funding programmes were passed by the German government, leading to a relative reduction of the specific final energy consumption for space heating by more than a third (per m²) from 1996 to 2016. This is not only beneficial for environmental reasons but also implies important potential economic savings for residents and income for companies and workers. However, the decrease in specific final energy consumption (per m²) for space heating is partly compensated by an increase in living space per person.

2. Top-runner approach in Japan

The top-runner approach, first implemented in Japan, helps the most environmentally friendly technology within a certain product group to penetrate the market in short time. The best available product on the market is declared standard which has to be met by other products of the same group within a certain time frame. Products which fail to meet the standard within the specified time frame can no longer be placed on the market. Besides ecological benefits, this instrument furthers technological development and leadership of certain industries. Although not implemented up to date, the German government has been advocating a top-runner approach at EU level since 2007 in order to increase energy efficiency of products.

3.2 Promoting the green consumption transition

In view of the growing importance of China's domestic consumption as a driver of its economy, we shall speed up the reform of the systems and mechanism concerning green products and services in order to accelerate their effective supply; perfect the green product standard system; strengthen public awareness of green consumption, and encourage people to have green low-carbon lifestyles and consumption patterns and vigorously promote green consumer products. Green consumption will create demand for green production and help to strengthen environmental governance.

3.2.1 Promoting the effective supply of green products and services in the production sector

3.2.1.1 Speeding up the reform of the systems and mechanism concerning green products and services and increasing their effective supply

We shall remove institutional barriers to the supply of green products and services, and guide and support more social capital to invest in the weak fields of green products and services. We shall also loosen the restriction on market access for green products and services, encourage all types of capital to invest in green industries, and increase the supply of green products and services.

3.2.1.2 Increasing the effective supply of green products and services

We shall guide and support enterprises to enhance their innovation capacity, increase investment in research and development, design and manufacturing of green products, reduce the cost of green products and services, and strengthen the core competitiveness and effective supply of green products and services. We shall also support enterprises in the research, development and storage of green technology, and accelerate the application of advances in science and technology. In addition, it is necessary to require manufacturing enterprises to reduce the use of toxic hazardous and volatile substances and substances which are difficult to degrade and dispose of, and to encourage them to build green supply chains, so as to reduce the environmental impact of the whole life cycle of products.

3.2.1.3 Building a diversified supply system of green products and services

We shall support enterprises to focus on improving the quality of green product supply, enhance the diversified competition among medium- and high-end brands, and build a diversified supply system of green products. In addition, we shall diversify the production of green consumer goods such as energy- and water-saving products, resource recycled products, environmental protection products, green building materials, new energy vehicles, etc. It is necessary to popularize the use of “Internet Plus” to promote green consumption, support the direct selling business of e-commerce enterprises or cooperate with bricks-and-mortar enterprises to supply green products and services, and encourage selling green products on the network.

3.2.2 Improving green standards and label certification in the market

3.2.2.1 Perfecting the green product standard system

We shall improve the standard system of green products and services, expand the coverage of standards, speed up the revision of standards for energy consumption, water consumption and material consumption in the production process, and dynamically adjust and continuously improve the resource and environment access criteria for products. We shall speed up the implementation of the top-runner approach for energy efficiency and environmental protection, and study and establish the top-runner approach for water efficiency. We shall also prioritize consumer products that are closely related to consumers, develop evaluation standards for green products, and organize certification to improve product quality.

3.2.2.2 Establishing a sound green product certification system

We shall promote China's certification program for environmental labeling, improve the labeling system for green buildings and green building materials, implement the certification management measures for energy-saving and low-carbon products, and accelerate the implementation of low-carbon and organic product certification. We shall also integrate environmental protection, energy conservation, water conservation, recovery, low carbon, recycling and organic products that have been established separately into green products, and establish a unified green product system containing certification, labeling, etc., so as to strengthen the quality supervision of green products.

3.2.2.3 Establishing a supervision mechanism in and after the fact

We shall establish a quantitative evaluation mechanism for green product standards and assess the effectiveness of certification implementation, propose basic requirements for implementing extended producer responsibility and the joint and several liability of the implementing agency for testing and certification results according to China's practice, and enhance the in-process and post-mortem regulation of green standards and label certification.

3.2.3 Promoting the practice of green lifestyles and patterns in the consumer sector

3.2.3.1 Establishing a sound incentive mechanism for consumers

We shall continue to provide subsidies to support the comprehensive promotion of

energy-efficient vehicles and new energy vehicles and accelerate the construction of electric vehicle charging infrastructure. We shall implement the “old products for remanufactured products” pilots, promote remanufactured engines and transmissions, put in place an incentive mechanism for consumers, and study the consumption points system of green products.

3.2.3.2 Advocating a green and low-carbon lifestyle

We shall encourage low-carbon mobility methods such as walking, bicycle and public transport. We shall also establish reasonable controls on building temperatures by setting the indoor air-conditioning temperature higher than 26°C in summer and lower than 20°C in winter, except for specific purposes. We shall encourage consumers to travel with their own toiletries and reduce the use of disposable daily necessities. We shall encourage large- and medium-sized cities to make use of mass leisure places and public welfare venues to set up flea markets for residents to exchange goods they no longer use. We shall improve the recycling system of renewable resources in residential communities and encourage the sharing of goods that are infrequently used. We shall also carry out in-depth actions against waste, over-packaging, food waste and excessive consumption.

3.2.3.3 Encouraging green product consumption

We shall encourage the purchase of water-saving products such as water-saving faucets, water-saving toilets, water-saving washing machines, as well as energy-saving products such as energy-efficient motors, energy-saving and environmentally-friendly cars, efficient lighting products. We shall promote products with environmental labels and encourage the use of coatings and dry cleaning agents with low VOCs. We shall promote green consumption in public institutions and improve the efficiency of using office equipment and assets by encouraging double-sided printing and working in paperless offices. We shall improve the evaluation criteria for conservation-oriented public institutions and rationally formulate indicators for water and electricity consumption. We shall promote the use of various green building materials and environmentally friendly decoration materials including energy-saving doors and windows, C&D waste recycled products, etc. We shall also implement green building standards for public buildings, install rainwater recycling systems and recycled water utilization facilities.

3.2.3.4 pay attention to the gender dimension of “green consumption”

The further investigate influence consumption by women should be analysed and policy guidance developed as part of the effort to green consumption to guide future policy development. As Chinese women are usually the main managers of household consumption, their consumption patterns will directly affect the social production structure; womens' consumption choices can effectively improve the deteriorating urban and rural environment; womens' own consumption is becoming a major driving force for social and economic development and is expected to become greener; women as the educator for the next generation influence the expansion of green consumption behavior. It is necessary to consider the factors influencing women in green consumption, and prepare policy guidance.

3.2.4 Promoting the cultivation of green consumer awareness, information, publicity and education

3.2.4.1 Green consumption education

We shall advocate traditional virtues, carry out green consumption education starting with children, and integrate the awareness of thrift, green and low carbon into family education, pre-school education, primary and secondary education, etc. We shall also regard green consumption as an important part of family ideology and moral education, ideological and political education for students, continuing education for employees and civil servant training, and incorporate it into the requirements for civilized cities, civilized villages and towns, civilized organizations, civilized families, civilized campuses and related educational demonstration bases.

3.2.4.2 Green consumption promotion

We shall incorporate green consumption into various thematic publicity and education activities such as the National Energy Conservation Propaganda Week, the Science and Technology Week, the National Low Carbon Day, the National Environment Day, etc. We shall carry out actions advocating energy conservation and emission reduction and traditional virtues, and organize activities on building green families, green shopping malls, green scenic spots, green hotels, green canteens, conservation-oriented institutions, conservation-oriented campuses, conservation-oriented hospitals, etc. We shall also give full play to the role of labor unions, the Communist Youth League, the Women's Federation and relevant industry associations and environmental protection organizations, and strengthen publicity and promotion, so as to create a good social atmosphere for green consumption.

3.2.5 Improving the green procurement system

We shall strictly implement the government's preferential and compulsory procurement system for energy-efficient and environmentally friendly products, expand the scope of public green procurement, improve standards and the implementation mechanism, and expand the scale of public green procurement. In addition, it is imperative to make clear the institutional arrangements for green production, distribution, consumption and resource recovery. In particular, the Government Procurement Law establishes binding regulations for public green procurement and the need to develop supporting by-laws and systems.

Government procurement preferentially sources domestically produced products that have the same or similar performance as foreign products. A compulsory purchase ratio may be adopted for key innovative products in China, so that the government-supported green technology and industry development financial funds are more targeted. In terms of the negotiation on the entering into the Government Procurement Agreement under the framework of WTO, it is recommended to reserve the right to give priority to the procurement of products that are friendly to ecological and environmental protection.

Box 3 German Green Consumption

Sustainable consumption means living within the Earth's carrying capacity and ensuring that today's consumption patterns do not jeopardize the ability of current and future generations to meet their needs. It is vital that our consumption behavior becomes significantly more sustainable. This challenge must be tackled by society as a whole.

1. International Initiatives

At the World Summit on Sustainable Development in Rio de Janeiro in 1992, first discussions were held on sustainable consumption. Then in Johannesburg in 2002, the Marrakesh Process was launched. Industrialized countries in particular were urged to promote sustainable consumption and production. At the World Summit on Sustainable Development in Rio de Janeiro (Rio+20) in 2012, the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns was approved. It provides a global framework for measures in the area of consumption and production patterns.

In September 2015 at the UN headquarters, the heads of state and government adopted the 2030 Agenda for Sustainable Development, which sets out the global

sustainable development goals. A number of chapters deal with the implementation of sustainable consumption and production patterns, and there is also a specific goal (SDG12: ensure sustainable consumption and production patterns).

Also the European Commission has launched numerous initiatives on environmental product policy. These include the Communication on integrated product policy (IPP) of June 2003, which laid foundations for taking into account the environmental impacts of products over their entire lifecycle. The European Ecodesign Directive ensures that environmental requirements are also observed in product design. Furthermore, there are numerous EU initiatives such as the EU eco-label, green public procurement initiatives and the eco-management and audit scheme (EMAS).

2. The National Programme on Sustainable Consumption

In 2016, the German Government adopted an updated National Sustainable Development Strategy, which is aligned with the UN's 17 sustainable development goals. In the same year, the German government launched the National Programme on Sustainable Consumption (NPNK), which describes the relevant fields of action and details over 170 specific measures. The programme with its whole-of-government approach, including all ministries and many stakeholder groups, is tackling consumption in a cross-cutting approach. The programme sets out how the German government plans to systematically strengthen and expand sustainable consumption in various areas, with various stakeholders at national level.

When it comes to sustainable consumption there are six areas (fields of need) with the greatest potential for reducing pressures on environment, such as mobility, food, housing and households, office and work, clothing, tourism and leisure.

3. Developing and improving green standards and label certification

The Blue Angel was launched in 1978 as the world's first eco-label. It is regarded as a pioneer of product-related environmental protection and has been providing reliable guidance for many years for the purchase of environmentally friendly goods and services. The eco-label is now available for 120 different product groups, making it one of the most comprehensive eco-label programmes in the world. A total of 12,000 products from around 1,500 companies are currently labelled with the Blue Angel. So also the German Sustainable Development Strategy formulated the target, that eco-labelled products reach a market share of 34 % until 2030.

4. Innovating to ensure the effective supply of green products and services

Social innovations for sustainable consumption comprise new organizational forms, services, products and practices, which are able to make consumption habits more sustainable. Examples are sharing -formats for cars, tools or other products, urban gardening projects or other collective initiatives. The Federal Environment Agency (UBA) carried out research about sustainable consumption through social innovations, to systematize social innovations for sustainable consumption and derive recommendations for promoting the ones with potential to reduce environmental effects.

5. Sustainable public procurement

The state can also play a decisive role in the sustainability turnaround with its actions. Its huge economic potential gives sustainable public procurement major leverage to promote sustainable products and services. Furthermore, with an appropriate procurement policy the public sector can lead by example and contribute to the credibility of a sustainable consumption policy.

6. Institutional Monitoring

For Implementation of the German National Programme on Sustainable Consumption and its measures, an interministerial working group and a competence center has been set up. With this institutional structures, Germany wants to contribute to anchor sustainable consumption firmly in the public debate. To this end, there has been put in place a major information platform in order to establish an exchange between all stakeholders, including companies, local authorities, consumer protection agencies, associations, ministries and other public agencies and of course, citizens and to create a strong link between various organizations working on sustainable consumption as well.

For a more effective policy to promote sustainable consumption, there is a need for comprehensive and continuous monitoring that shows what is happening with sustainable consumption in Germany and whether corresponding political measures are having an effect. For this monitoring the UBA, together with some other institutions, has now developed two new indicators for sustainable consumption in the national sustainable development strategy (the market share of products with government eco-labels and the energy consumption and CO₂ emissions of private consumption). To develop a tool to systematically track the market for green

products, to provide an estimate of the growth in green products and to evaluate measures and instruments of promoting green products, since 2013 a report is periodically published.

3.3 Vigorously promote green finance

To speed up the green transition, we will also pay more attention to the role of various economic instruments such as taxation, finance and pricing in improving environmental conditions. It is also necessary to increase green investment, improve the environmental management model, and give full play to the long-acting market mechanism.

3.3.1 Improving tax and financial policies for green consumption

We shall implement relevant tax incentives for eligible energy-saving, water-saving, environmental protection and comprehensive resource utilization projects or products, and include energy-intensive and high-pollution products and some high-end consumer goods in the scope of consumption tax collection. We shall also implement the electricity price policy for electric vehicles and improve the tiered pricing system for household electricity, water and gas.

3.3.2 Improving green financial policies

We shall encourage banking and financial institutions to implement green credit guidelines, innovate financial products and services, and provide credit for green consumption. We shall also study and introduce progressive policies to support green consumption credit such as for energy-saving vehicles and new energy vehicles, green buildings, new energy and renewable energy products and facilities, etc., and encourage financial institutions to increase credit support.

Stepping up efforts to develop financial products and service models needed for green transformation and upgrading. for example, by lowering business risks through the implementation of performance bonds, and encouraging businesses to lease advanced green technology equipment; by supporting green finance products and service model innovation, to facilitate financing for manufacturing enterprises, etc.

3.3.3 Establishing a mechanism in which the price of green elements are determined by the market as soon as possible

We shall urge enterprises to transform their competition from one that is driven by excessive depletion of energy and resources, as well as low costs, to one that relies on innovation and differentiation. The focus of the policy is to curb irrational investment and investment promotion methods such as low-cost land supply, tax reduction and exemption, and low-cost allocation of resources to avoid blind expansion of production capacity and homogeneous competition. We shall complete the development of the carbon emission trading market as soon as possible, and give full play to the carbon price discovery mechanism of the ETS, so that the economics of green innovation will be made explicit.

3.3.4 Accelerating resources tax reforms

We shall correct the abnormal current situation of “low-cost at front-end” and “low final price” by accelerating the price reform of resource products such as water, petroleum, natural gas, electricity, minerals, etc. This could be done for example by an orderly opening up of feed-in tariffs, and an appropriate timing to deregulate the price of refined oil products. The aim would be to form a relatively reasonable relationship between primary resource products and manufactured goods, reasonably compensate for environmental damage costs, and rationalize upstream and downstream price adjustment linkage mechanism for resource products. We shall correct the abnormal current situation of “coexistence of multiple pricing methods”, by focusing primarily on the dual track approach for coal, electricity and gas pricing, and rationalize the terminal pricing mechanism for resource products.

3.4 Promoting the reform of the green development statistics

3.4.1 To establish and improve the statistical system for green development

Work on the establishment and improvement of a statistical survey system and a comprehensive evaluation system that reflect green development will be accelerated. This includes: implementing a green development statistical reporting system and carrying out green development evaluation and accounting; establishing and implementing a statistical reporting system for market share of green products; improving resource and environmental statistical standards and energy statistics systems; and developing a green development index to promote the formation of green development methods and lifestyles.

3.4.2 Construct and improve the statistical system for green development

Actively develop the role of statistical indicators for green development and indicators that reflect green structural adjustment, green transformation and upgrading, and green quality benefits. Innovate green development statistics and give full play to the role of green development statistics. Strengthen the capacity building of ecological statistics monitoring and continuously enhance the statistical supervision role of green development.

3.5 Scientifically develop green development and precise supervision

3.5.1 Take differentiated environmental control measures

In accordance with the actual needs of pollution control and environmental management, scientifically formulate and implement differentiated management and control measures and regulatory measures. "One size fits all" approaches will not be adopted. For enterprises that are legal and meet the requirements of ecological and environmental protection, centralized production stop and remediation measures shall not be taken; for enterprises that are legal but do not meet the requirements of ecological and environmental protection, targeted measures according to specific problems shall be taken; for enterprises that are illegal and fail to meet ecological and environmental protection requirements, they shall be punished according to the laws and regulations.

3.5.2 Increase the refined management control in key areas and industries

For industrial parks and enterprises, "one park, one policy", "one factory, one policy" shall be implemented, and refined management and control shall be taken according to specific environmental issues. It is suggested to take specific measures in accordance with the local situations: for areas which is suitable for electricity, then electricity shall be put into use; for area which is more suitable for gas, then gas shall be given the priority; for area which is suitable for coal, then the use of coal is preferred. The implementation of winter cleaning and heating shall be accelerated. It is suggested to differentiate the enterprises that support the promotion of "scattering and pollution", and open up green channels, accelerate the integration and relocation, upgrade and reform, and organize acceptance.

4. PATHWAYS TO FUNDAMENTAL IMPROVEMENT OF ENVIRONMENTAL QUALITY BY 2035

4.1 Optimizing eco-environment governance structure, building long-term mechanism of green development

4.1.1 Building the consensus on the governance and improvement of ecological environment of the whole society

Consensus and public awareness are the foundations for promoting ecological environmental governance. This requires the transmission of ecological culture and ecological ethics, and fostering the public's collective consciousness and overall awareness. The government shall play a leading role and decentralize its power. The enterprises shall take the initiative to take the responsibility by promoting a better development of enterprises with green production; social organizations and the public shall be encouraged to take the initiative to participate in the environmental governance. The government should regard culture as an essential part of the eco-environmental governance system. Cultural transmission enables ecological civilization to be the mainstream value of social development, fostering ecological characteristics, and thus forming a good atmosphere for protecting the ecological environment in the whole society.

4.1.2 Streamlining administration and delegating power, enhancing primary-level capacity building of eco-environment governance

4.1.2.1 Strengthening government guidance mechanism

Local governments should make overall arrangements for eco-environment governance. They should not only allow and mobilize residents to actively participate in the primary-level eco-environment governance, and innovate in primary-level eco-environment governance, but also keenly identify and promote models in extensive primary government practices. They should also, lead in the formulation of rules and regulations to standardize eco-environment governance. The key is to establish a strong organization dedicated to eco-environment governance in cooperation with the government's internal governance activities. At the same time, consolidate government rules and regulations, implement laws, regulations, policies, environmental standards, assessment mechanisms and other means to regulate the conduct of all economic entities, and in particular, to guide local government officials to correctly handle the relation between economic development and environmental protection.

4.1.2.2 Innovative mechanisms for enterprises to participate in governance

By actively guiding enterprises and exploiting their state-of-the-art and innovative approaches, local governments and communities should contribute to the primary-level government practice of joint building and enjoyment by diverse subjects. They should use market mechanisms to allow enterprises to assume social responsibilities during production and environmental governance. Firstly, to apply the principle of economic leverage, clarify ownership of ecological resources, improve market trading mechanism of ecological resources, put into practice the idea of beneficiary pays through levy of resource tax and eco-environment tax so as to realize market deployment of ecological resources and arouse enterprises' motive of eco-environment governance; secondly, to drive industrial transformation and upgrading, which requires governments' positive promotion and guidance, and continuously push forward the development of strategic emerging industries like energy conservation and environmental protection, new energy, new material, and high-end equipment manufacturing by constantly adjusting economic structure and by strengthening technological innovation.

4.1.2.3 Driving extensive public participation in primary-level eco-environment governance

The primary-level eco-environment governance should enable residents and various social organizations in primary communities to participate extensively in the management of primary-level eco-environment affairs, jointly push forward community building and share governance results. It should also make sure that all interests of the public are secured from participation in eco-environment governance; expand the mechanisms for public participation in democratic decision making so that the public ecological policies can reflect people's interests and guarantee the public's rights to know; reinforce the monitoring and feedback mechanisms of public ecological policies; allow the public to know and conduct supervision through implementation of the environmental information disclosure system. The public can support the development and implementation of policies by tracing, evaluating and overseeing the policy implementation performance. At the same time, through supervision and feedback, exposure of ecological issues should be strengthened to generate strong pressure from public opinion and the whole of society for effective eco-environment governance.

4.1.3 Transfer the focus of eco-environmental governance from end-of-pipe treatment to source control

From 2020 to 2035, China's eco-environment governance process will continue to advance in line with industrialization, urbanization and agricultural modernization. Therefore, it is necessary to change the ideas of eco-environmental governance based on end-of-pipe treatment. The focus when establishing environmental governance, designing policies and allocating human resources should be transferred to the control of pollution at source control. This would promote green development, and achieve sustainable governance and the goal of a fundamental improvement in the environment.

4.1.3.1 Supply-side reform should continue to have a major role in eco-environmental governance

Starting from the production side, the government should further promote the adjustment of industrial, energy, and investment structures. In addition, the government should increase the proportion of emerging industries, especially environmental protection industries, in the industrial structure. The focus of subsidy policy has been transferred from supporting the industries to stimulating green production behaviors. The government should also build an energy utilization system consisting of the most clean, efficient and centralized utilization of coal, natural gas, as well as renewable energy (especially biomass energy, solar energy and wind energy).

4.1.3.2 Enhance the attention to the demand side in eco-environmental governance

Starting from the consumption side, the government should further adjust the trade structure and improve infrastructure at the municipal and community level (e.g. establishing a sound green public transportation supplying system, etc.). This would make the external conditions of green consumption in line with the green consumption concept.

4.1.3.3 Loosening control over market access, encouraging investment diversification

Various types of capital can support investment, construction and the operation of public products and services for environmental governance and ecological conservation. The market can help to diversify investors. First, improvements could be made to the operational mechanisms of PPP environmental infrastructure project and competition transparency improved. The principle of risk sharing between the parties should be established to optimize the whole project process including financing, engineering

design and construction, and operation, maintenance. It is expected that this would improve environmental service performance. Secondly, it is suggested to improve third-party mechanisms by setting up a national environmental protection fund, establishing a bi-directional incentive mechanism to promote pollution reduction, and introducing a corporate environmental blacklist system as a part of the social credit system. Thirdly, it is suggested to improve the economic components of environmental governance, such as improving the price composition and adjustment policies of environmental service products, strengthening the verification and price supervision of environmental public service costs, and improving the tax incentives for environmental protection industries in a non-operating environment with poor return on investment, such as the areas of groundwater, soil, watershed management, etc. It is recommended, when justified, to implement tax exemption and reduction policies for a certain year, and introduce tax incentives for environmental industries.

Box 4 Multi-level Governance in EU Countries

Take air treatment and control in London as an example. Air governance in the UK involves three levels: the EU, the UK government and the the local government. Among them, the EU mainly plays a regulatory role. At the UK level, the Department for Environment, Food and Rural Affairs (Defra) plays the main role in carrying out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU limit values for the specified pollutants.

I. EU supervision. It mainly includes three aspects:

(1) The European Union has set the goal of achieving air quality that does not give rise to significant negative impacts on human health and the environment. EU policy to control air pollution rests on three main pillars:

The first pillar comprises the ambient air quality standards set out in the Ambient Air Quality Directives for ground level ozone, particulate matter, nitrogen oxides, dangerous heavy metals and several other pollutants;

The second pillar consists of national emission reduction targets established in the National Emissions Ceiling Directive for the most important trans-boundary air pollutants: sulphur oxides, nitrogen oxides, ammonia, volatile organic compounds and particulate matter;

The third pillar comprises emissions standards for key sources of pollution, from vehicle and ship emissions to energy and industry.

However, the EU standards are generally lower than those set by the WHO. National governments though have the freedom of choice to set higher national standards.

(2) A variety of measures exist at the level of the EU to help promote compliance with Directives concerning air pollution. These measures include: financial mechanisms; advisory services to facilitate access to technical and financial assistance (e.g. URBIS that is supported by the European Commission and European Investment Bank); peer reviews of performance through environment implementation reviews; dialogue between the European Commission and EU Member States on how to improve compliance; and mechanisms for exchanging experience and good practices.

(3) Judicial means. When countries are not in compliance with EU air quality legislation, both the European Commission and citizens have recourse to courts in order to require governments to take the actions necessary to achieve compliance. At the EU level, the European Commission may launch infringement procedures which involve documenting non-compliance and requesting information on measures that the Member State will take in order to achieve compliance. If the country still doesn't comply, the Commission may refer the matter to the European Court of Justice which may impose penalties. The European Commission has filed lawsuits against 16 Member States, including Germany, and 13 countries including Germany and the United Kingdom have been accused for nitrogen dioxide. The EU and its Member States can coordinate their policy framework and implementation. Countries with valuations for several consecutive years may face penalty.

2. Supervision of the British government.

The air quality commitments contained in EU Directives were agreed at UK level. However, implementation is devolved to the four national administrations within the UK. Scotland has already produced its own Air Quality Strategy, and Wales and Northern Ireland are currently in the process of drafting their own. At the UK level, Department for Environment, Food and Rural Affairs (Defra) is responsible for implementing air quality related EU directives and general policies, and plays the main role in carrying out an annual national assessment of air quality using modelling

and monitoring to determine compliance with EU limit values for the specified pollutants.

Some of the main policies to be implemented at the national level include: phasing out the sale of vehicles using fossil fuels by 2040 and requiring vehicles to be basically zero-emission by 2050; providing financial support for various measures including: vehicle charging infrastructure, cleaner buses and taxis; and measures for reducing emissions generated by major roads; and grants to assist local authorities to improve air quality.

3. Supervision and measures of local government.

Local authorities shall regularly review and assess air quality in their area, and to assess whether national objectives have been, or will be, achieved at relevant locations, by an applicable date. If national objectives are not met, or at risk of not being met, the local authority concerned must declare an air quality management area and prepare an air quality action plan.

4. Civil environmental organizations play a supervisory role.

NGOs are granted judicial remedies. Therefore, they have been active in using the courts to pressure the UK into complying with EU air quality standards. In particular, Client Earth has played a major role in using the courts, not just in the UK but in a range of other EU countries including Germany. In 2016, the UK Supreme Court referred a case that Client Earth had brought concerning the interpretation of air quality plans in the EU Ambient Air Quality Directive. The ruling by the European Court of Justice on this interpretation is now binding on all national courts in the EU.

4.2 Maintaining the overall stability of ecosystems, reinforcing eco-environmental system development

4.2.1 Consolidating and expanding the achievements of pollution control campaigns

It is recommended to constantly expand achievements based on the consolidation of results of the pollution control campaign and fight for blue sky and water and pure land. In the main battlefields of Beijing, Tianjin and Hebei and their peripheral regions, Yangtze River Delta and Fen-Wei Plains, significant improvement of air quality should be established as a rigid requirement; joint protection and control should be

strengthened; heavy pollution eliminated; and the management of the three major pollution sources (industry, coal burning and moto vehicles) strengthened. The key lies in adjusting the industrial and energy consumption structures, cutting down excess and outdated production capacities, and adding add new growth momentum. To decrease the proportion of fossil energy consumption, coal consumption in particular should be decreased, and the proportion of clean energy consumption increased (solar and wind energy depending on local conditions).The transport structure should be changed, including by an increase in the volume of railway transportation. To promote clean heat in northern China during winter, it is recommended to enhance building of the natural gas supply, storage and sale system, optimize the layout of natural gas sources, enhance the interlink and interconnection of pipe networks, safeguard gas supply, and offer subsidy policy and price support. To promote compliant emissions, reduce pollutant emissions in key industries, and execute ultra-low emissions renovation in key industries including thermal power, iron and steel, etc. To reduce the emission of atmospheric pollutants such as factory exhaust gas, automobile exhaust gas, and residential heating, and to implement a carbon emission trading system to encourage clean production and green consumption.

4.2.2 Reinforce the conservation and restoration of ecologically vulnerable areas and ecological function areas

Firstly, to perform systemically ecological conservation and restoration in key regions in line with the characteristics of different vulnerable areas. To develop basic measures and technical countermeasures of ecological restoration in accordance with the principles of adaptation to local condition, combination of natural restoration and artificial measures, and benefiting livelihood, etc., based on comprehensive consideration of resources, environment, economy and other factors of the vulnerable areas. Secondly, to implement ecological restoration and conservation projects in an orderly manner, and promote the governance of ecological systems as a whole. To strengthen conservation of ecological systems such as forest, grassland, wetland, lake, etc. as a whole, and embark demonstration projects for typical damaged ecological system restoration first in the ecological conservation red line areas with vulnerable ecological environment. Thirdly, to carry out the supervision and management mechanism of ecological conservation and restoration, and strengthen subsequent regulation. Governments at all levels should clarify departmental duties and management requirements of ecological restoration and conservation by the managerial principle of no change of subject responsibility, realize the overall management of mountains, waters, forests, fields and lakes, establish the "sky and land integration" monitoring and supervision system and achieve supervision normalization; establish

technical specifications for monitoring and warning of ecological restoration and conservation in typical ecologically vulnerable areas, form a monitoring and warning network fully covering the restoration areas and conservation areas, and grasp dynamic changes in ecological restoration and conservation in a timely manner; complete the ecological conservation compensation mechanism, execute the compensation policies based on category and level, integrate properly the ecological conservation compensation and targeted poverty alleviation, develop innovative ways of fund use, carry out comprehensive ecological compensation trial in poor areas and explore new paths to ecological poverty alleviation; stringently perform evaluation and assessment, reinforce subsequent supervision of ecological restoration projects, regularly monitor and inspect the use of special funds for ecological restoration and project implementation, and formulate the regular reporting system. Fourthly, to underpin technological research for ecological conservation and restoration, and drive technological innovation guide. According to the dominant ecological functions in ecologically vulnerable areas, to undertake research on the ecological function based evaluation technology and diagnostic methods of degraded ecological systems, identify key indicators of regional ecological degradation, establish the ecological function based evaluation index system, class determination criteria and corresponding technical methods of degraded ecological systems, analyze driving factors of regional ecological degradation and ecological service function weakening, and through the restoration modes of integration of regional control and local restoration technology and coordination between regional ecological function improvement and economic development, search for suitable restoration modes for different types of ecological vulnerable areas.

4.2.3 Protecting ecological security barriers, enhancing overall service capacity of the ecosystem

To maintain holistic stability of the ecosystem, consolidate ecological security barriers, and enhance overall service capacity of the ecosystem. To adhere to the overall planning of land and sea, aiming at fundamental improvement of the quality of the ecological environment and achieving “beautiful China”, to increase the protection and restoration of ecosystems, optimize the ecological security barrier system, and achieve the improvement of ecological environment quality and sustainable use of resources. To implement important ecosystem protection and restoration major projects, to build ecological corridors and biodiversity conservation networks, and improve ecosystem quality and stability. To complete the work of delineating the three lines of ecological protection red line, permanent basic farmland and urban development boundary. To carry out national greening actions, promote desertification, rocky desertification, and

comprehensive management of soil erosion, strengthen wetland protection and restoration, and strengthen prevention and control of geological disasters. To improve the natural forest protection system and expand the return of farmland to forests and grasslands. To make overall planning on marine ecological conservation and development, and build a "One Belt Multiple Spots" marine ecological security structure with coastal belts, island chains and all kinds of reserves as the support. To conserve marine living resources, strengthen monitoring and early warning of marine ecological environment, and prevent environmental risks.

4.2.4 Developing environmental planning, and optimizing spatial arrangement

To perform the planning EIA for major economic policies and industrial distribution, optimize the arrangement of land development, and restructure industries within regions and in a river basins. Authorities of ecology and environment should fulfill their duties seriously, and unify the formulation of policies, planning and standards. To quicken formation of the spatial pattern, industrial structure, production mode and lifestyle that conserve resources and protect environment, limit economic activities and human behaviors to the level acceptable to natural resources and ecological environment, and leave time and space to the natural ecology for ecological self recovery. To expedite definition of and guard the ecological red line, environment quality bottom line and resource use upper line, namely Three Red Lines. Regarding the ecological red line, to establish strict control systems, further improve and strengthen the ecological space zoning and control by establishing a supervision and management system including the central, provincial and municipal levels to ensure the effectiveness of management and control. In the later phase, the classification criteria can be adjusted according to the progress of the eco-environmental quality improvement, and the demarcation of ecological space can be adjusted simultaneously to adapt to the coordinated development of the economic and the ecological environment.

4.3 Attaching importance to the all-round participation of stakeholders, strengthen the disclosure of environmental information

4.3.1 Nurturing public consciousness of ecological environment protection

To cultivate the concept of ecological civilization in the whole society, raise public awareness of ecological environment, cultivate ecological culture, and consolidate the platform of ecological environment education and turn the eco-environmental protection into all people's conscious action. To enhance all people's consciousness of

saving, environmental protection and ecology. The relevant competent authorities shall make the top-level design on ecological environment education, and root the ecological environment education in the national education system. To strengthen dissemination of scientific knowledge related to environmental protection, and make environmental protection a genuine conscious activity of the whole public. To make great efforts in youth education on environmental protection knowledge, set real and believable samples that practice ecological civilization, at the same time enable penetration of the "green" ecological culture through various education and training systems, and bring into play the key role of community groups, public media, etc. in spreading scientific knowledge on environmental protection, make great efforts to disseminate and report scientific knowledge on environmental protection, knowledge and accomplishments of green development, increase the public attention, elevate the public environmental consciousness, set up the concept of green development, and create a favorable atmosphere that advocates ecological civilization and environmental protection.

4.3.2 Initiating national green actions

To initiate national green actions and to create an ecological environment sharing and co-governing pattern to mobilize the whole society to reduce consumption of energies and resources and pollution emissions through practical actions and make contributions to the ecological environment protection. To establish climate neutral foundations, add inputs in scientific research, set prices through market mechanism, employ flexibly rewards, punishments, incentives, etc., expand and satisfy the public demand for green products, guide the public to practice the concept of green development and improve consuming habits and behaviors step by step, and promote all-round development of green production and consumption. The government should leverage the gender advantages of women by enhancing their participation in developing and implementing policies of green life, green consumption and other aspects. To create new eco-environment management systems, build communication platforms with the public on a regular basis, develop the approaches and channels for the public to take part in the green development, complete the systems and stages of public participation. To implement responsible entities, strengthen work collaboration, and ensure public participation in environmental decision-making. To establish an effective eco-environment public participation evaluation system, conduct regular evaluation and make feedback on public participation in the eco-environment through hearings, symposiums, questionnaires, telephone and letter return visits. It may also take advantage of technologies such as big data and cloud computing to control the quality and effectiveness of public participation in the ecological environment.

4.3.3 Underpinning eco-environment information disclosure

Governments should, in accordance with the laws, delegate powers to social organizations to enable them to supervise the waste discharge behavior of enterprises and publish information to the society; strengthen the development of the corporate environmental information disclosure system, establish a public directory of corporate environmental information, including classification of information, differentiation of degrees of disclosure, information disclosure using standardized templates, etc., improve the remedy mechanisms, penalties and incentives for all parties involved in the disclosure of corporate environmental information; open clear channels for the public to appeal, adopt the hearing system to key projects and policies, and initiate the round-table mechanism for hot topics. For the pattern of environment information disclosure, to build unified environment information disclosure platforms and formulate uniform disclosure assessment systems and criteria.

Box 5 EU Countries emphasizing on information disclosure and public participation

1. Legislation guarantees citizens' right to know regarding environment.

The German government attaches great importance to ensuring citizens' right to know in the legal provisions. Taking sustainable chemicals management as an example, Germany has introduced a series of laws and regulations, such as environmental protection laws and preventive protection laws, to ensure the public's right to know regarding the environment, including factory site selection and environmental protection measures.

2. Government at all levels pays attention to the disclosure of environmental information

First, the legislative departments of the EU and Member States have passed legislation to protect the public's right to know.

Second, government agencies such as the German Environment Agency have established public dialogue mechanisms, which ensures close contact with the general public. While drafting the Integrated Environment Program the Ministry for Environment held five dialogues are held each year in different cities in Germany with local public participation.

Third, the government joins universities and colleges to jointly publish environmental information. In the United Kingdom, for example, several open channels have been established for the disclosure of air quality information, including: UK-Air, NAEI and "CityAir" mobile app to share environmental information with the public, and announce early warning in the event of heavy pollution incident through subway and bus.

3. The concept of protecting citizens' right to know is deeply rooted in enterprises, and enterprises attach importance to public relations.

Take the chemical industry park in Germany as an example. Enterprises in the park attach great importance to maintaining a good and trustful relationship with the residents, actively disclosing relevant information to the public, and never rejecting anyone's right to know. Thus, enterprises establish themselves as trustworthy.

4. Paying great attention to the impact of the environment on human health in disclosing environmental information

The environmental information disclosure in the UK attaches great importance to the impact of environmental pollution on human health, and is intended to raise people's attention to environmental protection. UK-Air contains information on the network of monitoring sites and how they function, data on local concentrations of air pollutants, including datasets on air quality trends and real-time air quality assessments, short-term forecasts for air quality, and information on how air quality affects human health and the environment. "CityAir" mobile app includes information about which roads are polluted, when and how much are the pollution is at highest. It informs the public by dos and don'ts under each pollution level, and helps plan a route with least exposure to heavily polluted areas before leaving the house.

4.4 Improve the legal system for ecological protection

4.4.1 Improve environmental legislation

4.4.1.1 Accelerate the process of environmental legislation

Regarding environmental protection, the Communist Party of China and the State, during the new round of institutional reform, will formulate the "Basic Environmental

Law" to improve the current system and resolve fragmented and contradictory content. Meanwhile, we shall speed up the formulation of "Environmental Damage Compensation Law", "Environmental Insurance Law", "Nature Reserve Law", "Climate Change Law". This legislation will help legalize major reform measures while modernizing the national governance system and capacity of ecological protection

At present, with regards to energy, priority shall be given to the formulation of the Atomic Energy Law which defines duties and powers of competent authority and supervision agencies, nuclear research and industrial development, nuclear deposit mining, nuclear material control, supervision and management of nuclear facilities, nuclear waste disposal, radiation protection, application of nuclear devices and radioisotopes, nuclear accident emergency management and damage compensation, and applicable legal liability. The Atomic Energy Law shall be in close connection with the "Nuclear Safety Law", among other applicable laws.

4.4.1.2 Revise existing laws in a timely manner

Amend or revise the Environmental Protection Law, Forest Law, Grassland Law, Water Law, Water Pollution Prevention Law, Air Pollution Prevention Law and Environmental Impact Assessment Law to satisfy the latest demand for environmental protection. Soil?

4.4.2 Recommendations on strengthening ecological environment law enforcement guarantee

4.4.2.1 Recommendations on improving the reform of the ecological environment supervision system and mechanism

Optimize China's environmental management system to achieve a combination of centralization and decentralization for the regulatory approach and an integration of legal implementation and supervision. Bring China's environmental management system reform onto the track of rule of law, clearly distinguishing the powers and responsibilities of environmental authorities and other relevant authorities; optimize the division of labor between the central and local environmental supervision systems by carrying out a new round of reform of administrative power in environmental protection and decentralizing administrative licensing and regulatory authority, giving intermediary organizations technical service rights; establish high-standard environmental management coordination agencies for specific problems, e.g. by setting up the national environmental protection committee at the central level, and office of

the environmental protection committee under the Ministry of Environmental Protection, and setting up the river basin environmental protection coordination agencies at river basins and coordination agencies at key air pollution prevention and control areas, etc. Implement the system and mechanism of “equal liability for CPC and governments, dual liability for one post, and accountability for negligence”, and improve the system and mechanism of supervision by the people’s congress, so that governments and CPC committees at all levels can exercise environmental protection duties according to law.

4.4.2.2 Recommendations on improving the performance appraisal and evaluation mechanism

Firstly, improve the local government’s eco-performance appraisal & incentive compatibility mechanism, primarily by improving the civil servant performance & promotion mechanism, the explicit material incentive mechanism, the implicit reputation incentive mechanism, and by establishing an eco-performance quality credit rating system. Second, improve professional supervision mechanism for local government eco-performance appraisal. In the evaluation of eco-performance, it is necessary to avoid behaviors such as political fraud, exaggerating, and false reporting by establishing professional supervision mechanisms, to achieve institutionalization of supervision authority, specialization of supervision institutions, specialization of supervision talents and supervision comprehensiveness. Thirdly, improve the accountability mechanism for evaluation of local governments’ ecological performance appraisal, whereby a sanction ladder from low-key or informal lesser punishment to severe measures, establishing a list of assessment responsibilities to strengthen disciplinary function

4.4.2.3 Recommendations on promoting the development of environmental health risk management mechanism

Assess the environmental health risks based on China’s environmental realities and goals of environmental governance by 2035, design China’s environmental health management mechanism by applying the risk management theory, and provide constructive advice for the country to gradually establish an environmental health risk management system: Establish an environmental health risk monitoring system; establish an environmental health benchmark standard; integrate and link the basic system of environmental management; improve environmental health technical support capabilities; and establish an environmental health risk communication mechanism. The system should provide information at two scales:

- strategic priority setting and allocation of resources, typically at the level of five-year plans and government work plans;
- risk monitoring in concrete situations, such as industrial development, transport infrastructure and performance appraisal of cadres.

4.4.2.4 Recommendations on establishing a long-term mechanism for gender mainstreaming in environmental rule of law

Firstly, set up a special gender equality agency or coordinator in general and branched departments concerning environmental protection management, which is responsible for coordinating and supervising the gender mainstreaming of the department, issuing expert opinions on gender impact assessment of environmental legislation and decision-making, implementing the environmental protection gender equality program and maintaining communication with the coordinators of other relevant departments, and carrying out relevant international cooperation. Secondly, carry out gender budgeting in general and branched departments concerning environmental protection management. Analyze existing environmental budgets, fully consider the different impacts on men and women, and select gender-sensitive factors in the budget as a focus to promote gender equality and environmental protection in this area. Thirdly, collect gendered data as a basis for gender equality decision-making as adding necessary gender specific data to existing environmental data is an essential part of truly integrating the gender perspective into the environmental rule of law.

4.4.3 Recommendations on strengthening judicial safeguards for ecology and environment

4.4.3.1 Recommendations on establishing a diversified resolution mechanism for ecological and environmental disputes

Firstly, the top-down design of a diversified resolution mechanism for ecological and environmental disputes shall be strengthened. Based on the characteristics of China's system and social conditions, priority shall be given to the development of various types of public welfare settlement services, while gradually exploring the development model of market-oriented mechanisms and building a rational management system. Secondly, adopt a progressive, categorized and step-by-step approach starting from specific systems and procedures based on actual needs and conditions, establish effective and coordinated ecological and environmental dispute resolution system through special laws, separate regulations, legal amendments, etc.; and strengthen the coordination and

integration of all material aspects including civil and administrative mediation and litigation, Thirdly, cultivate a new culture of dispute resolution, starting from education, popularization and the transformation of legal concepts.

4.4.3.2 Promoting centralized jurisdiction over environmental resource cases

The reform and exploration of centralized management and trial of environmental resource cases is of great importance. It is recommended that the judiciary shall summarize experience seriously and gradually form a sound legal system to promote it. At the same time, relevant judicial organs and relevant departments should actively build a multi-jurisdictional mechanism which aims at a joint mediation mechanism, and improve the judicial identification mechanism by strengthening the convergence of environmental justice and environmental administrative law enforcement. The judiciary must communicate and coordinate with the public security organs and the environmental administrative departments in a timely manner to create a good external environment for environmental resource trials.

4.4.4 Strengthen public observance of law

Firstly, make efforts to create a social atmosphere in which all people consciously learn, abide by and utilize the law. The staff of CPC and government organs at all levels, especially those closely related to the sustainable development of the economy and society, shall take the lead in observing the Constitution and laws, and actively take advantage of emerging online media for its supervisory role. It is recommended that universities offer environmental law education courses. Secondly, adequately consider female factors in the design of public participation system and increase the proportion of women. Thirdly, propose a program for corporate law observance assistance and incentive mechanism to improve the legal self-consciousness and enthusiasm of polluters.

In addition, it is suggested to strengthen the competence of the law governance team. For judicial and law-enforcing departments with high work intensity and heavy tasks, the government should appropriately expand the staffing structure to ensure the competency. In addition, the government should establish a sound standardized training system to normalize the training and assessment mechanism towards the professional team, so as to improve the overall skills and professional quality of the staff of relevant departments.

Box 6 Gender mainstreaming in German legislation, jurisdiction and law-abiding

1. History and legal anchoring of gender mainstreaming

Gender Mainstreaming (GM) has been in force as an international obligation of states for over 20 years (1995, UN World Conference on Women / Beijing Platform for Action). At the level of the European Union, gender mainstreaming was first made binding in the Treaty of Amsterdam on the 1st of May 1999. Since the adoption of the Lisbon Treaty in 2008, the EU's commitment to gender mainstreaming has been continued as now enshrined in Article 8 of the Treaty on the Functioning of the European Union.

The Amsterdam Treaty gave rise to the cabinet decision of the Federal German Government of 23rd of June 1999, in which the Federal Government, on the basis of the state objective laid down in the Constitutional Law in Article 3 (2) ("Grundgesetz" - GG), recognizes equality between women and men as a universal guiding principle. Gender mainstreaming was then legally enshrined in § 4 (1) of the Federal Equality Act ("Bundesgleichstellungsgesetz – BGleiG") and in § 2 of the Joint Rules of Procedure of the Federal Ministries ("Gemeinsame Geschäftsordnung der Bundesministerien" – GGO). Since then, Germany and all federal authorities have had a national obligation to implement gender mainstreaming.

2. Definition and content of gender mainstreaming

(1) The legal definition of Gender Mainstreaming according to § 4 (1) Federal Equality Act (BGleiG) is as follows: "Employees, in particular those with supervisory or managerial tasks, the management of the department and human resources administration must promote the attainment of the objectives of this Act. This obligation must be taken into account as a consistent guiding principle in all areas of responsibility and decisions of the agencies as well as in the cooperation of agencies" (own emphasis).

(2) The Federal Ministry for Family Affairs, Senior Citizens, Women and Youth ("Bundesministerium für Familie, Senioren, Frauen und Jugend" - BMFSFJ) defines GM as follows: "The international term gender mainstreaming can best be translated as the guiding principle of gender equality. The guiding principle of gender equality means that in all social and political projects the different effects on the life situations and interests of women and men must be taken into account systematically and in principle."

Within the GM framework, gender equality is therefore understood as a cross-cutting

principle and all-encompassing task for the entire organization. This task is not only to be executed by certain individuals, in particular it is not limited to the gender equality officer only, and instead it requires all members of an organization (women as well as men) to contribute. The management and leadership level has a special responsibility in the implementation of GM. GM is thus a top-down strategy, in order to enable all federal employees to act in a gender-oriented way in their fields of work.

3. Status of Implementation of GM in Germany

In the past, instruments have been developed in the form of working aids, handbooks, guidelines (language guides, gender impact assessment, gender budgeting etc.) in order to convey and facilitate a consistent gender equality orientation in daily work routines. Currently, the second equality report of the German Federal Government states qualitatively on GM, for which no empirical-statistical reporting obligations are in place, as follows:

“By taking into account the principle of gender mainstreaming, as enshrined in the Joint Rules of Procedure of the Federal Government, the establishment of new structural disadvantages or the reproduction of roles and stereotypes can be prevented. It is thus an important guiding principle for the work of the Federal Government as a whole. However, its effectiveness in itself is limited. On the one hand, the application of the principle hardly gives rise to any legislative proposals and other political measures that start from the goal of equal opportunities for women and men and actively pursue these. On the other hand, the resort responsible for gender equality at the respective federal levels has hardly any responsibility for the areas of regulation in which structural disenfranchisements are anchored.”

(1) Specific answers to the questions posed by the Chinese Environment Council by the BMFSFJ: According to the BMFSFJ, which is the central federal agency to promote GM, GM is “a decentralized approach that obliges the individual departments and their employees in management functions. To ensure that this actually takes place, the departments, including the Higher Federal Authorities, regularly exchange upon it with each other. This concerns figures on the proportions of women and men as well as an exchange of practice on measures that promote gender equality. Practical measures include, for example, requests from the service management to all management levels to pay attention to the special needs of employees with family responsibilities when determining working hours. Before performance evaluation rounds, it is common for all managers to be reminded that the performance of part-time employees - a very large proportion of whom are women - must be measured by the number of hours they work so that the performance

of part-time employees is not compared with that of full-time employees. There are many other measures.”

(2) The gender impact assessment of federal legislation determines “whether as many women as men are affected by a legislative measure and whether women and men are affected in the same way by the measure.” According to the BMFSFJ, “the extent to which equality aspects have an impact on legal reality/implementation in Germany varies with each legislative measure and cannot be answered in general terms.” No monitoring is required. The public servant of the BMFSFJ answered the question of court cases on the implementation of gender mainstreaming in Germany (“judicial”) that “he personally was not aware of any court decisions.” He attributes it perhaps to the “fact that in many more specific legal regulations in Germany gender equality aspects are already taken into account, so that the standards relevant for the decision originate from these regulations.”

4. National GM environmental initiatives

The Green Climate Fund has a gender policy that requires a mandatory socio-economic and gender assessment that complements the Environmental and Social Safeguards (ESS) process. In 2016, the UN published a Guide to Integration. It identifies the gender entry points of the UNFCCC process: the National Communications (NCs), the National Mitigation Activities (NAMAs), the National Adaptation Plans (NAPs), the Technology Needs Assessments (TNAs), REDD-plus, the Global Environment Facility (GEF), the Green Climate Fund (GCF), the Paris Agreement (NDCs) follow-up process. A workshop on gender-responsive climate policy with a focus on adaptation, capacity building and gender training for delegates took place on 18-19th of May 2016. The German Sustainability Strategy 2016 includes gender aspects. At the UNFCCC COP 23 the UBA hosted a shared side Event with the Federal Ministry for Economic Cooperation and Development (BMZ) on the 16th of November 2017, named “Giving Voice, Assessing Impact: Dealing with climate change in the global North and South from gender perspectives.” The UNFCCC gender action plan led to creating a gender focal point at the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

5. The implementation of GM at UBA

The UBA has started its GM implementation in 2000 and since 2008 it has created the position of a research officer and advisor for this purpose. In accordance with the legal basis, the position is placed within the unit of the UBA gender equality officer, but it provides its services to the whole organization. With this consolidation of in-house competence for GM, UBA is a pioneer among all federal authorities and, to

our knowledge, has a unique selling proposition. The current Research Assistant for Gender Mainstreaming is academically and professionally qualified and in 2015 submitted a pilot concept to the Heads of the UBA for the steered implementation of GM, which was successfully adopted. At UBA, this GM implementation concept addresses the three areas of 1) human resources and capacity building, 2) organizational development as well as 3) research and policy advice. It introduced objectives and measurable goals for the first time, and its evaluation, including a collection of examples of good practice, will be carried out within the preparation of the UBA gender equality plan in 2019. As such, GM is integrated in the regular process of renewing, implementing and monitoring the UBA gender equality plan every four years, as legally required.

6. Summary on the role of GM at the UBA

In sum it can be attested that GM goes far beyond gender-just language use. Gender is not equally relevant everywhere. In those areas where it is relevant though, the integration of gender dimensions into research opens up important, innovative perspectives for the work of the UBA, e.g. in urban planning, mobility/traffic, environmental justice / environmental burden, sustainability, consumer/environmental behavior/product design, pollutant exposure and environmental health as well as toxicology. In contrast to the contradictory experiences with GM on a national and international level, GM at UBA can be described as a success model that illustrates and enhances the benefits both for gender equality and environmental protection. Furthermore and step-by-step, GM contributes to improving the quality of processes and procedures and leads to equal participation, employment and career equity.

Annex: The need for scenario-based outlooks

This SPS highlighted a need for foresight, in order to align the Beautiful China 2035 targets with China's vision for 2050 and to identify a critical path towards achieving both. A recommendation to this end is put forward by the SPS, specifically advising scenario methodology to guide China's environment policy.

In addition, **focusing on CCICED itself**, SPS members noted that a common base of mid- and long term scenarios would provide great leverage to the whole programme of CCICED studies. Previous, summary work in this direction was undertaken by the CCICED task forces exploring the connections between China's environment policy and its social development and its economic transition, respectively. This annex summarizes the potential for CCICED.

1. Potential for the CCICED programme of studies

A common base of scenarios, underlying the whole programme of work, would conceivably provide the following potential to CCICED:

- a common baseline, or set of baselines, in order to **facilitate comparison between all studies** and combine their findings. It is a bit late in phase VI to establish this, but perhaps something of the sort can still be done.
- A softer variant, applied at a later phase in the development of the studies would be: **stress testing draft recommendations** from all current CCICED studies, against a simple set of contrasting scenarios, spanning the width of conceivable futures
- back casting in order to **align the 2035 goals with the 2050 vision**. Scenario work in this style was recommended as a first priority by the 2013 task force on the interplay between environment policy and China's social development.
- input into the drafting of the **annual issues paper**.

Any relevant scenario for environment and development in China has to consider multiple geographical scales, including the wider region and the globe. The same goes for the associated modelling. A pragmatic way to accomplish this, instead of building your very own worldwide scenarios and models, is to use the existing Shared Socio-Economic Pathways as context **. More detailed work for China's domestic developments, based on Chinese knowledge, can then be elaborated within that

framework. Such an approach has recently been followed in analytical work for the CCICED Task Force on China's Green Transition to 2050.

2. Background: what is a scenario-based outlook?

Scenario methods belong to the larger domain of foresight. That is the ability to know about the future. Specifically, scenarios are used to build consistent stories about the future, with a consistent timeline. Typically, the various actors and forces interact, as in the theater. Hence the name. The key objective is to have thought through the future before it arrives so that you are better prepared.

What scenarios do NOT deliver are predictions. The world is too uncertain for that. In fact, scenario methods are key in exploring precisely the big uncertainties and their policy implications.

Thus, a scenario is a story, imagining how things could develop over time. It is NOT necessarily a story how things should develop, although important variants exist that have this character.

In matters of environment and sustainable development, scenarios are often composed of a narrative plus numbers, the latter based on models. The models should NOT be understood as a rigid law, but they are often useful in illuminating, for example, maximum rates of improvement and the longevity of 'stuff' such as energy installations and spatial patterns.

Many types of scenarios exist and there is abundant literature. The simplest distinction is in terms of the reasons why one would want to know about the future. The technical characteristics follow from this (plus of course, time and money budgets, the audience, etcetera). Three archetypal reasons/purposes exist, as follows.

(1) **Policy optimization:** what policy variant is most effective, cost-efficient, fast, acceptable, and so forth.

(2) **Advocacy:** what are the positive changes we are going to fight for? Importantly, one flavour here is back casting, exploring how to reach the vision. Back casting is NOT planning. It is much more strategic, for example identifying 'must-haves' and 'dead alleys' to be kept in mind when making near-term decisions.

(3) **Strategic orientation:** for what alternative worlds do we need to prepare ourselves? What if our current assumptions were wrong? What would be robust strategies? Importantly, this is the archetype where the client is NOT in control, but wants to prepare strategically for what could come his/her way.

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* *Study on China's Environmental Protection and Social Development*, CCICED executive report 2013; *The New Era of Green development – China's Green Transition to 2050*, CCICED discussion paper 2017.

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